PROCEDURE

NORMAL

SPECIAL

REFERENCE

A1-V22AB-NFM-500

NATOPS PILOT'S/ AIRCREW POCKET CHECKLIST

MV-22B TILTROTOR

THIS PUBLICATION SUPERSEDES A1-V22AB-NFM-500 DATED 15 MAY 2005, WHICH SHOULD BE REMOVED FROM THE FILES AND DESTROYED.

ISSUED BY AUTHORITY OF THE CHIEF OF NAVAL OPERATIONS AND UNDER THE DIRECTION OF THE COMMANDER, NAVAL AIR SYSTEMS COMMAND

A1-V22AB-NFM-500

NATOPS PILOT'S/ AIRCREW POCKET CHECKLIST

MV-22B TILTROTOR

THIS PUBLICATION SUPERSEDES A1-V22AB-NFM-500 DATED 15 MAY 2005, WHICH SHOULD BE REMOVED FROM THE FILES AND DESTROYED.

ISSUED BY AUTHORITY OF THE CHIEF OF NAVAL OPERATIONS AND UNDER THE DIRECTION OF THE COMMANDER, NAVAL AIR SYSTEMS COMMAND

0801LP1064543

1 OCTOBER 2006

LIST OF EFFECTIVE PAGES

Note: Text affected by current change indicated by vertical line in outer margin.

DATES OF ISSUE FOR ORIGINAL AND CHANGED PAGES ARE:

Original 0..... 1 Oct. 2006

TOTAL NUMBER OF PAGES IS 258, CONSISTING OF THE FOLLOWING:

Page No.	# Issue	Page No.	# Issue	Page No.	# Issue
Cover	0	SP17/(SP18 blank)	0	EG1 thru EG6	0
Title	0	SP19 thru SP24	0	EI1 thru EI14	0
A thru B/C (Blank)	0	SP25/(SP26 blank)	0	EI15/ (EI16 blank)	0
N1 thru N24	0	R1 thru R34	0	EL1 thru EL8	0
N25/(N26blank)	0	Flip Title (Rev blank)	0	EL9/(EL10 blank)	0
N27/(N28 blank)	0	EW1 thru EW16	0	ECH1 thru ECH2	0
N29 thru N30	0	EC1 thru EC64	0	ECH3/(ECH4 blank)	0
SP1 thru SP16	0	EA1 thru EA34	0	ECB1 thru ECB10	0

Zero in this column indicates an original page.
* Asterisk indicates pages changed, added, or deleted by the current change.

ADDITIONAL COPIES:

Additional copies of this manual and changes thereto may be procured by submitting Form DD 1348 to NPFC Philadelphia in accordance with NAVSUP Publication 2002, Section VIII, Part C.

INTERIM CHANGE SUMMARY

The following Interim Changes have been canceled or previously incorporated in this manual:

INTERIM CHANGE NUMBER(S)	REMARKS/PURPOSE
1 thru 6, 8, 9	Previously incorporated
7	HROD In VTOL Mode EP - Cancelled
10 thru 34	Previously incorporated

The following Interim Changes have been incorporated in this Change/Revision

INTERIM CHANGE NUMBER	REMARKS/PURPOSE
35	Addition of FCS PFBIT FAIL EP

Interim Changes Outstanding — To be maintained by the custodian of this manual

INTERIM CHANGE NUMBER	ORIGINATOR/DATE (or DATE/TIME GROUP)	PAGES AFFECTED	REMARKS/PURPOSE
36	032010Z Sep 07	SP-27 thru SP-37	RMWS checklist
37	042006Z Oct 07	EC-57	Rotor Load High EP

P 042006Z OCT 07
FM COMNAVAIRSYSCOM PATUXENT RIVER MD//4.0P//
TO ALL OSPREY ACTIVITIES
INFO CNO WASHINGTON DC//N780F2/N780R2//
COMNAVAIRFOR SAN DIEGO CA//N421H//
COMNAVAIRLANT NORFOLK VA//N421C//
DCMA BELL HELICOPTER TEXTRON//DCMDS-RKTB/RILSD//
DCMA BOEING PHILADELPHIA//RILSD//
VMX TWO TWO//CO//AMO/S-3/DSS//
VMM TWO SIX THREE//CO/AMO/S-3/DSS//
VMM ONE SIX TWO//CO/AMO/S-3/DSS//
VMMT TWO ZERO FOUR//CO//AMO/DSS//
PEOASWASM PATUXENT RIVER MD//PMA275//
HQ AFSOC HURLBURT FLD FL//DOV/XPRV//
418FLTS EDWARDS AFB CA//CC//
58SOW KIRTLAND AFB NM//CC/DO//
58OG KIRTLAND AFB NM//CC/DO/OGV//
COMOPTEVFOR NORFOLK VA//56//
NAVAIRDEPOT CHERRY PT NC//V22FST//
COMSPAWARSYSCOM SAN DIEGO CA//PMW187//
COMNAVAIRSYSCOM PATUXENT RIVER MD//4.3/4.4/4.1.1.2/
3.1.2H/5.0D43/4.0P/4.5//
NAVTESTWINGLANT PATUXENT RIVER MD//55TW3AA/55TW7AA//
AIRTEVRON TWO ZERO PATUXENT RIVER MD//5FA10A-130//
AIRTEVRON TWO ONE PATUXENT RIVER MD//55RW3AA/55RW1000A/5.5.5//
MSGID/GENADMIN/COMNAVAIRSYSCOM AIR-4.0P//
SUBJ/INTERIM CHANGES TO MV-22B AIRCRAFT NATOPS PUBLICATIONS//
REF/A/DESC:DOC/CNAF/03OCT2007//
REF/B/DESC:DOC/CNASC/04OCT2007//
REF/C/DESC:DOC/COMNAVAIRSYSCOM/01OCT2006//
REF/D/DESC:DOC/COMNAVAIRSYSCOM/01OCT2006//
NARR/REF A IS COG COMMAND CONCURRENCE.
REF B IS AIRS 2007-227.
REF C IS NAVAIR A1-V22AB-NFM-000 (MV-22B NATOPS MANUAL (NFM)) DTD 01
OCT 2006.
REF D IS NAVAIR A1-V22AB-NFM-500 (MV-22B NATOPS POCKET CHECKLIST
(PCL))DTD 01 OCT 2006.// POC/ROBERT H. ELLIOTT/FC
FACILITATOR/NAVAIRSYSCOM /LOC:PATUXENT RIVER,MD/TEL:301-757-5666
/EMAIL:ROBERT.ELLIOTT@NAVY.MIL// GENTEXT/REMARKS/1. THIS MESSAGE IS
ISSUED IN RESPONSE TO REFS A AND B. THIS MESSAGE ISSUES INTERIM CHANGE
(IC) NUMBER 58 TO REF C AND IC NUMBER 37 TO REF D.
2. SUMMARY.
   A. THIS IC ISSUES NEW INFORMATION IRT THE PITCH LINKS/
      ROTOR LOAD HIGH EMERGENCY PROCEDURES TO REFS C AND D.
   B. REPLACEMENT PAGES CONTAINING THESE CHANGES FOR DOWNLOADING
      AND INSERTION INTO REFS C AND D WILL BE ATTACHED TO THIS
      INTERIM CHANGE MESSAGE WHEN IT IS POSTED ON THE NATEC AND
      AIRWORTHINESS WEBSITES (SEE LAST PARA BELOW).
3. THE REPLACEMENT PAGES IMPACT THE FOLLOWING NATOPS MANUAL AND
ASSOCIATED CHECKLIST. THE REPLACEMENT PAGE PACKAGE INCLUDES THE
FOLLOWING:
   A. REF C (MV-22B NFM -000) PAGES 5(REVERSE BLANK), V-12-39,
      AND V-12-39 A/(B BLANK).
   B. REF D (MV-22B PCL -500) PAGES B(C BLANK), EC-57 AND
      EC-57 A/(B BLANK).
5. POINTS OF CONTACT:
   A. MV-22B NATOPS PROGRAM MANAGER:

MAJOR THOMAS NICHOLS, VMMT 204, MV-22 DSS
TEL COMM 910-449-6990, EMAIL: THOMAS.NICHOLS@USMC.MIL,

B. NAVAIR POCS:
(1) MARTY SCANLON, NATOPS IC COORDINATOR, TEL DSN 757-6045 OR COMM (301) 995-6045, EMAIL:MARTIN.SCANLON@NAVY.MIL
(2) MAJOR SCOTT TRAIL, AIR-4.1.1.2, MV-22 CLASS DESK, TEL DSN 757-5541, COMM (301) 757-5541, EMAIL: SCOTT.TRAIL@NAVY.MIL
(3) KRISTIN SWIFT, 4.0P NATOPS CHIEF ENGINEER, TEL DSN 995 4193 OR COMM (301) 995-4193 EMAIL: KRISTIN.SWIFT@NAVY.MIL.
(4) AIRWORTHINESS GLOBAL CUSTOMER SUPPORT TEAM, (301) 757-0187, EMAIL AIRWORTHINESS(AT)NAVY.MIL.

