CHAPTER 7
Shore-Based Procedures

7.1 PREFLIGHT CHECK

7.1.1 Line Operations. The yellow sheet must be checked for flight status, configuration, armament loading, and servicing prior to manning the aircraft. At least the 10 previous B sections should be reviewed for discrepancies and corrective action. Weight and Balance clearance is the responsibility of the maintenance department.

7.1.2 Exterior Inspection. The exterior inspection is divided into 24 areas. The inspection begins at the left fuselage and continues around the aircraft in a clockwise direction. Check doors secure and be alert for loose fasteners, cracks, dents, leaks, and other general discrepancies.

1. Nose landing gear

    a. Drag brace/fairing - CHECK CONDITION
    b. Drag brace ground safety pin - REMOVED
    c. Holdback fitting - CHECK CONDITION
    d. Tires and wheels - CHECK CONDITION
    e. Tire pressure - 150 psi (ashore) 375 psi (afloat) (gauges on some aircraft)
    f. Ensure key washer not in direct contact with wheel hub.
    g. Strut piston chrome exposed - 3 TO 4 INCHES
    h. Launch bar - CHECK CONDITION
    i. Nosewheel steering assembly - CHECK CONDITION
    j. Tiedown rings (2) - CHECK FOLDED AGAINST STRUT
    k. Taxi and approach lights - CHECK CONDITION
    l. Strut pressure gauges (2) - CHECK vs. Strut Servicing Plate
    m. Retract actuator - CHECK CONDITION
    n. Strut - CHECK CONDITION

2. Nose wheelwell – CHECK

    a. Emergency brake accumulator pressure - CHECK (2,600 psi minimum)
    b. Digital display indicator - NO FLAGS
    c. APU emergency shutdown switch - NORMAL
    d. Doors and linkages - CONDITION
    e. BRCU - CYCLE (if applicable)

3. Nose section (left side) – CHECK

    a. Gun - PREFLIGHT
    b. U BATT/E BATT circuit breakers - CHECK
    c. Pitot static probe - CONDITION
    d. Pitot static drains (5) - CLOSED
    e. AOA probe - CHECK CONDITION
        (1) Smooth, concentric rotation through the full range of travel to include while gently pulling and pushing the AOA probe.
        (2) No bends, dents, dings, or other surface discrepancies.
    f. Forward UHF antenna - CONDITION
    g. Radome - SECURE (2 points)

4. Nose section (top) – CHECK

    a. Gun blast diffuser and gun port – CLEAR

5. Nose section (right side) – CHECK

    a. Radome - SECURE (2 points)
    b. AOA probe - CHECK CONDITION
        (1) Smooth, concentric rotation through the full range of travel to include while gently pulling and pushing the AOA probe.
        (2) No bends, dents, dings, or other surface discrepancies.
    c. Pitot static probe - CONDITION
    d. Refueling receptacle cover - INSTALLED (Door 8R)

6. Right fuselage – CHECK

    a. SMS processor/SMUG - CHECK codes, Door 14R closed/secure
    b. Aft UHF antenna - CONDITION
    c. Engine intake duct - CLEAR
    d. ECS intake - CLEAR
    e. Chaff/flare dispenser – PREFLIGHT (Dispenser module (chaff/flare bucket) or access cover shall be installed.)

7. External fuel tank – PREFLIGHT

    a. Refuel cap - DOWN, LOCKED, ARROW FORWARD
    b. Precheck valve - DOWN, FLUSH, ARROW UP
    8. AIM-7, AIM-120, LDT/SCAM, or NAVFLIR - PREFLIGHT
    9. Fuel air heat exchanger intake - CLEAR AND CONDITION

10. Right main wheelwell – CHECK

    a. Doors and linkages - CONDITION
    b. APU accumulator - PRESSURE, TEMPERATURE, PISTON POSITION
    c. Landing gear downlock and retract actuators - CONDITION
    d. Downlock pin - REMOVED
    e. Hydraulic filter indicators - NOT POPPED
    f. APU accumulator pump handle - CONDITION, SECURITY, PIN
    g. Main fuel line clamps secure and safety wires attached.

11. Right main landing gear – CHECK

    a. Tire - TREAD WEAR, PRESSURE 250 psi (ashore) 350 psi (afloat) (gauges on some aircraft)
    b. Brake wear indicator - CHECK
    c. Shrink links and planing links - CONDITION
    d. Shock strut pressure - CHECK
    e. Tiedown rings and springs – CONDITION

12. Right wing – CHECK

    a. Leading edge flap - CHECK CONDITION
    b. Pylons and external stores -
        (1) Breech caps tight

(2) If applicable, cartridge installed indicator present (protruding from breech cap w/ext storesloaded)
(3) Retainer clip in place and horizontal to the deck
(4) Auxiliary cap tight

c. Navigation lights - CONDITION
d. Wingfold area - CONDITION
e. Wingfold lugs - CONDITION
f. LAU-7 - Ensure doors secure, power supply installed, and either nitrogen bottle or HiPPAG installed.
g. AIM-9 - PREFLIGHT
h. Aileron - CONDITION, FAIRED WITH WINGS FOLDED
i. Trailing edge flap - CHECK CONDITION

13. Right aft fuselage – CHECK

a. Hydraulic reservoir gauge - CHECK
b. Vertical stabilizer and rudder - CONDITION
(1) Navigation, formation, and strobe lights - CONDITION
(2) Fuel vent port and dump mast - CLEAR
c. Stabilator - CONDITION
d. Exhaust nozzle, afterburner section, turbine blades – CONDITION

14. Arresting hook area – CHECK

a. Arresting hook - CONDITION (pin removed)

15. Left aft fuselage – CHECK

a. Exhaust nozzle, afterburner section, turbine blades - CONDITION
b. Stabilator - CONDITION
c. Vertical stabilizer and rudder - CONDITION
(1) Fuel vent port and dump mast - CLEAR
(2) Formation and strobe lights - CONDITION
d. Hydraulic reservoir gauge – CHECK

16. Aft fuselage underside – CHECK

a. APU intake and exhaust - CLEAR
b. ATS exhaust – CLEAR

17. Left wing – CHECK

a. Trailing edge flap - CHECK CONDITION
b. Aileron - CONDITION, FAIRED WITH WINGS FOLDED
c. AIM-9 - PREFLIGHT
d. LAU-7 - Ensure doors secure, power supply installed, and either nitrogen bottle or HiPPAG installed.
e. Wingfold area - CONDITION
f. Wingfold lugs - CONDITION
g. Navigation lights - CONDITION
h. Pylons and external stores -
(1) Breech caps tight
(2) If applicable, cartridge installed indicator present (protruding from breech cap w/ext stores loaded)
(3) Retainer clip in place and horizontal to the deck

(4) Auxiliary cap tight

i. Leading edge flap - CHECK CONDITION

18. Left main landing gear – CHECK

a. Tire - TREAD WEAR, PRESSURE 250 psi (ashore) 350 psi (afloat) (gauges on some aircraft)
b. Brake wear indicator - CHECK
c. Shrink links and planing links - CONDITION
d. Shock strut pressure - CHECK
e. Tiedown rings and springs – CONDITION

19. Left main wheelwell – CHECK

a. Doors and linkages - CONDITION
b. Landing gear downlock and retract actuators - CONDITION
c. Downlock pin - REMOVED
d. Hydraulic filter indicators - NOT POPPED
e. Main fuel line clamps secure and safety wires attached.

20. Fuel air heat exchanger intake - CLEAR AND CONDITION

21. Station 4 – PREFLIGHT

22. Chaff/flare dispenser – PREFLIGHT (Dispenser module (chaff/flare bucket) or access cover shall be installed.)

23. Forward fuselage underside – CHECK

a. Loose fasteners and fluid leaks - CHECK
b. Centerline station/store - PREFLIGHT
c. Fuselage fuel cavity drains – CHECK

24. Left fuselage - CHECK

a. Engine intake duct - CLEAR
b. ECS intake - CLEAR
c. Total temperature probe - CONDITION
d. RLCS door – CHECK

7.1.3 Before Entering Cockpit

1. Boarding ladder - SECURE (2 points)

2. Aircraft upper surfaces – CONDITION

3. Windshield - SECURE
Push up on windshield bow to make sure the windshield is secure.

3. Canopy jettison rocket motors - Nozzles down (F/A-18A/C)

4. Ejection seat safe/arm handle - SAFE & LOCKED

5. Ejection seat – PREFLIGHT

a. Ejection seat manual override handle - Check handle full down and manual override initiator maintenance pin removed from sear.
b. Time release mechanism trip rod - Check time release mechanism trip rod secured to bulkhead and engaged in time release mechanism. Check red color band on trip rod not visible. Check maintenance pin removed from sear.
c. Right trombone assembly - Hoses connected and retaining pin installed.
d. Ballistic gas disconnect - Check engaged and red band not visible.
e. Survival kit release handle - Check full down.
f. Leg restraint lines - Check lines secured to cockpit floor, lines not twisted, and line pins locked into front of ejection seat.
g. Ejection seat firing initiators - Check firing linkage connected to sears.
h. Survival kit emergency oxygen - Check pressure gauge, emergency oxygen green ring stowed inboard of left thigh cushion, and automatic emergency oxygen operating cable lanyard connected to cockpit floor.
i. Rocket motor initiator - Check initiator cable lanyard connected to drogue gun trip rod without excessive cable hanging from initiator housing. Initiator sear installed with cable lever assembly link inserted, maintenance pin removed from sear. Left trombone assembly connected with quick release pin inserted.
j. Drogue gun trip rod - Check drogue gun trip rod secured to bulkhead and engaged in drogue gun with maintenance pin removed from sear. Check that red color band on trip rod is not visible.
k. Top latch mechanism - Check that top latch plunger and locking indicator is flush with the end of the top latch mechanism housing and the main beam.

WARNING

If the top latch mechanism check does not meet the outlined requirements the seat could come loose on the mounting rails.

l. Catapult manifold assembly - Check hoses and manifold connected, and retaining pin installed.
m. Scissor shackle tie-down - Check drogue withdrawal line connected to the drogue slug. Check forward flap on top of all other flaps and shackle tie routed through eyelet in top flap and routed through both drogue shackle and extender strap. Check scissor mechanism tied securely to top of parachute container. Check drogue shackle engaged in scissors, and scissors release plunger extended against moveable scissor arm with plunger pin visible on top of scissors plunger.
n. Parachute risers - Check risers routed down forward face of the parachute container and routed behind retaining strap sensing-release secure and ease of operation, and seawater activated release system for proper installation.
o. Radio beacon lanyard - Check lanyard secured to seat bucket.
p. Check lap belts secure. Pull up strongly on each belt to make sure bolt fittings are engaged in seat. Check front end of survival kit secured to seat. Pull up on front end of kit to test security.

CAUTION

If any portion of the survival kit cushion is moved to gain access to components underneath unsnap cushion retaining snaps by a forward/up motion (not back/aft) and resnap by an aft/down motion.

SJU-17 AND SJU-17A

a. Ejection seat manual override handle - full down and locked.
b. Right pitot - stowed.
c. Ballistic gas quick-disconnect - connected indicator dowel flush or slightly protruding.
d. Top latch plunger - Check that locking indicator is flush with the end of the top latch plunger.