THIS MESSAGE WILL BE POSTED ON THE NATEC WEBSITE, WWW.NATEC.NAVY.MIL WITHIN 72 HOURS OF RELEASE. NEW NATOPS IC MESSAGES MAY BE FOUND IN TWO PLACES ON THIS WEBSITE:

A. IN THE NATOPS IC DATABASE FOUND UNDER THE TMAPS OPTION.
B. IN THE AFFECTED PUBLICATIONS(S) JUST AFTER THE IC SUMMARY PAGE. IF THE IC MESSAGE INCLUDES REPLACEMENT PAGES, THEY WILL BE ADDITIONALLY PLACED WITHIN THE MANUAL AND REPLACED PAGES DELETED. MESSAGES ARE NORMALLY POSTED IN THE DATABASE BEFORE APPEARING IN THE PUBLICATION. THIS MESSAGE WILL ALSO BE POSTED ON THE NATOPS WEBSITE, AIRWORTHINESS.NAVAIR.NAVY.MIL. IF UNABLE TO VIEW THIS MESSAGE ON EITHER THE NATEC OR NATOPS WEBSITES, INFORM THE NATOPS GLOBAL CUSTOMER SUPPORT TEAM AT (301) 342-0870, DSN 342-0870, OR BY EMAIL AT NATOPS(AT)NAVY.MIL.
C. INFORMATION REGARDING THE AIRWORTHINESS PROCESS, INCLUDING A LISTING OF ALL CURRENT INTERIM FLIGHT CLEARANCES, NATOPS AND NATIP PRODUCTS ISSUED BY NAVAIR 4.0P, CAN BE FOUND AT OUR WEBSITE: AIRWORTHINESS.NAVAIR.NAVY.MIL.

6. THIS NATOPS CHANGE WAS PROCESSED AND APPROVED BY NAVAIR IN EPOWER FOLDER 433456, TASK 28677.

P 032010Z OCT 07
FM COMNAVAIRSYSCOM PATUXENT RIVER MD//4.0P//
TO ALL OSPREY ACTIVITIES
INFO CNO WASHINGTON DC//N780F2/N780R2//
COMNAVAIRFOR SAN DIEGO CA//N421H//
COMNAVAIRLANT NORFOLK VA//N421C//
DCMA BELL HELICOPTER TEXTRON//DCMDS-RKTB/RILSD//
DCMA BOEING PHILADELPHIA//RILSD//
VMX TWO TWO//CO//AMO/S-3/DSS//
VMM TWO SIX THREE//CO/AMO/S-3/DSS//
VMM ONE SIX TWO//CO/AMO/S-3/DSS//
VMMT TWO ZERO FOUR//CO//AMO/DSS//
PEOASWASM PATUXENT RIVER MD//PMA275//
HQ AFSOC HURLBURT FLD FL//DOV/XPRV//
418FLTS EDWARDS AFB CA//CC//
58SOW KIRTLAND AFB NM//CC/DO//
58OG KIRTLAND AFB NM//CC/DO/OGV//
COMOPTEVFOR NORFOLK VA//56//
NAVAIRDEPOT CHERRY PT NC//V22FST//
COMSPAWARSYSCOM SAN DIEGO CA//PMW187//
COMNAVAIRSYSCOM PATUXENT RIVER MD//4.3/4.4/4.1.1.2/
3.1.2H/5.0D43/4.0P/4.5//
NAVTESTWINGLANT PATUXENT RIVER MD//55TW3AA/55TW7AA//
AIRTEVRON TWO ZERO PATUXENT RIVER MD//5FA10A-130//
AIRTEVRON TWO ONE PATUXENT RIVER MD//55RW3AA/55RW1000A/5.5.5//
MSGID/GENADMIN/COMNAVAIRSYSCOM AIR-4.0P//
SUBJ/INTERIM CHANGES TO MV-22B AIRCRAFT NATOPS PUBLICATIONS//
REF/A/DESC:DOC/CNAF/02JUL2007//
REF/B/DESC:DOC/CNASC/21AUG2007//
REF/C/DESC:DOC/COMNAVAIRSYSCOM/01OCT2006//
REF/D/DESC:DOC/COMNAVAIRSYSCOM/01OCT2006//
NARR/REF A IS COG COMMAND CONCURRENCE.
REF B IS MV-22 AIRS 2007-135.
REF C IS NAVAIR A1-V22AB-NFM-000, MV-22B NATOPS FLIGHT MANUAL DTD 01 OCT 2006.
REF D IS NAVAIR A1-V22AB-NFM-500. MV-22B NATOPS POCKET CHECKLIST DTD 01 OCT 2006.// POC/ROBERT H. ELLIOTT/FC FACILITATOR/NAVAIRSYSCOM /LOC:PATUXENT RIVER, MD/TEL:301-757-5666 /EMAIL:ROBERT.ELLIOTT@NAVY.MIL// GENTEXT/REMARKS/1. THIS MESSAGE IS ISSUED IN RESPONSE TO REFS A AND B. THIS MESSAGE ISSUES INTERIM CHANGE (IC) NUMBER 57 TO REF C AND IC NUMBER 36 TO REF D.
2. SUMMARY.
   A. THIS IC ISSUES NEW INFORMATION IRT THE RAMP MOUNTED WEAPONS SYSTEM TO REFS C AND D.
   B. REPLACEMENT PAGES CONTAINING THESE CHANGES FOR DOWNLOADING AND INSERTION INTO REFS C AND D WILL BE ATTACHED TO THIS INTERIM CHANGE MESSAGE WHEN IT IS POSTED ON THE NATEC AND AIRWORTHINESS WEBSITES (SEE LAST PARA BELOW).
3. THE REPLACEMENT PAGES IMPACT THE FOLLOWING NATOPS MANUAL AND ASSOCIATED CHECKLIST. THE REPLACEMENT PAGE PACKAGE INCLUDES THE FOLLOWING:
   A. REF C (NFM -000): PAGES 5(REVERSE BLANK), 95(REVERSE BLANK), NEW PAGES VIII-18-13 THRU VIII-18-18(REVERSE BLANK).
   B. REF D (PCL -500: PAGES B(C BLANK), NEW PAGES SP-27 THRU SP-37(SP-38 BLANK).
5. POINTS OF CONTACT:
   A. MV-22B NATOPS PROGRAM MANAGER:

MAJOR THOMAS NICHOLS, VMMT 204, MV-22 DSS
TEL COMM 910-449-6990, EMAIL: THOMAS.NICHOLS@USMC.MIL,

B. NAVAIR POCS:
(1) MARTY SCANLON, NATOPS IC COORDINATOR, TEL DSN 757-6045 OR COMM (301) 995-6045, EMAIL:MARTIN.SCANLON@NAVY.MIL
(2) MAJOR SCOTT TRAIL, AIR-4.1.1.2, MV-22 CLASS DESK, TEL DSN 757-5541, COMM (301) 757-5541, EMAIL: SCOTT.TRAIL@NAVY.MIL
(3) KRISTIN SWIFT, 4.0P NATOPS CHIEF ENGINEER, TEL DSN 995 4193 OR COMM (301) 995-4193 EMAIL: KRISTIN.SWIFT@NAVY.MIL.
(4) AIRWORTHINESS GLOBAL CUSTOMER SUPPORT TEAM, (301) 757-0187, EMAIL AIRWORTHINESS(AT)NAVY.MIL.

THIS MESSAGE WILL BE POSTED ON THE NATEC WEBSITE, WWW.NATEC.NAVY.MIL WITHIN 48 HOURS OF RELEASE. NEW NATOPS IC MESSAGES MAY BE FOUND IN TWO PLACES ON THIS WEBSITE:

A. IN THE NATOPS IC DATABASE FOUND UNDER THE TMAPS OPTION.
B. IN THE AFFECTED PUBLICATIONS(S) JUST AFTER THE IC SUMMARY PAGE. IF THE IC MESSAGE INCLUDES REPLACEMENT PAGES, THEY WILL BE ADDITIONALLY PLACED WITHIN THE MANUAL AND REPLACED PAGES DELETED. MESSAGES ARE NORMALLY POSTED IN THE DATABASE BEFORE APPEARING IN THE PUBLICATION. THIS MESSAGE WILL ALSO BE POSTED ON THE NATOPS WEBSITE, AIRWORTHINESS.NAVAIR.NAVY.MIL. IF UNABLE TO VIEW THIS MESSAGE ON EITHER THE NATEC OR NATOPS WEBSITES, INFORM THE NATOPS GLOBAL CUSTOMER SUPPORT TEAM AT (301) 342-0870, DSN 342-0870, OR BY EMAIL AT NATOPS(AT)NAVY.MIL.
C. INFORMATION REGARDING THE AIRWORTHINESS PROCESS, INCLUDING A LISTING OF ALL CURRENT INTERIM FLIGHT CLEARANCES, NATOPS AND NATIP PRODUCTS ISSUED BY NAVAIR 4.0P, CAN BE FOUND AT OUR WEBSITE: AIRWORTHINESS.NAVAIR.NAVY.MIL.
D. EPOWER FOLDER NUMBER 427310, TRACKING NUMBER 27472.//

BRIEFING GUIDE

1. Administrative information
   a. Time hack
   b. Local area weather forecast
      (1) Sunrise/sunset
      (2) Moonrise/moonset
      (3) Moon angle/illumination
   c. En route weather forecast
   d. Alternates weather forecast
   e. Destination weather forecast
   f. Aircraft assignment

NOTE

Items a. through f. may be briefed by the ODO.

   g. Maps/charts/smart packs
   h. Flight leader/alternate
   i. Callsigns
2. Mission information
   a. Primary
   b. Secondary/implied
   c. Sequence of events/overview
3. Conduct of flight
   a. Times: Man/APU/Engines/Taxi/Takeoff
   b. Controlling agencies
   c. Frequencies
   d. Radio procedures
   e. IFF procedures and codes
   f. Formation instructions
      (1) Formation breakup
      (2) Lead changes
      (3) IMC breakup procedures
   g. Routes/checkpoint ID
      (1) Obstacles
      (2) Minimum safe altitudes
   h. Operating and landing areas
      (1) Size and obstacles
      (2) Landing direction
      (3) Waveoffs
      (4) Alternates
      (5) Landing site lighting
   i. Fuel required (mission/minimum)

CONTINUED

j. Fuel availability

4. Flight planning and operational data
   a. Navigational aids available and utilization
   b. Load computation card
   c. Mission essential equipment
      (1) Personal
      (2) Aircraft
      (3) Passengers
5. Emergency procedures
   a. Aborts
   b. Downed aircraft (controlled/uncontrolled)
   c. Loss of communications
   d. Inadvertent IMC procedures
   e. Aircraft emergencies (actual/simulated)
   f. Aircraft system failure (actual/simulated)
6. Special considerations
   a. Bump plan
   b. Go/no go
   c. Minimum operational weather
   d. En route hazards
   e. NVG considerations
   f. Aircraft lighting
   g. Loss of visual contact with flight
   h. Friendly fire plans
   i. Rules of engagement for onboard defensive weapons
   j. TRAP/SAR procedures
   k. Debrief time and place
7. Crew coordination
   a. Use of checklists
   b. Control changes — positive
   c. Navigation procedures
   d. Lookout doctrine
   e. PNF duties
      (1) Takeoff
      (2) En route
      (3) Approach/landing
8. Training information
   a. T&R requirements
      (1) Discussion items
      (2) Demonstrate
      (3) Introduce
      (4) Review

CONTINUED

9. IFR flight (brief when appropriate)
   a. Safety of flight — The PNF shall monitor performance instruments and advise the PF when any of the following are observed:
      (1) Angle of bank in excess of 30°
      (2) Rate of descent or climb exceeding 1,000 fpm
      (3) Airspeed errors in excess of 10 KIAS
      (4) Altitude errors in excess of 100 ft
      (5) Heading errors in excess of 10°
      (6) Vertigo/disorientation
   b. During approaches
      (1) The PNF shall follow progress of the approach as published and call out prebriefed altitudes.
      (2) The PNF will assist with timing as required.
      (3) The PNF will maintain a lookout for the airport:
         (a) When the airport is positively in sight, report that fact with the words, “Airport in sight.”
         (b) Controls will/will not be transferred and, until landing is assured, the PNF will maintain an instrument scan.
         (c) If a missed approach is required, the PNF will read missed approach instructions, change frequencies if required, and monitor progress as applicable.
10. NVG briefing guide (brief when appropriate)
   a. Light level calendar considerations
      (1) Sunrise/sunset — Lux levels
      (2) Moonrise/moonset — Lux levels/percent illumination
      (3) Moon angle/azimuth
      (4) Ambient conditions
      (5) Visual illusions
      (6) Shadowing
   b. Goggle/degoggle procedures (if applicable)
   c. Internal/external aircraft lighting
      (1) Anticollision lights
      (2) Navigation lights
      (3) Map light on/off as required
      (4) Formation/blade tip lights adjusted
      (5) Internal aircraft lighting
   d. Radar altimeter setting
   e. Hazards
   f. Formation considerations

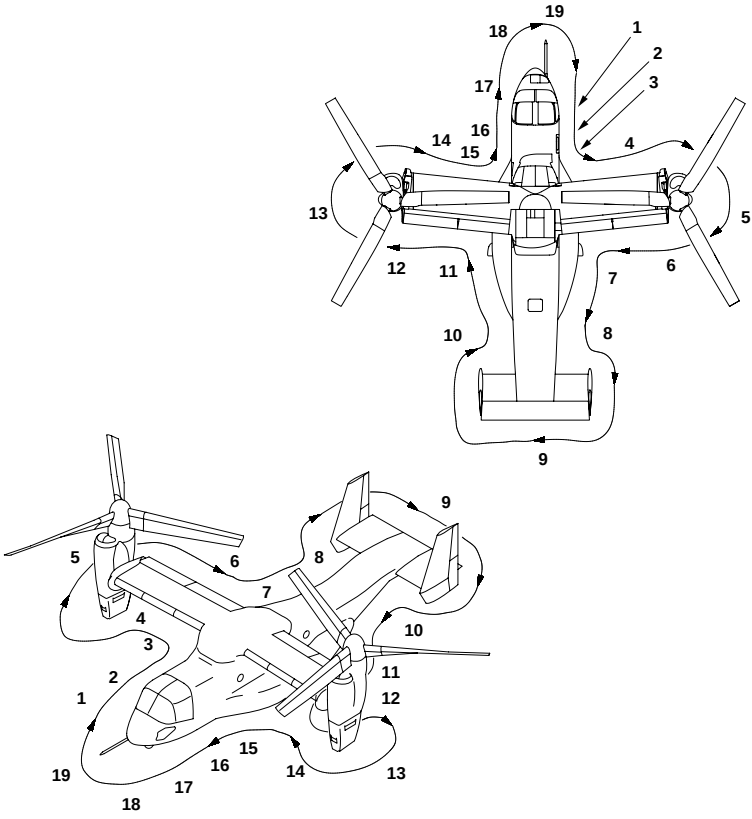
CONTINUED

g. Crew preparation
h. ROC/currency requirements
i. NVG emergencies (i.e., in-flight, terminal phase, IMC (if applicable))
j. LZ operations (if applicable)
(1) Hooks setup/chemical light sticks
(2) LZ preparations (i.e., lighting sequence)
(3) Safety frequencies
(4) Altitude and airspeed
(5) Pickup/drop procedures (scan, cues altitude, approach considerations)
(6) With/without load emergency procedures.
k. NVG preflight (if applicable)
(1) Ready room/eye lane
(2) Cockpit area
(3) Cabin area
(4) Hooks/pendants
l. Ordnance employment/coordination
(1) Effects of flash blindness
(2) Artificial illumination
m. Crew coordination
(1) PF — terrain/obstacle clearance, radio calls, emergencies
(2) PNF — navigation, barriers, monitor performance instruments, gauges, normal duties, emergencies
(3) Aircrew — lookout, navigation, obstacle clearance, emergencies

11. Aircrew brief
a. Times (manning, takeoff, landing)
b. ICS procedures
c. Mission(s)
d. Type cargo/passengers
e. Crewchief duties
(1) Prestart/start
(2) Taxi/takeoff
(3) En route
(4) Approach/landing
f. Friendly fire plans
g. Rules of engagement for onboard defensive weapons
h. Lookout doctrine
i. Aircraft emergencies (actual/simulated)
j. Downed aircraft procedures

CONTINUED

12. Passenger briefing guide
    a. Aircraft side number
    b. Time of takeoff
    c. Estimated time of arrival
    d. Safety regulations
        (1) Harnesses
        (2) Movement inside the aircraft
        (3) Smoking regulations
    e. Emergency procedures
        (1) Emergency exits
        (2) Fire on the ground
        (3) Fire in-flight
        (4) Forced landing
        (5) Ditching and evacuation
        (6) Parachuting (if appropriate)
    f. Fitting and operation of life preservers and safety equipment
    g. Order of embarkation and debarkation
    h. Use of land and water survival equipment



1. FUSELAGE-RT. SIDE
2. RT. WING ROOT-UPPER FUSELAGE
3. RT. FWD SPONSON
4. RT. WING LEAD EDGE
5. RT. ENG. NACELLE/P-RTR
6. RT. WING TRL. EDGE
7. RT. MLG WELL
8. RT. AFT SPONSON/FUSELAGE
9. EMPENNAGE
10. LT. FUSELAGE/AFT SPONSON
11. LT. MLG WELL
12. LT. WING TRL. EDGE
13. LT. ENG. NACELLE/P-RTR
14. LT. WING LEAD. EDGE
15. LT. FWD SPONSON
16. LT. WING ROOT-UPPER FUSELAGE
17. FUSELAGE-LT.SIDE
18. NLG WELL
19. FUSELAGE FRONT

9015
J026

EXTERIOR INSPECTION

Exterior Preflight

PREFLIGHT EXTERIOR INSPECTION

Fwd Right Fuselage

1. APR-39 and AAR-47 sensors . . . . . CHECK
2. Pitot/static probes, angle-of-attack sensor . . . . . CHECK
3. Landing gear down lock pin . . . . . CHECK
4. Cockpit side windows . . . . . CHECK
5. External window jettison handle . . . . . CHECK
6. Avionics cooling exhaust . . . . . CHECK
7. External ICS station . . . . . CHECK
8. Cabin door . . . . . CHECK
9. AN/AVR-2 sensor . . . . . CHECK
10. Particle separator . . . . . CHECK
11. Particle separator exhaust . . . . . CHECK

Right Wing

1. Wing deice boots . . . . . CHECK
2. Under side of wing . . . . . CHECK
3. Feed tank vent . . . . . CHECK
4. Conversion actuator fairing . . . . . CHECK