WARNING

If the top latch plunger check does not meet the outlined requirements the seat could come loose on the mounting rails.

e. Catapult manifold valve - Check hoses and manifold connected, and retaining pin installed.
f. Parachute withdrawal line - connected, secure.
g. Parachute container lid - secure.
h. Left pitot - stowed.
i. Electronic sequencer - expended unit indicator (EUI) not activated. (Black sequencer - OK,
White - CHECK THERMAL BATTERIES NOT ACTIVATED).
j. Thermal batteries - expended unit indicator (EUI) not activated. (White or pink - OK, Black or purple - expended)
k. Oxy/comm lines - connected secured.
l. Survival kit -
(1) Oxy/comm lines - connected, secure.
(2) Emergency oxygen gauge - black area.
(3) Radio beacon - secured.
m. Radio beacon lanyard - Check lanyard secured to cockpit floor.
n. Ensure that the lanyard and quick release connector are positioned forward of the underseat rocket motor tubes.
o. Check lap belts secure. Pull up strongly on each belt to make sure bolt fittings are engaged in seat. Check front end of survival kit secured to seat. Pull up on front end of kit to test security.
p. Negative g-strap - secure in seat bucket (SJU-17(V)1/A, 2/A, 9/A).
q. Leg restraint lines - Check lines secured to cockpit floor, lines not twisted, and line pins locked into front of ejection seat.
r. Ejection seat firing initiators - Check firing linkage connected to sears.
s. Parachute risers - Check risers routed down forward face of the parachute container and routed behind retaining strap, sensing-release secure and ease of operation, and SEAWARS for proper installation.
t. Backpad adjustment handle - Set to desired position (SJU-17A(V)1/A, 2/A, 9/A).

For solo flight in F/A-18B/D –

7. Rear cockpit - SECURED

a. Check ejection seat SAFE/ARM handle in SAFE.

b. Ensure ejection seat handle pin is removed.
c. Ensure CANOPY JETT handle - OUTBOARD AND DOWN/PIN REMOVED
d. Secure all loose items, including harnessing and JHMCS QDC.
e. Standby attitude reference indicator - CAGE/LOCK
f. EMERG BRK handle – IN

WARNING

Anti skid is not available with the rear cockpit EMERG BRK handle in the emergency position.

8. SEAT CAUT MODE switch - SOLO/PIN INSTALLED

7.1.4 Interior Check

CAUTION

Do not place any item on the glare shield as scratching the windshield is probable.

1. Harness and rudder pedals - SECURE/ADJUST
Fasten and secure leg restraint garters and lines. One garter is worn on the thigh approximately 3 inches above the knee and one garter is worn on the lower leg just above the boot top. Check leg garters buckled and properly adjusted with hardware on inboard side of the legs. Check that lines are secured to seat and floor and not twisted. Check that leg restraint lines are routed first through the thigh garter ring, then through the lower garter ring, and then routed outboard of the thigh garter ring before the lock pins are inserted into the seat just outboard of the snubber boxes. Connect oxygen, g suit, QDC (if applicable) and communications leads. Check routing of JHMCS UHVI does not interfere with oxygen hose. Check QDC is securely connected or stowed if not in use. Fasten and secure leg restraint garters and lines. Check leg garters buckled and properly adjusted with hardware on inboard side of the legs. Connect and adjust lap belt straps. Attach parachute Koch fittings to harness buckles. Check operation of shoulder harness locking mechanism.

WARNING

• The leg restraint lines must be buckled at all times during flight to ensure that the legs are pulled back upon ejection. This enhances seat stability and prevents leg injury by keeping the legs from flailing following ejection.

• Failure to route the restraint lines properly through the garters and properly position leg restraints could cause serious injury during ejection/emergency egress.

• The JHMCS UHVI must be properly routed through the torso bundle flue under the survival vest and the QDC secured in the QMB to ensure that no entanglement exists with the oxygen hose. Misrouting of the JHMCS UHVI may allow the QDC to rub against

the oxygen hose disconnect causing unintentional oxygen/communications disconnect in flight.

2. Ejection control handle – CLEAR

Left console –

1. Circuit breakers (4) - IN

2. Manual canopy handle - STOWED

3. Nuclear weapon consent switch - AS DESIRED

4. MC and HYD ISOL switches – NORM

LOX Aircraft –

5. OXYGEN supply lever - OFF

OBOGS Aircraft –

5. OBOGS control switch - OFF

a. OXY FLOW knob - OFF
b. OBOGS monitor pneumatic BIT plunger - VERIFY UNLOCKED AND FULLY EXTENDED

WARNING

Inadvertent rotation of the OBOGS monitor pneumatic BIT plunger while pressed can result in the locking of the plunger in a maintenance position and intermittent OBOGS DEGD cautions and lead to hypoxia. Rotation of the BIT plunger disengages the locking slot allowing the plunger to extend and move freely when pushed.

All Aircraft –

6. COMM 1/IFF ANT SEL switches - AUTO/BOTH

7. COMM panel - SET

a. Relay, cipher, squelch and guard - OFF
b. ILS - SET FREQUENCY/UFC
c. Master, mode 4, and crypto switches - NORM/OFF/NORM

8. VOL panel - SET AS DESIRED

9. GEN TIE CONTROL switch - NORM (guard down, aircraft 162394 AND UP)

10. FCS GAIN switch - NORM

11. PROBE switch - RETRACT

12. EXT TANKS switches - NORM

13. DUMP switch - OFF

14. INTR WING switch - NORM

15. EXT LT panel - SET

16. Throttles - OFF

17. PARK BRK handle - SET

18. LDG/TAXI LIGHT switch - OFF

19. ANTI SKID switch - ON

20. FLAP switch - FULL

21. SELECT JETT knob - SAFE

22. LDG GEAR handle – DN

23. Landing gear handle mechanical stop - FULLY ENGAGED

24. CANOPY JETT handle – FORWARD

Instrument panel –

1. MASTER ARM switch - SAFE

2. FIRE and APU FIRE warning lights - NOT PRESSED IN
If the light(s) is/are pressed, approximately 1/8 inch of yellow and black stripes are visible around the outer edges of the light(s).

3. L(R) DDI, HI/MPCD, and HUD knobs - OFF

4. Altitude source - SELECT

5. ATT switch - AUTO

6. COMM 1 and 2 knobs - OFF

7. ADF switch - OFF

8. ECM mode - OFF

9. Dispenser select knob/dispenser switch - OFF

10. AUX REL switch - NORM

11. Clock - CHECK AND SET

12. Standby attitude reference indicator - CAGE/LOCK

13. IR COOL switch - OFF

14. SPIN switch - GUARD DOWN/OFF

Right console –

1. Circuit breakers (4) - IN
2. HOOK handle - UP
3. WING FOLD handle - SAME AS WING POSITION
4. AV COOL or FCS COOL switch - NORM
5. Radar altimeter - OFF
6. GEN switches - NORM
7. BATT switch - OFF
8. ECS panel - SET
    a. MODE switch - AUTO
    b. CABIN TEMP knob - 10 O'CLOCK
    c. CABIN PRESS switch - NORM
    d. BLEED AIR knob - NORM and DOWN
    e. ENG ANTI ICE switch - OFF
    f. PITOT ANTI ICE switch - AUTO
9. DEFOG handle - MID RANGE
10. WINDSHIELD switch - OFF
11. INTR LT panel - AS DESIRED
12. Sensors - OFF
13. KY-58 panel - SET
14. AN/AWB-3(V) monitor control - SET
15. NVG container - SECURE/NVG STOW (if required)

7.1.5 Engine Start. With an external power start, all electrical systems except those on external power switch 3 are operative. With a battery start, power is available to operate the APU and engine fire warning systems, the intercom system between the pilot and the ground, the cockpit utility light and EMI/IFEI.

CAUTION

For external air start ensure that bleed air knob is OFF to avoid ATS damage.

When the engine crank switch is moved to L or R, the air turbine starter control valve (ATSCV) opens and the air turbine starter (ATS) rotates the engine thru the AMAD. Engine rotation is apparent almost immediately and can be seen on the tachometer. During operation below flight idle, the nozzles may go closed or oscillate. After the engine lights-off and accelerates to approximately 60% rpm, the engine crank switch returns to OFF. After both generators are on the line, the APU runs for 1 minute, and then shuts down.

The right engine is normally started first to provide normal hydraulics to the brakes. Rapid stick movement with only the right engine running may cause the priority valve to cut off brake pressure.

CAUTION

• To prevent engine damage during start, if an engine was not idled for 5 minutes prior to shutdown and a restart must be made between 15minutes and 4 hours after shutdown, the engine must be motored for 1 minute at 24% N_2.

• A flashing IFEI panel during engine start is indicative of a failing SDC or batteries that might not provide adequate power to the flight control computers in the event of dual generator failure. Further troubleshooting is required. Do not apply external power.

NOTE

To perform a valid battery status check the check must be accomplished without ground power applied or either generator on line.

Aircraft 161353 THRU 161528 –

1. Battery operation - CHECK

    a. Battery switch - ORIDE
    b. BATT SW caution - CHECK DISPLAYED
    c. Battery switch - ON (caution removed)

Aircraft 161702 AND UP –

1. Battery status - CHECK

    a. Battery switch - ORIDE
    b. E BATT voltage - CHECK
    After battery switch in ORIDE for minimum of 5 seconds, check for minimum voltage of 23.5 volts.
    c. Battery switch - ON
    d. U BATT voltage - CHECK

After battery switch in ON for minimum of 5 seconds, check for minimum voltage of 23.5 volts.
With cold weather temperatures down to -18°C a minimum of 20.5 volts on the UBATT is acceptable.

With external electrical power –

1. EXT PWR switch - RESET

2. GND PWR switches 1, 2, and 4 - B ON (hold for 3 seconds)

3. L(R) DDI, HI/MPCD, and HUD - ON

4. COMM 1, 2, and ADF - AS DESIRED

5. Warning and caution lights - TEST

6. Inertial navigation system - ENTER WAYPOINTS DESIRED

All starts –

1. BATT switch - ON (if not previously ON)

2. FIRE warning test - PERFORM

   a. FIRE test switch - TEST A (hold until all lights and aural warnings indicate test has been successfully passed)
   b. FIRE test switch - NORM (pause 7 seconds or cycle BATT switch for system reset)
   c. FIRE test switch - TEST B (hold until all lights and aural warnings indicate test has been successfully passed)

NOTE

• During a successful FIRE warning test, **ALL** of the following lights should illuminate in each TEST position: both FIRE lights (all 4 bulbs), the APU FIRE light (all 4 bulbs), and both L and R BLEED warning lights. Additionally, the following voice aural warnings should be heard in order: 3Engine fire left, engine fire right, APU fire, bleed air left, bleed air right3 (each repeated twice).

• A complete FIRE warning test is performed in each TEST position because it is difficult to recognize a single unlit bulb in a FIRE light. Since an aural warning does not annunciate if any of the FIRE or BALD loops are bad, lack of an aural warning is the best cue to the aircrew of a test failure.

If APU start –

3. APU ACC caution light - OFF

   a. APU switch - ON (READY light within 30 seconds)
   If fire or overheat condition is detected, the APU shuts down.