Right Nacelle

1. IR suppressor . . . . . CHECK
2. Doors, panels, and cowling . . . . . CHECK
3. Static discharge wicks . . . . . CHECK
4. Evidence of leakage . . . . . CHECK
5. Position light . . . . . CHECK
6. Proprotor blades . . . . . CHECK
7. Spinner/hub assembly . . . . . CHECK
8. EAPS Doors . . . . . CHECK
9. Covers . . . . . REMOVED/STOWED

Right Wing Trailing Edge

1. Fuel valve panel . . . . . CHECK
2. Wing trailing edge . . . . . CHECK
3. Flaperons and hinges . . . . . CHECK
4. Hydraulic leaks . . . . . CHECK

Right Fuselage

1. Wing lock pin indicators . . . . . CHECKED/BLACK
2. Fuselage escape hatch/observation window . . . . CHECK
3. AVR-2 sensor. . . . . CHECK

Right Sponson

1. Sponson fuel vent . . . . . CHECK/RECHECK (If required)
2. Main landing gear:
   a. VOR/ILS antenna . . . . . CHECK
   b. Landing gear down lock pin . . . . . INSTALLED
   c. Shock strut servicing pressure . . . . . CHECK
   d. Tires . . . . . CHECK
   e. Wheels and brakes. . . . . CHECK
   f. Static ground . . . . . CHECK
   g. Strut . . . . . CHECK
   h. Actuators . . . . . CHECK
3. Fuel/hydraulic lines . . . . . CHECK
4. Landing gear doors . . . . . CHECK
5. MLG strut access panel . . . . . CHECK
6. Sponson step . . . . . CHECK
7. Landing gear emergency extension bottle . . . . 2800 PSI
8. Battery disconnect circuit breakers . . . . . CHECK
9. Hydraulic access door (system 3) . . . . . CHECK
10. Auxiliary sponson vent . . CHECK/RECHECK (If required)
11. Fuel jettison tube . . . . . CHECK
12. AN/ALE-47 chaff and flare dispenser . . . . . CHECK
13. APR-39 and AAR-47 sensors . . . . . CHECK

Upper Fuselage

1. Antennas . . . . . CHECK
2. Emergency escape hatch . . . . . CHECK
3. Midwing gearbox door . . . . . CHECK
4. APU exhaust . . . . . COVER REMOVED

Aft Lower Fuselage

1. Antennas . . . . . CHECK
2. Drains. . . . . CHECK
3. Hoist operator light. . . . . CHECK
4. Anti-collision light . . . . . CHECK
5. Cargo hook doors . . . . . CHECK

Empennage

1. Right vertical stabilizer and rudder . . . . . CHECK
2. Elevator . . . . . CHECK
3. Hydraulic leaks . . . . . CHECK
4. Static discharge wicks . . . . . CHECK
5. Left vertical stabilizer and rudder . . . . . CHECK
6. Position and anti-collision lights . . . . . CHECK

Left Sponson

1. APR-39 and AAR-47 sensors . . . . . CHECK
2. AN/ALE-47 chaff and flare dispenser . . . . . CHECK
3. ECU cooling exhaust . . . . . COVER REMOVED
4. ECU air inlet . . . . . COVER REMOVED
5. GRDP/Refuel-defuel panel . . . . . CHECK
6. Sponson step . . . . . CHECK
7. Main landing gear:
   a. Shock strut servicing pressure . . . . . CHECK
   b. Tires . . . . . CHECK
   c. Wheels and brakes . . . . . CHECK
   d. Static ground . . . . . CHECK
   e. Landing gear down lock pin . . . . . INSTALLED
   f. Strut . . . . . CHECK
   g. Actuators . . . . . CHECK
8. Fuel/hydraulic lines . . . . . CHECK
9. Landing gear doors . . . . . CHECK
10. MLG strut access panel . . . . . CHECK
11. VOR/ILS antenna . . . . . CHECK
12. Gravity fuel cap . . . . . CHECK
13. Sponson fuel vent . . . . . CHECK/RECHECK (If required)

Left Fuselage

1. AVR-2 sensor . . . . . CHECK
2. Fuselage escape hatch and observer window (aft) . . . . . CHECK
3. Oil cooler exhaust/SDC intake . . . . COVERS REMOVED
4. Wing lock pin indicators . . . . . CHECK/BLACK

Left Wing Trailing Edge

1. Flaperons and hinges . . . . . CHECK
2. Hydraulic leaks. . . . . CHECK
3. Wing trailing edge . . . . . CHECK
4. Fuel shutoff valve panel . . . . . CHECK

Left Nacelle

1. IR suppressor. . . . . CHECK
2. Doors, panels, and cowling . . . . . CHECK
3. Static discharge wicks . . . . . CHECK
4. Evidence of leakage. . . . . CHECK
5. Position light. . . . . CHECK
6. Proprotor blades . . . . . CHECK
7. Spinner/hub assembly . . . . . CHECK
8. EAPS doors . . . . . CHECK
9. Covers . . . . . COVERS REMOVED

Left Wing

1. Conversion actuator fairing . . . . . CHECK
2. Wing deice boots . . . . . CHECK
3. Feed tank vent . . . . . CHECK
4. Under side of wing . . . . . CHECK

Fwd Left Fuselage

1. Fuselage escape hatch and observer window (fwd) . . . . . CHECK
2. AN/AVR-2 sensor. . . . . CHECK
3. Particle separator . . . . . CHECK
4. Particle separator exhaust . . . . . CHECK
5. Avionics cooling exhaust . . . . . COVER REMOVED
6. External power receptacle . . . . . CHECK
7. Cockpit side windows. . . . . CHECK
8. External window jettison handle. . . . . CHECK
9. Pitot/static probes and angle-of-attack sensor . . . CHECK
10. APR-39 and AAR-47 sensors . . . . . CHECK
11. Hike valve panel. . . . . CHECK

Fwd Fuselage

1. Windshield . . . . . CHECK
2. Wiper washer cap . . . . . CHECK
3. Aerial refueling light . . . . . CHECK
4. Aerial refueling probe . . . . . COVER REMOVED
5. FLIR . . . . . CHECK
6. Nose landing gear . . . . . CHECK
   a. Tires . . . . . CHECK
   b. Static ground . . . . . CHECK
   c. Strut . . . . . CHECK
   d. Servo . . . . . CHECK
   e. Steering lock pin . . . . . CHECK
   f. Doors . . . . . CHECK

Fwd Lower Fuselage

1. Searchlights . . . . . CHECK
2. Landing gear indicator light . . . . . CHECK
3. Antennas . . . . . CHECK

PREFLIGHT INTERIOR INSPECTION

Aft Cabin Area

1. Ramp . . . . . CHECK
2. Ramp latches . . . . . CHECK
3. Hydraulic ramp actuators . . . . . CHECK
4. Ramp seal . . . . . CHECK
5. Ramp support foot . . . . . CHECK
6. HFLM . . . . . CHECK LEVELS
7. Portable fire extinguisher . . . . . CHECK
8. Overhead wiring and hydraulics . . . . . CHECK
9. Overhead escape hatch . . . . . CHECK
10. Emergency oxygen bottle . . . . . CHECK PRESSURE
11. Window escape hatches . . . . . CHECK
12. Dome lights . . . . . CHECK
13. EELS lights/battery charger . . . . . CHECK
14. Windows . . . . . CHECK
15. Aft cargo hook . . . . . STOWED/SECURE
16. Manual cargo hook release . . . . . HANDLE STOWED
17. Battery . . . . . CHECK
18. Circuit breakers . . . . . CHECK

CONTINUED

19. Internal fuel connections . . . . . CHECK
20. Forward cargo hook . . . . . STOWED/SECURE

Left/Right Avionics Bays

1. Avionics bays . . . . . CHECK

Forward Cabin Area

1. Forward Cabin Control Station (FCCS):
   a. Control panel . . . . . CHECK
   b. WOG. . . . . CHECK/STOWED
   c. EELS switch . . . . . CKPT CONTROL
2. Cabin door emergency release lever . . . . . CHECK
3. First aid kit . . . . . CHECK
4. Portable fire extinguisher . . . . . CHECK
5. Circuit breakers . . . . . CHECK

PRE-ENTRY/SAFETY

1. Chocks . . . . . IN
2. Panels . . . . . As required
3. Fire bottle . . . . . MANNED
4. Covers . . . . . OFF as required
5. Aircraft . . . . . GROUND as required
6. Servicing . . . . . As required

COCKPIT PRE-ENTRY

NOTE

- Only those items marked with a pound sign (#) are required for an abbreviated checklist. The shutdown crew may use an abbreviated checklist for subsequent flights. The entire checklist must be performed for the first flight of the day or if maintenance has been performed.

- Items preceded with a **[A]** or **[B]** are only required for that block aircraft.

1. WFPS switch . . . . . ENABLED
2. Hydraulic Fluid Level Panel . . . . . CHECKED
3. Cabin escape hatch jettison pins . . REMOVED/STOWED
4. Cabin EELS switch. . . . . CKPT CTRL
5. FCCS CARGO HOOKS . . . . . SET as required
6. Generators . . . . . ON
7. Circuit breakers . . . . . CHECKED
a. [**A]** Pitot heat CBs . . . . . PULLED
8. Cockpit window pins. . . . . IN

COCKPIT PRE-START

1. Landing gear handle . . . . . DOWN
2. FLAPS . . . . . AUTO
3. MFDs/CDU/EICAS . . . . . OFF
4. ARC-210 control head . . . . . PRST/OFF
5. T-handles . . . . . NORM
6. ROTOR BRAKE . . . . . OFF
7. ECLs . . . . . OFF

CONTINUED

8. APU . . . . . STOP
9. PRIMARY LIGHTING. . . . . .OFF
10. EMERG EGRESS . . . . . .OFF
11. Secondary LIGHTING . . . . . .OFF
12. CARGO HOOK . . . . . .OFF
#13. BATTERY . . . . . ON/TEST
#14. ICS. . . . . CHECKED
15. ROTOR TIP LIGHTS . . . . . .OFF
16. FUEL DUMP . . . . . OFF/COVERED
17. EMERGENCY OXYGEN . . . . . OFF/COVERED
#18. Controls/TCL . . . . . .CENTERED/FULL AFT
19. Nacelle switches . . . . . CENTERED
20. EXTERNAL POWER or BATTERY . . . . . .Execute

NOTE

During extended (15 minute or more) single engine (Left, Right or APU only) operations, pull the opposite side suction lift pump CB. Ensure suction lift pump CBs are reset prior to running fuel PFBIT or starting of another engine.

EXTERNAL POWER

1. External power. . . . . .CONNECTED
2. EXT POWER switch . . . . . RESET
3. FDP/RFIS/SFD . . . . . .SET
4. MFDs/CDU/EICAS. . . . . .SET
5. LAND or SEA. . . . . .SELECTED
6. PRES POSN/DATE/TIME:
   a. GPS avail/LAND. . . . . WAIT until updated/Verified
   b. GPS avail/SEA . . . . . .Not Required
   c. GPS not avail (wing stowed or no sats.). . .ENTERED (enter ship spd/hdg)

NOTE

If stored position is a long distance from present position, manual entry of PRES POSN will expedite GPS signal acquisition and LWINS alignment.

7. NORMAL FLIGHT OPS . . . . . .SELECTED

CONTINUED

CAUTION

MAGR will attempt to acquire satellites at MC power up. RF interference or blockage of the GPS antenna (i.e., in hangar) may cause a GPS runoff condition requiring maintenance action.

#8. Avionics . . . . . ON as required
9. External lights. . . . . .SET
10. Cockpit lighting. . . . . .SET
#11. LAMP TEST/Stall Warning. . . . . CHECKED
#12. BFWS to FLT RDY. . . . . As required
#13. PRES SYST STAT. . . . . CHECKED
#14. C/A Summary. . . . . CHECKED
#15. MAINT DATA . . . . . ERASE
#16. INS alignment. . . . . CHECKED
#17. APU . . . . . RUN/ENGAGE, ENGAGE LIGHT ON/ASI ON

CAUTION

EMERG RUN/ENGAGE removes most of the protective circuits for the APU and shall not be selected for normal operations.

#18. MWGB oil pressure . . . . . NORMAL
#19. HYD pressure. . . . . NORMAL
#20. ECS . . . . . .MANUAL

NOTE

When OAT is < 10 °C, set temperature to at least 160 ° for approximately 2 minutes to warm up the system prior to initiating ECS PFBIT.

21. EXT POWER switch. . . . . .OFF
22. External power . . . . . DISCONNECTED
#23. ALL START . . . . . .Execute

BATTERY

#1. APU . . . . . RUN/ENGAGE, ENGAGE LIGHT ON

CAUTION

EMERG RUN/ENGAGE removes most of the protective circuits for the APU and shall not be selected for normal operations.

NOTE

During extended (15 min or more) single engine (Left, Right or APU) operations, pull the opposite side suction lift pump CB. Ensure suction lift pump CB's are reset prior to running fuel PFBIT or starting of another engine.

#2. FDP/RFIS/SFD . . . . . .SET
#3. MFDs/CDU/EICAS. . . . . .SET
#4. APU ASI. . . . . .ON
#5. MWGB oil pressure . . . . . .NORMAL
#6. HYD pressures. . . . . .NORMAL
7. LAND or SEA . . . . . .SELECTED
#8. PRES POSN/DATE/TIME:
   a. GPS avail/LAND . . . . . WAIT until updated/Verified
   b. GPS avail/SEA . . . . . Not required
   c. GPS not avail (wing stowed or no sats) . . .ENTERED
(enter ship spd/hdg)

NOTE

If stored position is a long distance from present position, manual entry of PRES POSN will expedite GPS signal acquisition and LWINS alignment.

#9. NORMAL FLIGHT OPS . . . . . SELECTED

CAUTION

MAGR will attempt to acquire satellites at MC power up. RF interference or blockage of the GPS antenna (i.e., in hangar) may cause a GPS runoff condition requiring maintenance action.

#10. Avionics . . . . . ON as required
#11. ECS . . . . . .MANUAL

CONTINUED

NOTE

When OAT is < 10 °C, set temperature to at least 160 ° for approximately 2 minutes to warm up the system prior to initiating ECS PFBIT.

12. External lights. . . . . SET
13. Cockpit lighting. . . . . SET
#14. LAMP TEST/Stall Warning. . . . . CHECKED
#15. BFWS to FLT RDY. . . . . As required
#16. PRES SYST STAT. . . . . CHECKED
#17. C/A Summary. . . . . CHECKED
#18. MAINT DATA . . . . . ERASE
#19. INS alignment. . . . . CHECKED
#20. ALL START . . . . . Execute

ALL START

CAUTION

The flight control system may be damaged by forced cold hydraulic fluid. Do not attempt Flight Control Checks, FCS PFBIT and engine starts if HYD HEATER ACTIVE ADVISORY is displayed.

#1. Landing gear panel . . . . . 3 LIGHTS
#2. Parking brake. . . . . RESET/LIGHT ON/ASI POSTED
3. PWR STEER/NOSE LK . . . . . OFF/As required
#4. Rotor Brake . . . . . ON/WRA CHECKED/OFF
5. NACELLE B/U ENABLE. . . . . OFF
#6. AFCS RESET or PFCS . . . . . RESET
7. AFCS . . . . . ON
#8. Ramp/door . . . . . As required
9. ECS PFBIT. . . . . INITIATED
#10. Flight Control Checks:
    a. C/A Summary . . . . . Display/Clear
    b. FCS/HYD STAT . . . . . Display/Clear
    c. Nacelle/flight control surfaces. . . . . Clear
    d. Flight controls . . . . . Centered
    e. TCL. . . . . Full Aft
    f. Nacelles. . . . . 78 °
    g. Longitudinal cyclic . . . . . Full Fwd, Aft, Center
    h. Lateral cyclic. . . . . Full Left, Right, Center

CONTINUED

i. Dircetional pedals . . . . . Full Left, Right, Center
j. TCL . . . . . .Fwd to 4-inch stop
k. TCL OTVL. . . . . Press/Advisory posted
l. TCL . . . . . Overtravel limit
m. TCL . . . . . Full Aft/Friction set
n. TCL OTVL . . . . . Press/Advisory out
o. Trim release . . . . . Checked
p. Force trim . . . . . Checked
q. CONV ACT/HYD SYS C/As . . . . . None posted
r. L/R NAC CONT DSBL switches . . . . . Press/Disabled
(1) DSBL lights . . . . . .On
(2) L/R PLT NAC CONTR FAIL Caution . . . . .Posted
(3) PFCS FAIL RESET . . . . . .On
s. Nacelles . . . . . Verify no response
t. L/R NAC CONT DSBL switches . . . . . .Press/Clear
u. NACELLE B/U ENABLE switch . . . . . .Press
(1) NACELLE B/U ENABLE light . . . . . .On
(2) CRIT CVRSN ACTR FAULT Caution . . . .Posted
(3) MASTER ALERT. . . . . .On
(4) PFCS FAIL RESET . . . . . .On
(5) Primary conv actuator segments. . . . . Red
(6) Backup conv actuator segments . . . . . Green
v. Nacelles . . . . . Verify response
No CVRSN Actuator faults
w. NACELLE B/U ENABLE switch . . . . . .Press
(1) NACELLE B/U ENABLE light . . . . . .Off
(2) CRIT CVRSN ACTR FAULT Caution . . . Cleared
(3) MASTER ALERT. . . . . RESET
(4) PFCS FAIL RESET . . . . . .Self-clear
(5) Primary conv actuator segments. . . . . Green
(6) Backup conv actuator segments . . . . . Green
x. Nacelles . . . . . Verify Response
No CVRSN Actuator faults/SET 90 °

11. ECS PFBIT . . . . . .STATUS CHECKED
12. O2N2 PFBIT . . . . . .INITIATED
13. IEWS SYSTEM WARM-UP
a. ALE-47 safety pin . . . . . IN
b. AN/APR-39 Control Panel Switch. . . . . .OFF
c. Chaff/flare CBs (3) . . . . . IN
d. IEWS
(1) RWR/JMR/MWS . . . . . .OFF
(2) ALE-47. . . . . .STBY
(3) **[B]** Marker Beacon ICS Knob . . . . . .UP

CONTINUED

(4) AN/APR-39 Control Panel Test Switch . . . . . ON

#14. FCS PFBIT
- a. Nacelles/flight control surfaces . . . . . CLEAR
- b. Nacelles . . . . . 90 °
- c. FLAPS . . . . . Verify AUTO
- d. Controls . . . . . Centered
- e. TCL . . . . . Full Aft
- f. PRES SYST STAT . . . . . ELEC PWR and FCS/HYD WRAs clear
- g. FCS PFBIT . . . . . INITIATED
- h. FCS PFBIT . . . . . STATUS CHECKED

NOTE

[A] With JASS 2.7.0.3, the FCS PFBIT does not show the correct result for the test just run. The FCS PFBIT Fail Caution can be relied on to indicate the correct result. The PRES SYST STAT may also be utilized to show the correct result.