CAUTION

• To prevent running engagements during APU coast-down and to prevent APU exhaust torching, a minimum of 2 minutes must elapse between APU shutdown and another APU start.

• To preclude APU/ATS damage on aircraft 161353 THRU 163175 BEFORE IAYC 853, ensure generator switches are ON and bleed air aug is OFF.

If external air start –

3. BLEED AIR knob – OFF

-All starts

4. ENG CRANK switch – R

WARNING

Uncommanded stick motion during engine start is abnormal and aircraft shall not be flown prior to maintenance action.

CAUTION

Holding the engine crank switch in L or R may cause ATS damage. Shut down the APU only when engine crank switch is OFF. On aircraft 161353 THRU 163175 BEFORE IAYC 853, shutting down the APU while cranking the engine with the opposite engine running can cause APU surge.

5. Right throttle - IDLE (15 % rpm minimum)
Maximum EGT during start is 815°C.

NOTE

On aircraft 161353 THRU 162889, setting any ground power switches to ON with an engine driven generator on line activates a false MMP code 884 (ground power circuit fail).

6. GPWS Voice Alerts - CHECK (OFP 15C AND UP: ″ROLL LEFT, ROLL LEFT”) (OFP 13C: “ROLL OUT, ROLL OUT”)

NOTE

In aircraft with MC OFP 13C AND UP, MC1 does an ACI configuration check after the generator comes online during a cold start power-up. Successful completion of the check is indicated by system initiation of a “ROLL OUT” (for OFP 13C) or “ROLL LEFT″ (for 15C) voice alert. If no voice alert is heard, GPWS is disabled and the GPWS option on the MENU/HSI/DATA/AC sublevel display will not be present. If an incorrect voice alert is heard on startup or the GPWS option is not present, notify maintenance and commence troubleshooting the GPWS, ACI, and CSC system components and wiring.

All aircraft –

7. L(R) DDI, HI/MPCD, HUD, and UFC avionics, and radar altimeter - ON

WARNING

If the DDI or HI/MPCD do not come on they may not be properly secured to the instrument panel. Do not launch with an improperly secured DDI or HI/MPCD.

CAUTION

If ATS caution is on when the DDI comes on shut down engine to avoid starter damage.

8. HMD switch (if applicable) - ON

9. EMI/IFEI - CHECK

a. After engine start, it may be necessary to advance power above IDLE to get the ECS turbine started.

Ground idle –

	F404-GE-400	F404-GE-402
N_2	61 to 72 %	63 to 70 %
EGT	190° to 590°C	190° to 590°C
Fuel flow	420 to 700 pph	420 to 900 pph
Nozzle	73 to 84%	73 to 84%
Oil pressure (warm oil)	45 to 110 psi	45 to 110 psi

NOTE

For fuel temperatures in excess of 38°, the lower oil pressure can vary as much as 10 psi.

If APU or crossbleed start –

10. BLEED AIR knob - CYCLE THRU OFF TO NORM
The bleed air shutoff valves close during the fire warning test and the BLEED AIR knob must be cycled thru OFF to NORM with ac power on to reset the valves.

11. Warning and caution lights – TEST

For a crossbleed start, ensure APU switch is OFF and a minimum of 80% rpm and 1,900 pph fuel flow.

12. ENG CRANK switch - L

13. Left throttle - IDLE (15% rpm minimum)

14. ENG CRANK switch - CHECK OFF

If external air start –

15. BLEED AIR knob - RETURN TO NORM

16. EMI/IFEI - CHECK

17. External electrical power - DISCONNECT (if required)

7.1.6 Before Taxi

1. Waypoint zero and magnetic variation - CHECK

NOTE

To achieve the best align quality and align complete in the minimum time, waypoint zero should be the true position within 0.01 nautical miles (60 feet or 0.6 seconds.)

2. INS knob - CV, GND (parking brake set) or IFA (functioning GPS)

3. RADAR knob - OPR

4. WING FOLD - SPREAD AND LOCK

CAUTION

• Wait 5 seconds after wings are fully spread before placing the WING FOLD handle to LOCK. Placing the WING FOLD handle to LOCK before the wings are fully spread removes the WING UNLK caution even though the wings are not fully spread and could cause severe damage to the wing fold transmission.

• The wingfold control handle should smoothly go into the LOCK position. Forcing the handle could cause damage to the wingfold system.

5. FCS RESET button - PUSH

If the wings are folded verify aileron Xs are present.

CAUTION

To avoid damaging the flaps ensure ailerons are not faired inboard prior to raising the flaps conducting IBIT or running FCS exerciser. Proper aileron position can be determined either visually or by verifying an aileron position of 0 or down arrow on the FCS page.

NOTE

Xs appear in CH 1/3 of the PROC row on the FCS page with INS ATT caution set and/or the ATT switch is placed to STBY.

If no reset –

a. T/O trim button - PUSH (note TRIM advisory)
b. FCS exerciser mode - INITIATE
Lift FCS BIT consent switch and push FCS RESET button simultaneously.

If still no reset –

c. FCS circuit breakers - PULL 4 CHANNELS
d. Wait 10 seconds.
e. FCS circuit breakers - RESET
f. FCS RESET button - PUSH

6. FLAP switch - AUTO

7. FCS RESET button and paddle switch - ACTUATE SIMULTANEOUSLY

8. FLAP switch - HALF

9. FCS INITIATED BIT - PERFORM

a. AOA warning tone - VERIFY ANNUNCIATION AT FCS IBIT COMPLETION

WARNING

Flight with any PBIT BLIN other than 51, 124, 322 and 336 or IBIT BLIN 4124, 4263, 4322, 4336, 4522, 4526, 4527, 4773, 4774 and 70261 can result in a flight control system failure and aircraft loss. If IBIT detects any failure other than those indicated by the IBIT BLINs listed above, IBIT must be performed again following an FCS reset, to ensure the detected failure no longer exists. Pressing the FCS reset button, simultaneously with the paddle switch, does not correct BIT detected flight control system failures; it simply clears the BLIN code(s) from the display. If the second IBIT is not successful, the aircraft requires corrective maintenance action to address the failure(s).

CAUTION

• If wings are folded, check both ailerons Xd out. Even with wings folded there are aileron functions tested that may reveal problems via valid BLIN codes.

• Auto throttle system performance is degraded if IBIT results in BLIN code 124, 322, 336, 4124, 4322, 4336, 4522, 4526, 4527, 4773, or 4774.

These BLIN codes require no maintenance action to be taken prior to flight, but use of the auto throttle system is prohibited.

• If BLIN 51 does not reset after airborne, wing-fold function may not be available after landing.

10. Trim - CHECK
Check pitch, roll, and yaw trim for proper movement and then set for takeoff.

NOTE

Actuation of roll trim within 20 seconds of FCS IBIT with wings folded inhibits roll trim. Roll trim is reactivated by pressing the T/O Trim button with WOW.

11. T/O TRIM button - PRESS UNTIL TRIM ADVISORY DISPLAYED
If a trim advisory does not appear, abort. If takeoff trim is not set, full NU stabilator movement may not be available and takeoff distance will increase. T/O TRIM button sets 12° NU.

12. FLAP switch - AUTO

13. Controls - CHECK
Tolerance for rudder and stabilator position is ±1°.

a. Control stick - CYCLE
Full aft: 24 NU stabilator
Full fwd: 3 NU
R/L Aileron: CHECK 20 units differential stabilator.
CHECK differential trailing edge flaps
b. FLAP switch - HALF
c. Rudder pedals - CYCLE 30° left and right

14. Trim - SET FOR TAKEOFF
If takeoff trim is not set, full leading edge down stabilator movement may not be available and takeoff distance will increase.

15. PROBE, speedbrake, LAUNCH BAR switches, HOOK handle and pitot heat - CYCLE
(LAUNCH BAR optional for shore based operations.)

16. Air scoop - CHECK

a. AV COOL or FCS COOL switch – EMERG
FCS ram air scoop deploys (thumbs up from plane captain).
b. Plane captain manually restows scoop.

17. APU - VERIFY OFF

18. Fuel - BIT/SET BINGO

19. Altimeter - SET

20. GPWS/TAWS - BOXED

21. Mission data - ENTER

22. BIT - NOTE DEGD/FAIL

23. Weapons/sensors - AS REQUIRED

24. STORES page - VERIFY PROPER STORE INVENTORY AND STATION STATUS

25. HMD - ALIGN (both cockpits)

NOTE

Canopy must be down and locked to align HMD/AHMD.

(CVRS record HMD if desired)

a. SUPT/HMD/ALIGN page - SELECT
b. Superimpose the HMD alignment cross on the HUD/BRU alignment cross.
c. Cage/Uncage button - PRESS and HOLD until ALIGNING turns to ALIGN OK or ALIGN FAIL

If ALIGN FAIL –

d. Repeat steps b and c.

If ALIGN OK and HMD alignment crosses are not coincident with HUD/BRU alignment cross –

d. Perform FINE ALIGN.
(1) With FA DXDY displayed, use TDC to align azimuth and elevation HMD alignment crosses with the HUD/BRU alignment cross.
(2) Cage/Uncage button - PRESS and RELEASE
(3) With FA DROLL displayed, use TDC to align the roll axis HMD alignment crosses with the
HUD/BRU alignment cross.
(4) Cage/Uncage button - PRESS and RELEASE

If satisfied with alignment –

e. ALIGN – UNBOX

26. Standby attitude reference indicator - UNCAGE

27. ATT switch - STBY
Verify INS attitude data is replaced by standby attitude data on HUD. Check agreement of standby and INS data. Verify Xs appear in CH 1/3 of the PROC row on the FCS page.

28. ATT switch - AUTO

LOX Aircraft –

29. Oxygen system – CHECK

a. OXYGEN supply lever - ON/MASK ON
b. Oxygen flow - CHECK
c. OXYGEN supply lever - OFF/MASK OFF

WARNING

If OXYGEN supply lever is ON and the mask is not properly donned the flow control valve could freeze in the open position and cryogenic burns could result.

OBOGS Aircraft –

29. OBOGS system - CHECK

    a. OBOGS control switch - ON
    b. OXY FLOW knob - ON/MASK ON (both cockpits)
    c. OBOGS flow - CHECK
    d. OBOGS monitor electronic BIT pushbutton - PRESS AND RELEASE
    e. Verify OBOGS DEGD caution set and removed within 15 seconds.
    f. OXY FLOW knob - OFF/MASK OFF (both cockpits)

WARNING

Continued operation and use of the OBOGS system with an OBOGS DEGD caution may result in hypoxia.

All aircraft –

30. ID - Enter three digit Julian date and event number via UFC

31. Canopy either full up or full down during taxi.

CAUTION

Taxiing with canopy at an intermediate position can result in canopy attach point damage and failure. Do not open or close the canopy with the aircraft in motion.

7.1.7 Taxi. As aircraft starts to roll, apply brakes to check operation. When clear, check nosewheel steering in both directions in the high mode to ensure proper operation. At high gross weight, make all turns at minimum practicable speed and maximum practicable radius.