- i. MAINT DATA DNLD . . . . . If required

15. O2N2 PFBIT . . . . . STATUS CHECKED
16. [B] ARRP EXTENTION TEST . . . . . As required

#17. Standby flight instruments . . . . . CHECK/SET

18. IEWS BIT . . . . . INITIATED
    - a. AN/APR-39 Control Panel Test Switch . . . SELECTED
    - b. OFP 111_ and MDF 111_ . . . . . Verified
    - c. CCU status . . . . . GO after BIT (approx 15 seconds)
    - d. Mission load . . . . . Verified in CCU

#19. Personnel equipment
- a. Seat height/weight adjustments . . . . . SET
- b. Harnesses . . . . . ADJUSTED
- c. COMM/oxygen . . . . . CONNECTED
- d. HABD bottle . . . . . ON
- e. Side panels . . . . . CHECKED/SET

#20. AVSS . . . . . ENABLED

#21. MDL Cartridge . . . . . INSERTED

#22. MSN DATA . . . . . UPLOADED/Verified

#23. CDU default/ACFT INIT . . . . . SET

CONTINUED

#24. COMM modes . . . . . SET
25. Declutter levels . . . . . SET

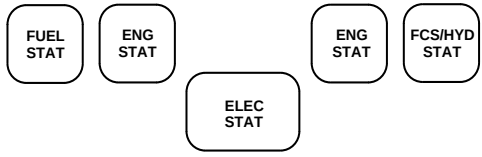
ENGINE START

#1. Landing gear pins. . . . . .REMOVED/STOWED

WARNING

Inadvertent landing gear retraction resulting in personnel injury or death may occur if the system components have failed and landing gear lockpins are removed. The nose landing gear lockpin should be removed first. If there is any resistance or unusual force in removing a lockpin or seating the handle flush with the aircraft, reinsert the lockpin immediately and do not remove any of the remaining lockpins. If gear motion is observed following any lockpin removal, keep hydraulic power applied to the aircraft, ensure parking brake is set and secure the aircraft with four-point jacks until all lockpins are reinstalled.

#2. Cockpit window pins. . . . . .REMOVED/STOWED
#3. INTERIM POWER . . . . . CHECKED/OFF
#4. FADECs . . . . . SWITCHED/MATCHED
#5. AFCS . . . . . ON
#6. EAPS/EXDEF. . . . . .AUTO/AUTO
#7. BFWS. . . . . .FLT RDY
#8. MFDs and CDU/EICAS . . . . . .SET



#9. XFER VALVE. . . . . AUTO
#10. TPUMP. . . . . SUCTION
11. AIR/HIFR . . . . . .OFF
#12. Fuel Tank Isolation. . . . . .SET
#13. Controls/TCL . . . . . CENTERED/FULL AFT
#14. Rotor Break . . . . . .OFF
#15. Nacelles . . . . . 90 °
#16. Aircraft . . . . . CLEAR
#17. No.2 ECL . . . . . START
#18. Ng, Np, Nr . . . . . STABILIZE
#19. No.2 ECL . . . . . .FLY

CONTINUED

CAUTION

- The CF generators may be damaged by: 1) overheating if ground run time below 72% Nr is greater than 5 minutes, and 2) by shaft harmonics with continuous operation between 53% and 67% Np. Avoid extended operation below 72% Nr.
- Do not operate engine above ground idle power with the engine oil temp at less than 20 °C. If operational necessity exists, full power is available, however a loss of bearing life will result.

#20. No.1 ECL . . . . . START

CAUTION

Starting the second engine with Nr below 75% may result in improper PRGB clutch engagement and system damage. Ensure Nr stabilizes above 75% before continuing.

#21. APU . . . . . STOP
#22. EMERG EGRESS . . . . . ARM
#23. Chocks . . . . . REMOVED
#24. Cargo ramp and door . . . . . As required
#25. Main cabin door . . . . . As required
#26. ECLs . . . . . FLY
#27. EAPS . . . . . OPEN (L/R)

POST ENGINE START

#1. Engine response
   a. FADECs . . . . . MATCHED
   b. TCL Input . . . . . Qe, Wf and MGT CHECKED
   c. FADECs . . . . . .SWITCHED
   d. TCL Input . . . . . Qe, Wf and MGT CHECKED
#2. Manual TORQUE BEEP
   a. Manual Control . . . . . L/R Control verified/Set a Split
   b. PFCS RESET . . . . . Ng's MATCHED
   c. Torque . . . . . .SET WITHIN 2%
#3. FUEL and ELS PFBITs . . . . . INITIATED

NOTE

- The PSOV test occurs automatically once per flight provided the FUEL PFBIT is complete, both engines are running > 60 seconds and are burning > 600 pph for more than 20 seconds.
- Attempts to reaccomplish the FUEL PFBIT once the PSOV test has begun will be inhibited until the test is complete (up to 15 minute duration).

4. **[A]** ENG ANTI-ICE . . . . . ON/RISE IN MGT/SET
5. **[B]** IPS - ADS/WING/WS PFBIT . . . . . INITIATED
6. **[B]** IPS - ENG/PRTR PFBIT . . INITIATED/RISE IN MGT
#7. FUEL and ELS PFBITs . . . . . .STATUS CHECKED
8. **[B]** IPS PFBITs . . . . . .STATUS CHECKED
#9. STAT layers . . . . . CHECKED

PILOT WARM/HOT SEAT

1. Parking brake . . . . . SET
2. Hotseat cockpit window pin . . . . . IN
3. No. 2 ECL (overdeck eng) . . . AFT of FLY until Nr ~ 83%
4. Controls/ECL . . . . . GUARDED (Remaining pilot)
5. Hotseat pilot's seat/rudder pedals . . . . . FULL AFT
   FULL FWD/HARNESS LOOSE
6. Hotseat pilot . . . . . Carefully Exit
7. New pilot . . . . . Carefully Enter
8. Personnel equipment
   a. Seat height/weight adjustments . . . . . SET
   b. Harnesses . . . . . ADJUSTED
   c. COMM/oxygen . . . . . CONNECTED
   d. HABD bottle . . . . . ON
   e. Side panels. . . . . CHECKED/SET
9. Cockpit window pin . . . . . REMOVED/STOWED
10. ECLs . . . . . FLY

PRE-TAXI/BREAKDOWN

#1. APU . . . . . Verified OFF
2. PROG SELECT switch . . . . . 1-4 as required
#3. PWR STEERING/NOSE LK. . . . . As required
#4. ECLs . . . . . Verified FLY
#5. COMM/NAV/FDP/IFF. . . . . SET
#6. Radar altimeter . . . . . SET
#7. BARO PRESS/STBY altimeter . . . . . SET
#8. IPS/ENG ANTI-ICE . . . . . SET
#9. [A] Pitot heat CBs. . . . . IN
#10. ALE - 47 safety pin. . . . . REMOVED if required
#11. PRES SYST STAT. . . . . CHECKED
12. C/A SUMMARY . . . . . CHECKED
#13. MFDs and CDU/EICAS . . . . . SET
#14. Parking brake . . . . . As required

TAXI

1. Wheelbrakes . . . . . CHECKED
2. Heading indicators . . . . . MATCHED (PFD/NAV/MAG)
3. Sideslip indicators . . . . . CHECKED

PRE-TAKEOFF

#1. FLAPS . . . . . AUTO
#2. External lights. . . . . .SET
#3. Fuel quantity. . . . . CHECKED
#4. ECLs . . . . . .FLY
#5. INTERIM POWER . . . . . As required
#6. Cargo ramp/door . . . . . CLOSED/As required
#7. PWR STEER/NOSE LK . . . . . OFF/As required
#8. Harnesses . . . . . .LOCKED
#9. IFF . . . . . OPER
#10. Crew. . . . . Briefed

AFTER TAKEOFF

1. Landing gear . . . . . UP/LIGHTS OUT
2. INTERIM POWER . . . . . As required
3. EAPS . . . . . CLOSED above 80 KCAS
4. Nacelles . . . . . .CLEAN AND DRY

CLIMB

1. Oxygen masks . . . . . DON above 10,000 ft
2. Altimeter . . . . . SET 29.92 passing 18,000 ft

PENETRATION

1. RWR/JMR/MWS . . . . . ON
2. Weapon . . . . . CHECKED
3. Fuel . . . . . CHECKED
4. IFF . . . . . As briefed
5. External Lights . . . . . As briefed
6. RADALT. . . . . As required
7. TACAN. . . . . As required
8. Alibi . . . . . CHECKED

DEPENETRATION

1. RWR/JMR/MWS . . . . . .OFF
2. Weapon . . . . . CHECKED
3. Fuel . . . . . CHECKED
4. IFF . . . . . As briefed
5. External Lights . . . . . As briefed
6. RADALT. . . . . As required
7. TACAN. . . . . As required
8. Alibi . . . . . CHECKED

PRACTICE STALL

1. Loose equipment . . . . . SECURED
2. Harnesses . . . . . LOCKED
3. Aircrew seated/harness . . . . . SECURED
4. Ramp . . . . . CLOSED
5. Flaps . . . . . AUTO
6. SYST STAT . . . . . CHECKED
7. C/A Summary. . . . . CHECKED
8. Clearing turn. . . . . CONDUCT

DESCENT

1. Altimeter . . . . . SET LOCAL/IAW FIH passing 18,000 ft
2. Oxygen masks . . . . . OFF below 10,000 ft

APPROACH

1. ATC clearance . . . . . As required
2. COMM/NAV frequencies . . . . . SET
3. ENAV . . . . . SET
4. BRG/CDI displays . . . . . SET
5. FDP . . . . . SET
6. BARO PRESS/STBY altimeter. . . . . SET
7. IFF modes . . . . . SET/OPER
8. Crew. . . . . Briefed

LANDING

1. Crew. . . . . Briefed
2. Landing gear . . . . . DOWN/3 LIGHTS
3. FLAPS . . . . . AUTO
4. Parking Brake. . . . . As required
5. Lights (Position/Landing/Search) . . . . . As required
6. NOSE LOCK . . . . . As required
7. INTERIM POWER . . . . . As required
8. Cargo ramp/door . . . . . Check position
9. Harnesses . . . . . LOCKED

TOUCH AND GO

1. Crew. . . . . Briefed
2. Landing gear . . . . . DOWN/3 LIGHTS
3. Parking Brake. . . . . As required
4. NOSE LOCK . . . . . As required
5. INTERIM POWER . . . . . As required

AFTER LANDING

#1. INTERIM POWER . . . . . .OFF
#2. PWR STEER . . . . . As required
#3. ALE-47 safety pin. . . . . IN
#4. IFF . . . . . HOLD/STBY
#5. **[A]** Pitot heat CBs . . . . . PULLED
#6. **[B]** IPS . . . . . As required
#7. FLIR/DIGMAP . . . . . OFF/OFF
#8. APU . . . . . RUN/ENGAGE
9. Searchlights . . . . . .AS REQUIRED

SHUTDOWN

#1. TCL . . . . . .FULL AFT
#2. Nacelles . . . . . 90 °
#3. Searchlight . . . . . OFF/STOWED
#4. Parking brake . . . . . .SET
#5. **[A]** ENG ANTI-ICE . . . . . .OFF
#6. **[B]** IPS . . . . . .OFF
#7. PWR STEER . . . . . .OFF
#8. APU . . . . . ENGAGE LIGHT ON/ASI ON
#9. EMERG EGRESS . . . . . .OFF
#10. ECLs . . . . . .OFF

NOTE

- To prevent thermal lock-up, allow engines to cool down for 2 minutes below 537 °C prior to engine shutdown.
- Engines shall be rinsed following the last flight of each day if any flight activity that day occurred in a salt-water, salt laden or other corrosive environment.

11. ROTOR BRAKE . . . . . ON, Nr < 40% As required

CAUTION

- Engine oil may be lost if HYD 3 continues to drive engine compressor. Ensure Ng decreases to 0%. If residual Ng persists, select HYD 3 OFF.
- Rotors should not be allowed to rotate backwards as this can result in damage to the engine brush seals. In high wind or shipboard considerations should be given to locking the rotors prior to removing power.

CONTINUED

#12. Chocks . . . . . IN
#13. Landing gear pins . . . . . All IN
#14. Cargo ramp/door . . . . . As required
#15. MAINT DATA . . . . . Ensure Ng 0% then DOWNLOAD
#16. VSLED . . . . . DOWNLOAD
17. BFWS. . . . . As required
#18. External lights . . . . . OFF
#19. ECS . . . . . EMER VENT
#20. SYS LOG OFF . . . . . INITIATED
#21. MFDs/CDU/EICAS. . . . . OFF
#22. SFD/RFIS/FDP . . . . . MIN BRIGHT
#23. Cockpit lighting. . . . . OFF
#24. APU . . . . . STOP
#25. Cockpit window pins . . . . . BOTH IN
#26. WFPS. . . . . DISABLE
#27. Cabin escape hatch pins . . . . . BOTH IN
#28. BATTERY . . . . . Wait 20 seconds from APU STOP/OFF

HOT REFUELING

CAUTION

The MATS (if installed) should be limited to 2350 lbs in the forward tank, 2200 lbs in the mid tank and aft tank for normal operations. If these levels are exceeded, the restraint system may catastrophically fail during a crash.

1. Countermeasure systems . . . . . DISARM/OFF
2. Parking brake . . . . . SET
3. # 1 ECL . . . . . START
4. Hot brake check . . . . . COMPLETE
5. Landing gear . . . . . CHOCKED
6. Aircraft . . . . . GROUNDED
7. EMCON . . . . . SELECT
8. T-pump . . . . . SUCTION

WARNING

Once fueling evolution has commenced, the aircraft's electrical power status and connections shall not be changed until fueling has been stopped. Engines or auxiliary power units shall not be started or stopped and external power shall not be connected, disconnected, or switched on or off. Changing the aircraft electrical power status can create significant ignition sources.

9. Aircraft . . . . . REFUEL

WARNING

Ensure that refueling hose is kept well clear of the engine exhaust wake. Temperatures of up to 300 °F above ambient exists below the engines.

CAUTION

Immediately cease fueling if any of the following tank quantities are exceeded:

- Feed tanks — 650 lbs
- Wing auxiliary tanks (if installed) — 2050 lbs

CONTINUED

- Forward sponson tanks — 3300 lbs
- Aft sponson tank (if installed) — 2110 lbs
- MATS (if installed) — 2875 lbs

10. Chocks/ground wire . . . . . REMOVE
11. EMCON . . . . . .DESELECT
12. ECLs. . . . . .FLY

AERIAL REFUELING CHECKLIST

The aerial refueling checklist shall be completed prior to join-up and after refueling operations are complete.

1. CBNTNK ISOL . . . . . .MATS ISOLATED

NOTE

If MATS are installed, they should be isolated until refueling is commenced and fuel flow into the aircraft is verified. If a low fuel state exists in the MATS during aerial refueling, they will provide an air source in the system that will cause the suction lift pump to loose prime and result in a FEED TANK LOW caution. (Faulty fuel system components can also provide additional air leakage into the system).

For ARRPHydraulic operation:

2. PROBE OFF/EXTEND/STOW . . . . . .EXTEND
   Wait for the MFD to display PROBE EXTENDED

CAUTION

Do not select PROBE OFF during normal hydraulic aerial refueling operations. If aerial refueling is conducted with PROBE OFF selected and the probe is not manually locked, impact loading may damage the probe motor, which may result in probe retraction.

For ARRP Manual operation:

3. PROBE OFF/EXTEND/STOW . . . . . .PROBE OFF
4. Manually EXTEND the ARRPuntil PROBE EXTENDED illuninates on the MFD. Ensure locking pin is inserted into gearbox drive after extension

CONTINUED

For Fixed Probe, ARRP Hydraulic and ARRP Manual operations:

NOTE

Aerial Refueling training operations (Dry Plugs, with no actual fuel flow from the tanker) shall be conducted with AIR/HIFR deselected to minimize air ingeation.

5. AIR/HIFR . . . . . SELECTED

CAUTION

Failure to select AIR/HIFR prior to wet plugs or deselecting AIR/HIFR while fuel is flowing from the tanker can result in pressure spikes potentially causing fuel system damage and/or leakage.

NOTE

- With AIR/HIFR selected, the FMU will not command the boost pumps ON even when BOOST is selected and indicating white with an asterisk on the Fuel System Status layer. Deselecting AIR/HIFR will restore operational control of the boost pumps to the pilots and proper status will be indicated on the Fuel System Status layer.

- Selecting STOW on the Air Refuel Control key from the Aerial Refuel Control layer page on the MFD may introduced air from the refuel manifold and increase the time required to replenish the feed tanks.

6. FCS AERIAL REFUEL . . . . . SELECTED

CAUTION

Failure to select the FCS AERIAL REFUEL key prior to refueling will result in a single or multiple ADS failure. These failures may not resettable in flight.

7. FLAPS . . . . . 0°, 10° or AUTO

CONTINUED

8. Nr . . . . . As required
9. ENGINE ANTI ICE . . . . . As required

NOTE

Recommended configuration is 84% Nr and AUTO flaps. At high altitudes and/or high gross weight 100% Nr will provide greater power margin. If 100% Nr is used the recommded flap setting is 10° for airspeeds below 200 KCAS and 0° for 200 KCAS and above. Selecting ENGINE ANTI ICE off will also incerase power margin.

10. Exterior lighting. . . . . As required
11. Cargo ramp and door . . . . . CLOSED
12. Aerial Refueling - Commence, confirm positive fuel flow by monitoring fuel quantities
13. CBNTNK ISOL . . . . . MATS DEISOLATED

CAUTION

Immediately cease aerial refueling (normal disconnect) if during aerial refueling operations any of the following JP5 fuel levels are exceeded:

- Feed tanks . . . . . 650 lbs
- Forward sponson tanks . . . . . 3300 lbs
- Aft sponson tanks. . . . . 2110 lbs
- Wing auxiliary tanks . . . . . 2050 lbs
- MATS (if insalled). . . . . 2875 lbs

If either of the feed tanks reach 675 lbs for 5 seconds an overfill advisory will be posted and the FMU will automatically deselect from AIR/HIFR. Reselecting AIR/HIFR will reconfigure the aircraft to continue aerial refueling and may lead to feed tank overfills and/or rupture disc failure and fuel venting.