1. Normal brakes - CHECK

2. Nosewheel steering - CHECK

When using brakes, apply firm, steady brake pedal pressures. Use nosewheel steering whenever possible, minimizing differential braking. Avoid dragging brakes or light brake applications except as necessary for drying wet brakes. Wet brakes can have as much as 50% reduced braking capacity. Hard momentary braking with wet brakes during taxi can reduce drying time.

7.2 TAKEOFF

7.2.1 Before Takeoff

1. Canopy - CLOSED

2. OXY FLOW knob or OXYGEN supply lever - ON/MASK ON

WARNING

It is possible to place the OXY FLOW knob in an intermediate position between the ON and OFF detents which may result in a reduced flow of oxygen. The OXY FLOW knob should always be fully rotated to the ON or OFF detent position.

3. IFF - ON

4. Inertial navigation system - CHECK
On aircraft without GPS, after alignment is complete, NAV may be selected. On aircraft with GPS or EGI, after alignment is complete, select NAV or IFA.

NOTE

On GPS equipped aircraft, selecting IFA without an OK results in transition to IFA RDR.

5. PARK BRK handle - FULLY STOWED

6. MENU checklist - COMPLETE (figure 7-1)

7. Engines - MIL CHECK (if desired)

	F404-GE-400	F404-GE-402
N_2 % RPM	92 to 102	90 to 102
EGT °C	715 to 830	715 to 880
FF pph	6,000 to 9,000	6,000 to 12,500
NOZ %	0 to 57	0 to 48
OIL psi (warm oil)	95 to 180	95 to 180
AB	Check if desired	Check if desired

7.2.2 Normal Takeoff. Set takeoff trim to 12° and ensure the speedbrake is retracted. The aircraft should be aligned with the centerline of the runway for individual takeoffs. When in position, roll forward slightly to center the nose wheel and select low gain nosewheel steering. As the takeoff roll is begun, advance throttles to MIL power and check EGT and RPM. If an afterburner takeoff is desired, afterburner is selected by moving both throttles into the afterburner range and advancing smoothly to MAX power. If one afterburner fails to light or blows out during takeoff, the resulting power loss is significant. Sufficient directional control is available with the rudder and nosewheel steering to continue the takeoff with asymmetric power. The decision to abort or continue the takeoff depends on existing circumstances: external stores configuration, runway remaining, and the characteristics of the afterburner failure since it may indicate problems with the basic engine. Nosewheel steering is used to maintain directional control throughout the takeoff roll. Differential braking alone may not be adequate to maintain directional control on takeoff. Also, the drag of the brakes increases the length of the takeoff roll.

The location of the main landing gear well aft of the CG does not allow the aircraft to be rotated early in the takeoff roll. The normal rotation technique is to position the stick aft of neutral approaching nosewheel lift-off speed. Nosewheel lift-off speed depends on weight

and CG, however, hold the aft stick until 6° to 8° nose high attitude (waterline symbol) is reached. Main gear lift-off follows shortly, and a forward adjustment of stick is necessary to maintain the desired attitude.

For a minimum run takeoff, use full afterburner power. Approaching nosewheel lift-off speed, apply full aft stick until the aircraft begins to rotate. Adjust the stick to maintain a 10° to 12° nose high attitude (waterline symbol). Once a positive climb rate is established, ensure the gear handle light is out and retract the gear. Accelerate to the appropriate climb speed.

WARNING

• Improper trim setting (e.g., 10° nose down vice 10° nose up) can reduce stabilator authority to a level below that required for takeoff.

• Full stabilator (with 12° nose up trim) is not available at airspeeds greater than approximately 180 knots.

CAUTION

• Takeoff with significant standing water on runway has caused water ingestion which in extreme cases can cause engine stalls, flameouts, A/B blowouts, and/or engine FOD. Avoid standing water in excess of 0.25 inch.

• Ensure computed nosewheel liftoff speed does not exceed nose tire speed limitation (190 knots groundspeed) during takeoffs under certain combinations of the following conditions: high gross weight, high pressure altitude, high temperature, or forward CG. See NATOPS performance charts.

• Analysis has shown that an improperly serviced nose strut can increase nosewheel liftoff speed by as much as 10 knots.

• Premature aft stick input below nose wheel liftoff speed will increase takeoff roll.

7.2.3 Crosswind Takeoff. The initial portion of the crosswind takeoff technique is the same as the normal takeoff. Aft stick pressure should not be applied until approaching liftoff speed.

Do not assume an immediate wing low attitude in order to counteract for wind drift; the pilot cannot properly judge the wing tip ground clearance on a swept wing aircraft.

7.2.4 Formation Takeoff. Refer to Formation Flight, Chapter 9.

7.2.5 After Takeoff

When definitely airborne –

1. LDG GEAR handle - UP

2. FLAP switch - AUTO

7.2.6 Climb. For visibility over the nose, maintain 350 knots to 10,000 feet. For optimum climb performance, refer to Part XI.

7.2.7 10,000 Feet

1. Cockpit altimeter - CHECK

2. Fuel transfer - CHECK

3. Radar altimeter low altitude warning system - CHECK/SET

7.2.8 Cruise. Optimum cruise and maximum endurance should be found in the Performance Data, Part XI, and is attained by flying the correct Mach number for configuration and altitude. Maximum range cruise is approximated by establishing 4.2°, but no faster than Mach 0.85. Maximum endurance is approximated by establishing 5.6° AOA.

CAUTION

When using JP-4 fuel and ambient temperature at takeoff exceeds 85°F, idle power decelerations between Mach 1.23 and Mach 0.9 may result in engine flameout.

7.2.8.1 Cruise Check.

1. Cabin pressurization/temperature - MONITOR
During cruise, check cabin pressurization/temperature control. Pressurization shall remain at 8,000 feet up to 23,000 - 24,000 feet altitude. Above 23,000 to 24,000 feet altitude, cockpit pressurization shall follow schedule in figure 2-37.

AIRCRAFT ALTITUDE	CABIN ALTITUDE
30,000 feet	10,000 to 12,000 feet
40,000 feet	15,000 to 17,000 feet

WARNING

A slowly increasing cabin pressure altimeter may be the first or only warning of a gradual loss of cabin pressurization.

7.3 LANDING

7.3.1 Descent/Penetration. Before descent, preheat the windshield by increasing defog air flow (DEFOG-HIGH) and, if necessary windshield anti-ice/rain air flow (WINDSHIELD ANTI-ICE/RAIN). Since rapid descents cannot always be anticipated, the maximum comfortable cockpit interior temperature should be maintained to aid in defrosting the windshield. Normal instrument penetration is 250 knots and 4,000 to 6,000 feet per minute descent. Refer to Part XI, for optimum descent profiles.
Before starting descent, perform the following:

1. ENG ANTI ICE switch - AS DESIRED

2. PITOT ANTI ICE switch - AUTO

3. DEFOG handle - HIGH

4. WINDSHIELD switch - AS DESIRED

5. Altimeter setting - CHECK

6. Radar altimeter - SET AND CHECK

7. HUD - SELECT NAV MASTER MODE, COMPARE WITH STANDBY FLIGHT INSTRUMENTS AND STANDBY COMPASS

8. Navaids - CROSSCHECK

9. ARA-63 (ILS) - ON AND CHANNEL SET

10. IFF - AS DIRECTED

11. Weapons/sensors - AS REQUIRED

7.3.2 Approach. See figure 7-2. Enter the pattern as prescribed by local course rules. At the break, reduce thrust and extend the speedbrake (if required). As the airspeed decreases through 250 knots, lower the landing gear and place the FLAP switch to FULL and ensure that speedbrake is retracted. Retract speedbrake, if extended. Decelerate to on-speed, and compare airspeed and angle of attack. Complete the landing checklist. Roll into the base leg and establish a rate of descent, maintaining on-speed AOA. On-speed without external stores and 2,000 pounds of internal fuel is about 125 knots. Add about 2.5 knots for each 1,000 pounds increase in fuel and stores. Rate of descent can be established using the velocity vector on the HUD to set the glide-slope. Avoid overcontrolling the throttles as thrust response is immediate. Compensate for crosswind by crabbing the aircraft into the wind on final approach.
1. LAND checklist – COMPLETE

7.3.3 Touchdown. Maintain approach attitude and thrust setting to touchdown using the lens or make a firm touchdown at least 500 feet past the runway threshold. At touchdown, place the throttles to IDLE. The aircraft tends to align itself with the runway. Small rudder corrections (NWS) may be required to keep the aircraft tracking straight. Using a flared minimum descent rate landing, the WOW switch may not actuate immediately. In this case, the throttles cannot be reduced to ground idle and may be inadvertently left in the flight idle position, thereby reducing the deceleration rate and extending the length of the landing rollout. Track down the runway centerline using rudder pedals to steer the aircraft. Aerodynamic braking is not recommended. Getting the nosewheel on the ground and use of aft stick (programmed in by light braking and slowly pulling the stick aft after touchdown so only the minimum required distance to command full aft stabilator deflection by 100 knots) provides faster deceleration from the stabilators and more directional control with use of the NWS.

WARNING

Commanding full aft stick deflection with the ejection seat within 1.75 inches of the top limit can cause the lower ejection handle to snag on the air to air weapon select switch and result in inadvertent ejection. In particular, during stabilator braking after a full stop landing the control stick should be pulled back only the minimum required distance to command full stabilator authority. Inadvertent ejections have occurred after stabilator braking when the pilot has released full aft stick.

7.3.4 Nosewheel Steering. The nosewheel steering (NWS) is the most effective means of directionally controlling the aircraft during landing rollout. Aerodynamic control surface inputs become ineffective below an airspeed of 75-85 knots. Differential braking requires special attention and technique to control the aircraft below this speed. NWS is activated automatically in the low mode (16° limit) by weight on the nose and at least one main gear. NWS inputs are commanded through force sensors behind the minimum displacement rudder pedals allowing for precise directional control. The NWS does not receive commands through the rolling surface to rudder interconnect (RSRI).

NOTE

Rudder and vertical tail effectiveness is significantly reduced if the speedbrake is extended during the landing rollout and degrades directional control during crosswind landings. Aircraft directional stability is further reduced on a wet runway.

The aircraft can be safely landed with the nosewheel steering failed (castering) in crosswinds up to 25 knots. The aircraft tends to drift more to the downwind side of the runway and corrections are more difficult. With the anti-skid on, directional control with differential brakes require pumping of the upwind brake or releasing pressure from the downwind brake. To reduce the risk of blowing the tires, landing without anti-skid on when heavy braking is anticipated is not recommended.

CAUTION

Engaging the high gain mode of NWS while maintaining a rudder pedal input causes a large nosewheel transient and may cause loss of directional control.

NOTE

Using the high gain mode of nosewheel steering (NWS HI) during the landing rollout is not recommended and may lead to directional pilot induced oscillations due to the increased sensitivity of the NWS to rudder pedal inputs.

7.3.5 Landing Rollout. Track down the runway centerline using rudder pedals to steer the aircraft directionally. Aerodynamic braking is not recommended. Use wheel braking only after the aircraft main wheels are firmly on the runway.

7.3.6 Braking Technique. Under normal circumstances, the best results are attained by applying moderate to heavy braking with one smooth application of increasing braking pressure as airspeed decelerates towards taxi speed. Anti-skid is effective down to approximately 40 KGS. Below 40 KGS, heavy brake pedal pressure should be relaxed to

prevent tire skid. Below 35 KGS, steady but firm brake pedal pressure should be applied. Steady, light brake applications should be avoided, as they increase brake heating, do not significantly contribute to deceleration, and ultimately reduce braking effectiveness. If desired, selecting aft stick (up to full) below 100 KCAS will increase TEU stabilator deflection and aid in deceleration. Full aft stick increases down force on the main landing gear, as well as significantly increasing drag due to large stabilator size.

CAUTION

Recommended braking speeds are based on tests conducted at sea level. Ground speed may be significantly higher than calibrated airspeed at airfields above sea level. Aircrew should consider available runway length and field elevation to evaluate wheel brake usage and landing rollout distance to avoid excessive brake heat buildup and subsequent tire deflation or wheel assembly fire when landing at airfields above sea level.

Maximum braking performance is attained by applying full brake pedal pressure (approximately 125 lb) immediately after touchdown. Anti-skid must be on to attain maximum braking performance and to reduce the risk of a blown tire. Longitudinal pulsing may be felt as the anti-skid cycles. Approaching 40 KCAS, full brake pedal pressure should be relaxed to prevent tire skid.

7.3.7 Crosswind Landing. The optimum technique for crosswind landing is to fly a crabbed approach, taking out half the crab just before touchdown. For landing in a crosswind greater than 15 knots on a dry runway, the touchdown should be slightly cushioned in order to reduce landing gear trunion loads. The wing-down top-rudder technique is ineffective in crosswinds greater than 20 knots, creates excessive pilot workload, and should not be used. Touchdown in a full crab or with all the crab taken out may cause large directional oscillations which can lead to excessive pilot inputs and subsequent PIO. Taking out half the crab provides the correct amount of pedal force and resultant NWS command to start the aircraft tracking down the runway.

CAUTION

When calculating crosswind components for takeoff or landing use the full value of any reported gusts in your calculations.

NOTE

Pilot control inputs are not required to counter slightly objectionable directional oscillations which may occur at and immediately following touchdown. Minimize stick and rudder pedal inputs until nose movement is stable. If oscillations continue, execute a go-around.

Subsequent runway centerline tracking requires only small rudder inputs to initiate directional corrections. Although lateral stick is not generally required during the landing roll, judicious inputs may be made to counter the upwind wing rocking up. Landing rollouts in crosswinds up to 30 knots
have been accomplished with hands off the control stick with little or no objectionable roll (less than 5°) induced by crosswind or asymmetric stores.

7.3.8 Wet Runway Landing. The aircraft exhibits satisfactory handling characteristics during landing rollouts on wet runways. However, experience indicates that landing in crosswind conditions may increase the pilot tendency to directionally overcontrol the aircraft during the landing rollout. Wet runways can induce hydroplaning throughout the landing rollout. As a result, the aircraft may respond sluggishly to NWS commands and encourage the pilot to use excessively large control inputs. Rudder pedal commands should be kept small, especially if hydroplaning is suspected. Minimum total hydroplaning speed of the main landing gear tires inflated to 250 psi is 140 knots groundspeed and, for nose gear tires inflated to 150 psi, is 110 knots. However, some hydroplaning can occur at much lower speed, depending upon runway conditions. For wet (standing water) runway landings, reduce gross weight to minimum practical. Concentrate on landing ON SPEED or slightly slow with power coming off at touchdown. Maintain a constant attitude and sink rate to touchdown. Ensure the throttles are in ground idle. When comfortable with directional control, use maximum anti-skid braking to minimize landing distance. Go around if a directional control problem occurs and make an arrested landing. Delaying the decision to abort the landing and go around can put the pilot in a situation in which he cannot remain on the runway during the takeoff attempt.

CAUTION

Landing with significant standing water on runway has caused water ingestion which in extreme cases can cause engine stalls flameouts A/B blowouts and/or engine FOD. Avoid standing water in excess of 0.25 inch.

7.3.9 Asymmetric Stores Landing. Landing with asymmetric external stores up to 12,000 footpounds of lateral asymmetry requires no special considerations. Above 12,000 foot-pounds of lateral asymmetry, AOA must be kept below 12° to prevent uncommanded sideslip.

The inboard station is 7.3 feet from the aircraft centerline and the outboard station is 11.2 feet from the aircraft centerline. A lateral asymmetry of 12,000 foot-pounds occurs with 1,636 pounds of asymmetry on an inboard station or 1,070 pounds of asymmetry on an outboard station.

Due to landing gear structural limitations, the weight of an asymmetric tip missile and/or internal wing fuel asymmetry must be used in calculating total aircraft asymmetry. Asymmetry due to internal wing fuel imbalance is calculated by multiplying the difference of fuel weight between left hand and right hand wing by 8.0 feet. Fuel weight differences of less than 100 pounds are considered negligible. Wingtip missile asymmetries can be calculated by multiplying missile weight by 19.5 feet (the distance of the wingtip station from aircraft centerline.)

If lateral asymmetry exceeds 12,000 foot-pounds, do not exceed 12° AOA. Recommend fly straight-in approach at optimum approach speed. Do not apply cross controls and make only smooth, coordinated rudder and lateral stick inputs. In a crosswind, fly a crabbed approach to touchdown.

CAUTION

Field landings (flared) with asymmetries between 17,000 and 26,000 foot pounds are authorized only at touchdown sink rates up to 500 fpm due to structural limitations of the landing gear.

7.3.10 Waveoff. Do not delay the decision to take a waveoff to the point that control of the landing or rollout is in jeopardy. Takeoff distances at MIL or MAX power are short provided the aircraft has not decelerated to slow speed. Advance the throttles to MIL or MAX as required to either stop the sink rate or takeoff and maintain angle of attack. Raise the landing gear and flaps only after a safe climb has been established.

7.4 POSTFLIGHT

7.4.1 After Landing. Do not taxi with the right engine shut down. With the right engine shut down, only the accumulators provide hydraulic power for nosewheel steering and brakes.

NOTE

To prevent damage to the moving map servos, keep the HI brightness selector knob in NIGHT or DAY and at least one DDI on whenever the aircraft is in motion.

When clear of active runway –

1. Ejection seat - SAFE

WARNING

Ensure that the SAFE/ARM handle is locked in the detent in the safe position and that the word **SAFE** is completely visible on the inboard side of the SAFE/ARM handle. If the SAFE/ARM handle does not lock in the detent or the word **SAFE** is not completely visible, check to ensure that the ejection handle is fully pushed down into its detent and attempt to resafe the seat with the SAFE/ARM handle. Instruct line personnel to remain clear of the cockpit until this downing discrepancy is properly checked by qualified ejection seat maintenance personnel.

2. Landing gear handle mechanical stop - FULLY ENGAGED

3. FLAP switch - AUTO

4. T/O TRIM button - PUSH (note TRIM advisory)

5. Mask – OFF

LOX Aircraft –

6. OXYGEN supply lever – OFF

OBOGS Aircraft –

6. OXY FLOW knob – OFF

All Aircraft –

7. Canopy either full up or full down.

CAUTION

Taxiing with canopy at an intermediate position can result in canopy attach point damage and failure.

NOTE

Adjusting seat height after Koch fittings are removed may result in trombone fairing damage.

7.4.1 Hot Refueling. When refueling external tanks, the tanks refuel slowly until the internal tanks are full. Do not hot refuel with the right engine shut down. With the right engine shut down, only the accumulators provide hydraulic power for nosewheel steering and brakes.

The fuel quantity indicator must stabilize within 45 seconds after initiating pre-check and must not increase more than 100 pounds in the following 60 seconds. The pre-check system may require as long as 45 seconds to close the refueling pilot valves. Closing of the valves is indicated by a rapid decrease in the refueling rate. An increase of more than 100 pounds fuel quantity after allowing time for the valves to close (45 seconds maximum) indicates failure of one or more valves to close.

WARNING

A failed or leaking refueling pilot valve causes rapid overfilling of the fuel overflow/vent tank fuel spillage from the vent mast(s) and possible fire if fuel spills on hot engine components.

Before taxi, the plane captain/final checker shall signal confirmation that the fuel cap is properly installed and door 8 right is closed. The signal is a cupped open hand rotated counterclockwise then clockwise followed by a thumbs up.

7.4.3 Before Engine Shutdown.

1. PARK BRK handle - SET
2. BIT display - RECORD DEGD
3. BLIN codes - RECORD
4. Radar maintenance codes - NOTE IF PRESENT
5. INS - PERFORM POST FLIGHT UPDATE
6. INS knob - OFF (10 seconds before engine shutdown)
7. Standby attitude reference indicator - CAGE/LOCK
8. Sensors, radar, avionics and VTRS - OFF

NOTE

To prevent tapes from jamming, wait a minimum of 20 seconds after VTRS/CVRS shutdown before removing aircraft power.

9. COMM 1 and 2 - OFF

10. EXT and INT LT knobs – OFF

WARNING

For aircraft 163985 AND UP a high voltage (100,000 volt) static electrical charge may build up in flight and be stored in the windscreen and canopy. To prevent electrical shock ensure that the static electricity has been discharged.

11. CRYPTO switch - AS REQUIRED

NOTE

Ensure the MIDS terminal is ON, by ensuring L16 or TACAN is ON, prior to any attempt to zeroize IFF Mode 4 Crypto Keys via the CRYPTO switch.

12. Canopy - OPEN

13. QDC - DISCONNECTED AND STOWED

CAUTION

Failure to disconnect QDC prior to pilot egress will damage the lower IRC connection.

7.4.4 Engine Shutdown

1. Brake gauge - 3,000 psi

2. Nosewheel steering - DISENGAGE

3. FLAP switch - FULL

4. Throttle - OFF (alternate side)

NOTE

Before engine shutdown, engine should be operated at flight or ground idle for 5 minutes to allow engine temperatures to stabilize.

5. Monitor HYD pressure. As pressure decreases below 1,500 psi, gently pump the stick approximately 1 inch fore and aft at approximately two cycles per second, decreasing hydraulic pressure on shutdown engine below 800 psi. Ensure system pressure on operating engine remains above 1,500 psi.

NOTE

Pressure must remain below 800 psi on shutdown engine for valid test.

6. Continue gently pumping the stick while monitoring FCS page for FCS Xs and/or BLIN codes for 12 seconds after system pressure on shutdown engine drops below 800 psi. Record if present.

NOTE

• BLIN code 63 and/or rudder Xs indicate a malfunctioning rudder switching valve and further maintenance action is required.

• BLIN code 66 and/or aileron Xs indicate a malfunctioning aileron switching valve and further maintenance action is required.

• BLIN code 67 and/or LEF Xs indicate a malfunctioning LEF switching valve and further maintenance action is required.

7. L(R) DDI, HI/MPCD, and HUD - OFF

8. Throttle – OFF

When amber FLAPS light illuminates –

9. BATT switch - OFF

WARNING

Turning battery switch off before the amber FLAPS light illuminates could result in severe uncommanded flight control movement. The only cockpit indication that hydraulics have been removed from the flight controls and that they are no longer powered is the amber FLAPS light.

NOTE

If engines are not idled for 5 minutes prior to shutdown, a restart should be avoided between 15 minutes and 4 hours after shutdown.

7.5 REAR COCKPIT PROCEDURES (F/A-18B/D)

WARNING

Flight in the rear seat is limited to crewmembers with buttock-leg length less than 48 inches and buttock-knee length less than 26.5 inches.

7.5.1 Before Entering Cockpit

1. Ejection seat safe/arm handle - SAFE & LOCKED

2. Ejection seat - PREFLIGHT PER FRONT COCKPIT CHECKLIST

7.5.2 Interior Check

1. Harness and rudder pedals - SECURE/ADJUST
Fasten and secure leg restraint garters and lines. Check leg garters buckled and properly adjusted with hardware on inboard side of the legs. Check that lines are secured to seat and floor and not twisted. Check that leg restraint lines are routed first through the thigh garter ring, then through the lower garter ring, and then routed outboard of the thigh garter ring before the lock pins are inserted into the seat just outboard of the snubber boxes. Attach parachute risers to harness buckles. Connect and adjust lap belt straps. Connect oxygen, g suit, and communications leads. Check operation of shoulder harness locking mechanism.

WARNING

• The leg restraint lines must be buckled at all times during flight to ensure that the legs are pulled back upon ejection. This enhances seat stability and prevents leg injury by keeping the legs from flailing following ejection.

• Failure to route the restraint lines properly through the garters could cause serious injury during ejection/emergency egress.

2. EMERG BRK handle – IN

WARNING

Anti skid is not available with the rear cockpit emergency brake handle in the emergency position.

3. Ejection control handle - CLEAR

Left console -

LOX Aircraft -

1. OXYGEN supply lever - OFF

OBOGS Aircraft

1. OXY FLOW knob - OFF

All Aircraft -

2. CANOPY JETT handle - OUTBOARD AND DOWN

3. VOL panel - SET

4. Throttles (on rear stick and throttle equipped F/A-18D) - OFF

Instrument panel -

1. EMERG LDG GEAR handle - IN

2. EMERG BRK handle - IN

3. L(R) DDI/MPCD knobs - OFF

4. COMM 1 and 2 knobs - OFF

5. Clock - CHECK AND SET

6. Standby attitude reference indicator - CAGE/LOCK

Right console -

7. INTR LT panel - AS DESIRED

8. NVG container - SECURE/NVG STOW (if required)

7.5.3 Before Taxi

1. L(R) DDI/MPCD - ON

2. Fuel quantity gauge - CHECK QUANTITY

3. Altimeter - SET

4. Flight controls (on rear stick and throttle equipped F/A-18D) - CYCLE
After FCS reset in the front cockpit, cycle the flight controls.

5. Standby attitude reference indicator - UNCAGE

LOX Aircraft -

6. Oxygen system - CHECK
   a. OXYGEN supply lever - ON/MASK ON
   b. Oxygen flow - CHECK
   c. OXYGEN supply lever - OFF/MASK OFF

WARNING

If OXYGEN supply lever is ON and the mask is not properly donned the flow control valve could freeze in the open position and cryogenic burns could result.

OBOGS Aircraft -

6. OBOGS system - CHECK
   a. OXY FLOW knob - ON/MASK ON
   b. OBOGS flow - CHECK
   c. OXY FLOW knob - OFF/MASK OFF

7.5.4 Before Takeoff

1. T.O. checklist - CONFIRM COMPLETE

2. OXY FLOW knob or OXYGEN supply lever - ON/MASK ON

WARNING

It is possible to place the OXY FLOW knob in an intermediate position between the ON and OFF detents, which may result in a reduced flow of oxygen. The OXY FLOW knob should always be fully rotated to the ON or OFF detent position.

7.5.5 Descent/Penetration

1. Altimeter setting - CHECK

2. Standby instruments – CHECK

7.5.6 Approach

1. LAND checklist - CONFIRM COMPLETE

7.5.7 After Landing

When clear of active runway –

1. Ejection seat - SAFE

2. Mask - OFF

3. OXY FLOW knob or OXYGEN supply lever – OFF

7.5.8 Before Engine Shutdown.

1. L(R) DDI/MPCD - OFF

2. COMM 1 and 2 - OFF

3. Interior lights - OFF

4. Standby attitude reference indicator - CAGE/LOCK

7.6 NIGHT FLYING

7.6.1 External Light Management. During night operations, the external lights should be set as follows:

1. On the line - Position and formation lights BRT, strobe light ON

2. When ready to taxi - Taxi light - AS DESIRED

3. In flight - AS REQUIRED

a. Single aircraft - BRT (or as weather conditions dictate)
b. Formations - AS REQUIRED BY WINGMAN
The last aircraft in formation should have external lights on BRT unless tactical situation demands otherwise (actual penetrations).

CHAPTER 8
Carrier-Based Procedures

8.1 GENERAL

The CV and LSO NATOPS Manuals are the governing publications for the carrier-based operations and procedures. All flight crewmembers shall be familiar with CV NATOPS procedures and Aircraft Launch/Recovery Bulletins prior to carrier operations.

8.1.1 Carrier Electromagnetic Environment. Tests conducted in a carrier deck electromagnetic environment (EME) have documented numerous electronic interference problems that affect aircraft systems, displays and weapons. These electromagnetic interference problems do not occur all the time as they are a function of operating shipboard emitters and aircraft location. The electromagnetic interference problems are especially apparent if avionics bay doors are open on the flight deck.

CAUTION

With avionics bay doors open when operating in or near the carrier electromagnetic environment a NOGO may be displayed next to MC 1 or MC 2 on the BIT display. Checks of the computers have confirmed that some memory alteration has occurred and the NOGO indication is valid and should not be ignored.

NOTE

Operating in or near the carrier electromagnetic environment may cause the following temporary effects on the aircraft systems:

DDI - streaking and strobes on display, loss of BIT status, vibration indicator on ENG page may show a significant increase in engine vibration, unusable video picture on Walleye display, and inoperable Walleye cage/uncage button.
HUD - altitude display to flash on/off.
TACAN - loss of range and bearing.
UHF - blanking of communications, communications relay may be unusable.
RAD/ALT - low altitude warning light flashing.
IFF - failure to reply when lower antenna is selected.
ICS - excessive background noise.
VTR - distortion during playback.
Engine Monitor Indicator - uncommanded switching of numbers.
Warning/Caution Lights - intermittent illumination of arresting hook and landing gear warning light.

F/A-18D -

FIRE Warning Light - illumination of aft cockpit fire warning light.
DDI - loss of symbology alongside buttons of left DDI in both cockpits.
AOA - intermittent illumination of AOA indexer lights.

8.1.2 Carrier INS Environment. The CV alignment is dependent on the Ship Inertial Navigation System (SINS). Align times are longer to achieve QUALs typical on land. Ship

turns and sea-state also affect the CV alignment. Postflight updates (closeout) cannot be performed on carriers.

NOTE

It is recommended that a waypoint zero position (SINS, PIM, etc.) be input to reduce GPS satellite acquisition time.

8.2 DAY OPERATIONS

8.2.1 Preflight. When directed to man the aircraft, conduct a normal preflight inspection with particular attention given to the landing gear, struts, tires, arresting hook, and underside of the fuselage for possible arresting cable damage. Ensure sufficient clearance exists for cycling ALL control surfaces. Interior checks are the same as shore based except anti-skid OFF. Note the relationship of the APU exhaust port and the arresting hook to the deck edge. Do not start the APU if there is a possibility of damage from the APU exhaust. Do not lower the hook during post start checks unless the hook point will drop on the flight deck.

CAUTION

The maximum wind allowed for canopy opening is 60 knots. Attempting canopy opening in headwinds of more than 60 knots or in gusty or variable wind conditions may result in damage to or loss of the canopy.

8.2.2 Engine Start. When directed, start engines. APU starts should be made whenever possible. Crossbleed starts must be approved by the Air Boss due to the relatively high power setting required, and the potential for injury from the jet blast.
Perform the before taxi checks and be ready to taxi when directed.

8.2.3 Taxi.

WARNING

• Ensure anti-skid switch is OFF for all carrier operations.

• Wait 5 seconds after wings are fully spread before placing the WING FOLD handle to LOCK. Placing the WING FOLD handle to LOCK before the wings are fully spread removes the WING UNLK caution even through the wings are not fully spread and cause severe damage to the wing fold transmission.

CAUTION

The wingfold control handle should smoothly go into the LOCK position. Forcing the handle could cause damage to the wingfold system.

CAUTION

> Due to the high wind over the deck it is possible for the aileron locking pin to shear at any time. This will allow the aileron to fair away from the neutral position. Pay special attention to the aileron position with the wings folded on the carrier deck. To avoid damaging the flaps ensure ailerons are not faired inboard prior to raising the flaps conducting IBIT or running FCS exerciser. Proper aileron position can be determined either visually or by verifying an aileron position of 0 or down arrow on the FCS page.

Taxiing aboard ship is much the same as ashore, but increased awareness of jet exhaust and aircraft directors are mandatory.

Nosewheel steering is excellent for directional control aboard ship. Taxi speed should be kept under control at all times, especially on wet decks, in the landing area, and approaching the catapult. The canopy should be down, oxygen mask on, and the ejection seat armed during taxi. Be prepared to use the emergency brake should normal braking fail. In the event of loss of brakes, inform the tower and lower the tailhook immediately to indicate brake loss to the deck personnel.

8.2.4 Hangar Deck Operation. Occasionally the aircraft is manned on the hangar deck. Follow the same procedures as those concerning flight deck operation.

Tiedowns shall not be removed from the aircraft unless emergency brake accumulator pressure gauge indicates at least 2,600 psi. The emergency brake shall be used for stopping the aircraft anytime it is being moved while the engines are not running. If the aircraft is not already on the elevator, it will be towed or pushed (with the pilot in the cockpit) into position to be raised to the flight deck. Close the canopy, ensure tiedowns are in place, and put the parking brake on anytime the aircraft is on the elevator.

The signal to stop an aircraft that is being towed is either a hand signal or a whistle blast. The whistle signifies an immediate or emergency stop. Leave the canopy open and helmet off to ensure hearing the whistle; keep the plane director in sight at all times. If unable to see the plane director, or if in doubt of safe aircraft movement, stop the aircraft immediately.

8.2.5 Before Catapult Hook-Up. Before taxi onto the catapult, complete the takeoff checklist, set the standby attitude reference indicator for use if the HUD fails during the launch. With flaps HALF or FULL, the takeoff trim button should be pressed until the TRIM advisory appears and then the horizontal stabilator trim should be manually positioned for CG location, excess end airspeed and power setting for launch. The takeoff trim button need not be pressed between successive launches in a single flight. With an asymmetric load, trim stabilator for normal position then trim differential stabilator unloaded wing down. The trim settings in figure 8-1 are applicable for HALF flaps only, all air-to-air stores, air-to-ground stores, clean aircraft, external fuel tanks, gross weights and launch CG between 17.0 and 27.5% MAC. For normal operation, 15 knots excess end airspeed above minimum is recommended.

Correct stabilator trim is critical to aircraft hands off fly-away performance. Stabilator trim affects initial pitch rate and determines AOA capture. A low trim setting both lowers the initial pitch rate below optimum and causes the aircraft to fly away in a flatter attitude due to a lower than optimum AOA capture. This results in degraded climb performance after launch. A higher than recommended trim setting can cause excessive AOA overshoots which can lead to loss of lateral directional control when loaded with asymmetric stores, or in a single engine emergency.

WARNING

Use of catapult 4 is restricted with certain stores loaded on station 2.
Refer to applicable launch bulletin.

The following trim settings are recommended:

Symmetrical loading -

a. Directional trim - 0°
b. Lateral trim - 0°
c. Longitudinal trim - See figure 8-1

Asymmetrical loading -

a. Directional trim - 0°
b. Longitudinal trim (first) - See figure 8-1
c. Lateral trim - See figure 8-1

WARNING

Failure to input differential stabilator trim for catapult launches with asymmetric stores can aggravate aircraft controllability.

8.2.6 Catapult Hook-Up. Before taxiing past the shuttle, aircraft gross weight should be verified, takeoff checklist complete, and arming completed by the ordnance crew if required. Check external fuel quantity. Approach the catapult track slowly, lightly riding the brakes, with nosewheel steering on. Use minimum power required to keep the aircraft rolling. Close attention to the plane director's signals is required to align the aircraft with the catapult track entry wye. When aligned, the plane director signals the pilot to lower the launch bar. Place the launch bar switch to EXTEND. The green LAUNCH BAR advisory light comes on and nosewheel steering disengages. Nosewheel steering low mode may be engaged while the launch bar is down by pressing and holding the nosewheel steering button. This should only be done on signal from the director since catapult personnel may be in close proximity to the launch bar. Do not use nosewheel steering once the launch bar enters the track. The catapult crew installs the holdback bar and the aircraft may taxi forward slowly, following the signals of the plane director. When the launch bar drops over the shuttle spreader, the aircraft will be stopped by the holdback bar engaging the catapult buffer. On aircraft 161353 THRU 161715, upon receipt of the "Release Brakes" signal, advance throttles to 85% to 90% rpm. Do not advance throttles to MIL at this time since this could retract the launch bar before it is trapped by the tensioned shuttle spreader. On aircraft 161716 AND UP, upon receipt of the "Release Brakes" signal, advance throttles to MIL.

WARNING

Check AOA when aligned on catapult. With MC OFP 13C AND UP, check AOA on the FCS page to ensure both values are less than +10°. With MC OFP 10A AND UP, ensure HUD AOA is less than 10°.

8.2.7 Catapult Afterburner Operation. Permissible catapult launch power settings depend on aircraft gross weight. At gross weights of 45,000 lbs and above, afterburner catapult shots are required. At gross weights of 44,000 lbs and below, three options are provided, allowing pilots to tailor the power settings to their needs. Military power launches minimize the impact of sustained afterburner operation on the ship's jet blast deflectors (JBDs) and reduce fuel consumption. Afterburner catapults improve aircraft sink-off-bow performance and single engine flyaway performance in case of an emergency. Stabilizing in military power while in catapult tension and selecting afterburner (MIL/MAX setting) at holdback release provides a compromise between single engine climb capability, fuel consumption and JBD compatibility. Performing a MIL to MAX afterburner transient results in only a small reduction of engine stall margin. If afterburner thrust is to be selected during the catapult stroke, advance throttles to MAX immediately following catapult holdback release. This maximizes the available time for the engines to stabilize prior to the end of the catapult stroke. The catapult settings for a MIL/MAX shot are identical to a MIL power shot, so there is no need for pilots to communicate their intention to exercise the MIL/MAX option to the catapult crew.

CATAPULT THROTTLE SETTINGS	
Weight Board	**Engine Power**
44,000 lbs and below	MIL MIL/MAX MAX
45,000 lbs and above	MAX

NOTE

• MIL/MAX power setting is defined as stabilizing in military power while in catapult tension, and selecting maximum afterburner at holdback release.

• Any engine experiencing self-clearing pop stalls due to steam ingestion during the catapult launch indicates the engine is operating at near the limits of available stall margin. Aircraft experiencing any pop stalls shall be launched at a stabilized power setting (MIL or MAX) and afterburner shall not be selected during a catapult launch, except in an emergency.

• In certain weather conditions with high humidity and cool temperature, with heavy steam coming out the catapult track there exists the possibility of fireballs coming out the exhaust at the end of the catapult shot. A possible cause of the fireball is momentary fan stall that recovers quickly and may not be detrimental to the engine.
Ensure proper engine operation.

8.2.8 Catapult Launch.

WARNING

Do not catapult with partially full external fuel tank(s) less than 1,900 pounds.

When the "Final Turnup" signal is received from the catapult officer, advance throttles to MIL or MAX. On aircraft 161353 THRU 161715, the launch bar switch automatically returns to

RETRACT and the green LAUNCH BAR advisory light goes out. On aircraft 161716 AND UP, place the launch bar switch to RETRACT. Cycle the flight controls, wait 4 seconds then ensure all warning and caution lights are out. If afterburners are to be used, select them on signal from the catapult officer. Check engine instruments. When satisfied that the aircraft is ready for launch, hold throttles firmly against the detent, place the head against the head-rest, and salute the catapult officer with the right hand.

WARNING

• The close proximity of the flap and launch bar switches may result in inadvertent selection of FLAPS UP vice launch bar up.

• Movement of the launch bar switch to RETRACT prior to the aircraft being fully tensioned may result in a mispositioned launch bar and subsequent launch bar/shuttle separation during catapult launch.

NOTE

Failure to place launch bar switch to retract may result in hydraulic seal failure.

Throttle friction may be used to help prevent inadvertent retraction of the throttles during the catapult stroke. If required, it can be overridden if afterburner is needed due to aircraft/catapult malfunction. Immediately after the end of the catapult stroke the aircraft will rotate to capture the trimmed AOA without control stick inputs. PIO can occur immediately after launch if the control stick is restrained during the launch or control inputs are made immediately after launch. The pilot should closely monitor the catapult sequence and be prepared to make corrections if required. Clearing turns should not be made until sufficient flying speed is attained. Retract the gear and flaps when a positive rate of climb is established.

NOTE

Engaging the ATC with throttle friction on may cause the system to disengage.

The longitudinal flight control system is designed to rotate the aircraft to a reference or capture AOA following catapult launch. Trim settings between 10° and 18° nose up correspond linearly to reference AOAs between 4° and 12°. Twelve degrees AOA is the highest AOA that can be commanded hands-off and setting trim above 18° nose up increases the initial pitch movement without changing the reference AOA. The single engine minimum control airspeed increases as AOA increases. The recommended trim settings of paragraph 8.2.5 are designed to minimize aircraft sink-off-bow while maintaining AOA low enough so that lateral directional controllability is sufficient in the event of an engine failure. Normal catapult launches are characterized by an initial rotation as high as 13° AOA before AOA and pitch rate feedbacks reduce the AOA to the reference value. A range of 10 to 12° AOA is the optimum compromise between minimizing sink-off-bow and ensuring controllability in the event of an engine failure.

F/A-18 catapult launch endspeeds are determined by one of two limiting factors, single engine minimum control airspeed and sink-off-bow. At gross weights of 45,000 lbs and above, the minimum launch endspeed ensures that the aircraft will not sink excessively during the catapult flyaway. With normal endspeed (11 to 20 knots above minimum) and

deck conditions, 4 to 6 feet of settle can be expected. The pilot perceives the catapult shot to be level, as the rotation of the aircraft keeps the pilot's eye approximately level, even though the aircraft center-of-gravity sinks. With zero excess endspeed, up to 20 feet of settle can be expected. For heavy weight shots which are planned with 10 knots or less excess endspeed, trim settings are increased 3° to help minimize the settle that will occur. This higher trim setting comes at the cost of reducing the margin of controllability should an engine fail. Therefore, the higher trim settings should only be used when advised by the ship that the shot will definitely have 10 knots or less excess endspeed. The higher trim settings bias the compromise between aircraft controllability and minimizing settle to favor minimizing settle, because in the case of a planned reduced endspeed shot, excessive settle is definitely going to occur, while the chance of an engine failure is no different than any other shot.

At gross weights of 44,000 lbs and below, the minimum launch endspeed is determined by the single engine minimum control airspeed. This endspeed is greater than the speed required to minimize sink-off-bow for that weight range. Therefore, catapult shots in this regime are characterized by greater climb rates than catapult shots at weights of 45,000 lbs and above. Little to no sink should be observed for nominal endspeed and deck conditions when launched at 44,000 lbs and below.

The single engine minimum control airspeed increases as asymmetry increases. Minimum launch endspeeds for weight boards of 37,000 lbs and above ensure sufficient airspeed to maintain aircraft control for asymmetric loadings up to and including 22,000 ft-lbs. For weight boards of 36,000 lbs and below, airspeed is only sufficient to guarantee controllability for up to 6,000 ft-lbs of asymmetry.
Aircraft being launched at these weights must not exceed the 6,000 ft-lb asymmetry limit.

8.2.9 Catapult Suspend. To stop the launch while tensioned on the catapult, signal by shaking the head negatively and transmitting SUSPEND, SUSPEND on land/launch frequency. Do not use a thumbs down signal or any hand signal that might be mistaken for a salute. The catapult officer replies with a SUSPEND signal followed by an UNTENSION AIRPLANE ON CATAPULT signal. The shuttle spreader is moved aft and the launch bar automatically raises clear of the shuttle spreader.
Maintain power at MIL/MAX until the catapult officer steps in front of the aircraft and signals THROTTLE BACK. The same signals are used when a catapult malfunction exists.

8.2.10 Landing Pattern. Refer to Chapter 4, for carrier operating limitations.

CAUTION

Carrier landing with more than 500 pounds in the centerline fuel tank is prohibited.

While maneuvering to enter the traffic pattern, attempt to determine the sea state. This information will be of value in predicting problems that may be encountered during the approach and landing.

Enter the carrier landing pattern (figure 8-2) with the hook down. Make a level break from a course parallel to the Base Recovery Course (BRC), close aboard to the starboard of the ship. Below 250 knots lower the gear and flaps. Descend to 600 feet when established downwind and prior to the 180° position. Complete the landing checklist and crosscheck angle-of-attack and proper airspeed. Pitch trim is set to 8.1° AOA when autopilot is disengaged while in the PA configuration if AOA is greater than 6.0°.

With a 30-knot wind over the deck begin the 180° turn to the final approach when approximately abeam the LSO platform. When the meatball is acquired, transmit “Call sign, Hornet, Ball or CLARA, fuel state (nearest 100 pounds) and auto” (if using ATC for approach). Refer to figure 8-3 for a typical Carrier Controlled Approach.

8.2.11 ATC Approach Mode Technique. The ATC approach mode should be engaged with the aircraft near on-speed. If fast when ATC is engaged, additional time may be required for on-speed capture. The technique required for an ATC approach mode differs from a manual approach in that all glideslope corrections are made by changing aircraft attitude. Since this technique violates the basic rule that altitude/glideslope is primarily controlled by the throttle, practice is required to use ATC. For the ATC to perform satisfactorily, smooth attitude control is essential. Large attitude changes result in divergent glideslope oscillations or overcontrolling power response. Close-in corrections are very critical. If large attitude correction for a high-in-close situation develops, the recommended procedures is to stop ball motion and do not attempt to recenter it. A low-in-close condition is difficult to correct with ATC and usually results in an over-the-top bolter. It may be necessary to manually override ATC in order to safely recover from a low-in-close condition. The force required to manually disengage ATC is significant and may prevent salvaging the pass. Throughout the approach the pilot should keep his hand on the throttles in the event it is necessary to manually disconnect/override the ATC.

8.2.12 Glideslope. The technique for flying the glideslope is basically the same as FCLP except that more power may be required to maintain glideslope, and line-up will be much harder to maintain. With rough seas and a pitching deck some erratic ball movement may be encountered. If this is the case, listen to the LSO’s calls and average out the balls movement to maintain a safe controlled approach.

8.2.13 Waveoff. When the waveoff signal is received, immediately apply military/afterburner power and effect a slight nose rotation to stop the rate of descent. During an in-close waveoff, excessive rotation by the pilot will cause a cocked-up or over-rotated attitude which can result in an inflight engagement and possible aircraft damage.

Selecting afterburner during an ‘‘in close’’ or a technique waveoff, produces limited performance gains. FULL flap approach airspeed is essentially the same as the single engine afterburner minimum controllable airspeed. The asymmetric thrust from an asymmetric afterburner light-off of either the -400 or -402 engines during a ‘‘high coming down’’ or a ‘‘slow’’ approach may result in unacceptable yaw control and significant lineup deviations. Unintentional arrestment may result in damage to the aircraft and arresting gear.

WARNING

An afterburner waveoff should be performed only during an extremely low approach or when in danger of a rampstrike.

8.2.14 ACL Mode 1 and 1A Approaches. A typical Mode 1 and 1A approach is shown in figure 8-4.
The Mode 1/1A approach does not require automatic throttle control but it should be used, if available. The following procedure is for a typical Mode 1 and 1A approach from marshal to touchdown or 0.5 mile.

1. Horizontal indicator (HI/MPCD) - PRESS ACL
The Link 4 display appears on the left DDI and ACL mode automatically starts its self test. At this time, the ILS, data link, and radar beacon are automatically turned on (if not

previously on); IBIT is run on the data link and radar beacon systems. Also, the uplinked universal test message is monitored for valid receipt.

2. On board ACL capability - CHECK ACL 1
ACL 1 must be displayed on the Link 4 display to accomplish a Mode 1 or 1A approach.

WARNING

A degraded augmenter may lead to a significant lineup error, most often right-of-centerline. ACL coupling with an augmenter DEGD is not inhibited.

3. Report departing marshal.

4. Normal CCA - PERFORM
Descend at 4,000 feet per minute and 250 knots to 5,000 feet, (platform) then reduce rate of descent to 2,000 feet per minute. When passing through approximately 5,000 feet, ILS steering is automatically displayed on the HUD and must be manually deselected, if not desired.

a. At 5,000 feet, report - SIDE NUMBER, PLATFORM
b. Continue descent to 1,200 feet MSL.
c. At 10 miles, report - SIDE NUMBER, 10 MILES

5. Landing checklist - COMPLETE AT 10 MILES

a. Slow to approach speed at 6 miles.

6. Automatic throttle control - ENGAGE

7. Radar altitude hold - ENGAGE (if desired)
ACL acquisition occurs at approximately 3.5 to 5 miles and is indicated by ACL RDY on the DDI and the data link steering (TADPOLE) on the HUD. It is desired, but not required, to have ACL coupled at least 30 seconds before tipover. T/C is replaced by MODE 1 on the link 4 display.

After ACL Acquisition –

8. On the upfront control, CPL button - PRESS TWICE
Traffic control must be decoupled by pressing CPL and then CPL must be pressed a second time to couple ACL. When the aircraft is not coupled, ACL RDY is displayed on the HUD. ACL couple is indicated by CMD CNT and MODE 1 on the DDI and CPLD P/R on the HUD. At this time, the uplinked command displays of heading, airspeed, altitude, and rate of descent are removed from the DDI and HUD.

9. When coupled, report - SIDE NUMBER, COUPLED

10. When aircraft responds to automatic commands, report - SIDE NUMBER, COMMAND CONTROL

Mode 1A Approach -

11. At 0.5 mile, the controller or pilot may downgrade the approach to Mode 2. Continue manually with the approach and make a visual landing.

a. Uncouple, report - SIDE NUMBER, HORNET, BALL or CLARA, FUEL STATE.

CAUTION

The paddle switch should be activated to ensure reversion to CAS operation. Extreme pitch axis PIO will result if the approach is continued with autopilot inadvertently engaged.

Mode 1 Approach -

12. At 0.5 mile controller advises the pilot to call the ball. Report - SIDE NUMBER, HORNET, COUPLED, BALL or CLARA, FUEL STATE.

13. At approximately 12.5 seconds before touchdown, the uplinked 10 SEC is displayed on the DDI and HUD.

14. After touchdown, ACL and automatic throttles are disengaged.

NOTE

After Mode 1 or 1A downgrade or touch-and-go, actuate the paddle switch to ensure complete autopilot disengagement.

8.2.15 ACL Mode 2 Approach. A typical ACL Mode 2 approach is shown in figure 8-5. For a Mode 2 approach, the HUD data link steering is used to fly a manual approach.

1. Horizontal indicator (HI) - PRESS ACL
The link 4 display appears on the left DDI and the ACL mode starts its self test. At this time, the
ILS, data link, and radar beacon are turned on (if not previously on); IBIT is run on the data link and radar beacon systems. Also, the autopilot mode is engaged and the unlinked universal test message is monitored for valid receipt.

2. Onboard ACL capability - CHECK ACL OR ACL 2
Either ACL 1 OR ACL 2 may be displayed for Mode 2 approach.

3. Normal CCA - PERFORM
Descend at 4,000 feet per minute and 250 knots to 5,000 feet, then reduce rate of descent to 2,000 feet per minute. When passing through approximately 5,000 feet, ILS steering is displayed on the HUD and must be manually deselected, if not desired.

a. At 5,000 feet, report - SIDE NUMBER, PLATFORM
b. Continue descent to 1,200 feet MSL.
c. At 10 miles, report - SIDE NUMBER, 10 MILES

4. Landing checklist - COMPLETE AT 10 MILES

a. Slow to approach speed at 6 miles.

5. Automatic throttles - ENGAGE (if desired)

6. Radar altitude hold - ENGAGE (if desired) ACL
Acquisition occurs at approximately 3.5 to 5 miles and is indicated by ACL RDY on the DDI and data link steering (TADPOLE) on the HUD

After acquisition –

7. Report - SIDE NUMBER, NEEDLES

8. Link 4 display - CHECK MODE 1 OR MODE 2

9. At 0.75 mile, report - SIDE NUMBER, HORNET, BALL or CLARA, FUEL STATE.

8.2.16 Arrested Landing and Exit From the Landing Area. Fly the aircraft on the glideslope and ON-SPEED all the way to touchdown. Advance the throttles to MIL as the aircraft touches down. When forward motion has ceased reduce power to IDLE and allow the aircraft to roll aft. Apply brakes on signal. Raise the hook when directed. If the wire does not drop free, drop the hook when directed, and allow the aircraft to be pulled aft. Raise the hook again on signal.

When the come ahead signal is received add power, release brakes, and exit the landing area cautiously and expeditiously. Fold the wings unless directed otherwise.

If one or both brakes fail, use the emergency brakes, advise the tower and drop the arresting hook. Taxi the aircraft as directed. Do not use excessive power. Once spotted, keep the engines running until the CUT signal is given by the plane director and the minimum required number of chocks or tiedown chains are installed.

8.3 NIGHT OPERATIONS

8.3.1 General. Night carrier operations have a much slower tempo than daylight operations and it is the pilot's responsibility to maintain this tempo. Standard daytime hand signals from deck crew to pilot are executed with light wands. The procedures outlined here are different from, or in addition to, normal day carrier operations.

8.3.2 Preflight. Conduct the exterior preflight using a white lensed flashlight. Ensure that the exterior lights are properly positioned for launch and the external lights master switch OFF before engine start. Ensure that instrument and console light rheostats are on. This reduces brilliance of the warning and advisory lights when the generators come on.

8.3.3 Before Taxi. Adjust cockpit lighting as desired and perform before taxi checks.

8.3.4 Taxi. Slow and careful handling by aircraft directors and pilots is mandatory. If any doubt exists as to the plane director's signals, stop the aircraft. At night it is very difficult to determine speed or motion over the deck; rely on the plane director's signals and follow them closely.

8.3.5 Catapult Hook-Up. Maneuvering the aircraft for catapult hook-up at night is identical to that used in day operations; however, it is difficult to determine speed or degree of motion over the deck.

8.3.6 Catapult Launch. On turn-up signal from the catapult officer, ensure throttles are in MIL or MAX and check all instruments. Ensure that launch bar switch is in the retract position. When ready for launch, place external lights master switch ON.

All lights should be on bright with the strobes on. If expecting to encounter instrument meteorological conditions shortly after launch, the strobes may be left off at the discretion of the pilot.

After launch, monitor rotation of the aircraft to 12° nose up crosschecking all instruments to ensure a positive rate of climb. When comfortably climbing, retract the landing gear and flaps and proceed on the departure in accordance with ship's procedures. The standby attitude reference indicator should be used in the event of a HUD failure.

8.3.7 Aircraft or Catapult Malfunction. If a no-go situation arises, do not turn on the exterior lights and transmit SUSPEND, SUSPEND. Maintain MIL/MAX power until the catapult officer walks in front of the wing and gives the throttle-back signal. If the external lights master switch has been placed on prior to ascertaining that the aircraft is down, transmit SUSPEND, SUSPEND and turn off the exterior lights and leave the throttles at MIL until signaled to reduce power.

8.3.8 Landing Pattern. Night and instrument recoveries normally are made using case III procedures in accordance with the CV NATOPS Manual.

8.3.9 Arrestment and Exit From the Landing Area. During the approach all exterior lights should be on with the exception of taxi/landing light. Following arrestment, immediately turn the external lights master switch off. Taxi clear of the landing area following the plane director's signals.

8.4 SECTION CCA

A section CCA may be necessary in the event a failure occurs affecting navigation aids, communications equipment, or other aircraft systems.

Normally, the aircraft experiencing the difficulty flies the starboard wing position during the approach. The section leader detaches the wingman when the meatball is sighted and continues straight ahead, offsetting as necessary to the left to determine if the wingman lands successfully. Lead shall continue descending to not lower than 300 feet and turn on all lights to bright and strobes on. This provides the wingman with a visual reference in the event of a bolter or waveoff. The wingman should not detach until the meatball is in sight. If the wingman fails to arrest, the leader begins a climb to 1,200 feet or remains VFR at 150 knots during the rendezvous, but in no case should a rendezvous be attempted below non-precision minimums. The rendezvous should be completed before any turns are made to begin another approach. If the weather is below non-precision minimums, the wingman should expect to climb to VFR-on-top, heading for the nearest divert field. The leader joins the wingman as vectored by CATCC. Necessary lighting signals between aircraft are contained in Chapter 26.

NOTE

A section penetration should not be made to the ship with less than non-precision minimums.