14. Aerial refueling . . . . . Complete

Post aerial refueling:

15. Exterior lighting. . . . . As required
16. ENGINE ANTI ICE . . . . . As required
17. Nr . . . . . As required
18. FLAPS . . . . . As required

For ARRP Hydraulic operation:

19. PROBE OFF/EXTEND/STOW . . . . . Select STOW

CONTINUED

CAUTION

If the ARRP is to remain extended for an extended period of time after refueling is complete, and when not behind the tanker, ensure AIR/HIFR and FCS AERIAL REFUEL are OFF. Failure to deselect AIR/HIFR could cause a FEED TANK LOW caution. Failure to deselect FCS AERIAL REFUEL will result in significantly degrade ADS failure detection and may result in degrading flying qualities and structural load limit protection.

NOTE

AIR/HIFR is automatically deselected when PROBE STOW is selected during hydraulic operation.

For ARRP Manual operation:

20. Manually RETRACT the ARRP - Ensure PROBE PARTIAL extinguishes from the MFD

For Fixed Probe, ARRP Hydraulic and ARRP Manual operations:

21. FCS Aerial Refueling . . . . . .OFF
22. AIR/HIFR . . . . . .OFF

NOTE

- The FMU will execute an AR manifold purge after AIR/HIFR is deselected. Feed tank quantities will fluctuate during AR Manifold Purge. During this purge operation FEED TANK LOW cautions are suppressed for 60 seconds. If a FEED TANK LOW condition persists for greater than 60 seconds a FEED TANK LOW caution will be posted. 30 seconds after posting the FEED TANK LOW caution (90 seconds after low feed condition was first detected by the FMU) will exit the manifold purge operation and not re-attempt manifold purge until AIR/HIFR is selected again.
- If the FMU initiates a manifold purge operation when FEED TANK LOW caution exists, the manifold purge operation will be terminated within 30 seconds and will not re-attempt until AIR/HIFR is selected and deselected again.

PRESSURE REFUELING

CAUTION

- Pressure fueling operations shall be halted immediately upon indications of fuel spillage from any fuel tank vent, or loud/unusual noise accompanied by wing vibration. Inspect suspect fuel tank and immediate area, including the internal wing (as required) for structural damage.
- To prevent structural damage ensure that fueling pressure does not exceed 55 psi (minimum 35 psi).
- Cold refueling aircraft with JP-4 or commercial JET B requires a dedicated fire extinguisher operator in addition to the nozzle operator and the station/truck operator.
- Immediately cease fueling if any of the following tank quantities are exceeded:
  - Feed tanks . . . . . 650 lbs
  - Forward sponson tanks . . . . . 3300 lbs
  - Aft sponson tank . . . . . 2110 lbs
  - Wing auxiliary tanks . . . . . 2050 lbs
  - MATS (if installed) . . . . . 2875 lbs
- The MATS (if installed) should be limited to 2350 lbs in the forward tank, 2200 lbs in the mid tank and aft tank for normal operations. If these levels are exceeded, the restraint system may catastrophically fail during a crash.

1. Disembark all non-essential personnel
2. Fire extinguisher. . . . . POSITIONED
3. Fuel truck/ship ground cable . . CONNECT TO GROUND
4. Fuel truck/ship ground cable . . . . . CONNECT TO A/C
5. GRDP/SPR adapter panel . . . . . OPEN
6. SPR adapter. . . . . REMOVE FUEL CAP
7. GRDP power switch . . . . . ON
8. Panel lighting . . . . . ADJUST
9. LAMP TEST . . . . . PRESS
10. Pressure refueling adapter/nozzle . . . . . CONNECT
11. Fueling nozzle valve. . . . . OPEN
12. MODE SEL switch . . . . . PRESSURE FILL
    (Wait two seconds for process to start)
13. TANK FILL . . . . . SEL FILL WING AUX
    and/or FILL RH AFT SPON (if desired)
14. Fueling truck/ship station . . . . . START REFUELING

CONTINUED

15. SYSTEM STATUS . . . . . PRECHECK ILLUMINATED
16. SYSTEM FAIL light . . . . . NOT ILLUMINATED

(If SYSTEM FAIL light illuminated, stop refueling process)

17. SYSTEM STATUS display . . . . . OBSERVE

CAUTION

Monitor the SYSTEM STATUS lights constantly during refueling. If the STOP REFUEL indicator illuminates, immediately turn off the pump (by releasing the Deadman Switch if equipped) and close the refuel adapter valve immediately. Failure to do so may cause fuel spillage resulting in aircraft damage and possible fire hazard.

18. Aircraft . . . . . FUEL UNTIL DESIRED LEVEL REACHED
19. Fuel nozzle . . . . . CLOSE/DISCONNECT/ INSTALL FUEL CAP ON SPR ADAPTER
20. Grounding wires . . . . . REMOVE
21. GRDP PWR switch . . . . . OFF
22. GRDP panel/SPR panel . . . . . CLOSE

FUEL DUMP (Reduce Gross Weight) CHECKLIST

CAUTION

Fuel dump with ramp open, ramp upper door open, or main cabin door open may result in fuel and/or fuel vapor entering the cabin area. Fuel dump outside prescribed fuel dump envelope or with landing gear down may result in a larger fuel impingement area.

NOTE

Fuel dump limited to 6000 ft AGL and above, except in an emergency. Expect fuel impingement into the aircraft aft of the fuel dump tube exit plane and fuel intrusion into the internal empennage area aft of station 724.

1. Airspeed . . . . . 80 KCAS and higher

CONTINUED

2. Altitude . . . . . 6000 ft AGL and higher
3. ROD . . . . . 1000 fpm maximum
4. ROC . . . . . No limit
5. NAC . . . . . 0 to 75 °
6. Cargo ramp . . . . . CLOSED
7. Cargo door . . . . . CLOSED
8. Main cabin door . . . . . CLOSED
9. Landing gear . . . . . UP
10. Fuel dump . . . . . Select (as required).

NOTE

If not manually secured, fuel dump will automatically secure approximately 70 seconds after USABLE FUEL reaches approximately 1700 lbs indicated. Feed tank fuel will NOT be dumped unless the associated Suction Lift Pump has failed.

NVG/HUD OPERATION

1. NVG/HUD display unit . . . . . .ATTACH TO NVGs
2. NVG/HUD CCU . . . . . ON
3. Display unit EYE SELECT switch . . . . . .AS REQUIRED

NOTE

Turn the EYE SELECT switch to the opposite position if the image in the display unit is inverted.

On any MFD:

4. SYST . . . . . PRESS
5. MAINT LAYER . . . . . PRESS
6. SYST STAT . . . . . PRESS
7. SEQ ↓ . . . . . TO SYS INT AND DISP
8. WRA PRES STAT . . . . . PRESS
9. PG ↓. . . . . PRESS - PAGE 3 OF 3
10. Under NVG/HUD verify:
    a. LEFT DISPLAY UNIT . . . . . .(P)
    b. RIGHT DISPLAY UNIT. . . . . .(P)
    c. SIGNAL DATA CONV. . . . . .(P)

On the cockpit overhead NVG/HUD CCU:

11. BIT/ACK switch . . . . . BIT
12. NONE during test, (P) after test . . . . . .VERIFY

After one minute of warmup:

13. Brightness (BRT/DIM) . . . . . ADJUST
14. Operation/PGM mode switch . . . . . L or R
15. PGM switch . . . . . NXT/SEL AS DESIRED
16. BIT/ACK switch . . . . . ACK UNTIL OK DISPLAYED
17. Operation/PGM mode switch . . . . . .OP
18. MODE 1-4/DCLT . . . . . AS DESIRED
19. DSPL POS knob . . . . . .CENTER DISPLAY
20. MFD PFD agrees with NVG/HUD headings. . . . .VERIFY
21. Cyclic MODE/DCLT . . . . . .CHECK
22. Cyclic BRT/DIM . . . . . .CHECK

APR-39 OPERATION

CAUTION

Do not operate the AN/APR-39 RSDS within 10 yards of ground based radar, or within 1 yard of airborne radar antennas. Operating the RSDS closer than these limits may caused damage to the AN/APR-39 antenna-detectors and receivers.

NOTE

This procedure also powers-up the AN/AAR-47(V)2 MWS.

1. RAD WARN, RAD DETR, MISSILE WRN C/Bs . . . . . IN
2. AUDIO knob . . . . . MIDPOINT
3. PWR . . . . . ON
4. RSI BRIL knob . . . . . .SET

CAUTION

Excessive brightness may damage RSI cathode-ray tube display. Set RSI BRIL knob for minimum readable display.

5. MODE switch . . . . . .AS REQUIRED
6. 2 minutes.. . . . . ALLOW FOR WARM-UP
7. TEST button . . . . . PRESS
8. OFP and EID numbers . . . . . .VERIFY
9. NO flashing P symbol. . . . . .VERIFY
10. AN/APR-39 receivers pass BIT . . . . . .VERIFY
11. NO flashing asterisks . . . . . .VERIFY
12. NO AN/AAR-47 signals flashing, and “Four-seven signal lost” is not heard . . . . . .VERIFY
13. Plus symbol displayed (+) . . . . . .VERIFY

ALE-47 OPERATION

AN/ALE-47 CMDS Preflight

Prior to testing the CMDS, ensure that the AN/APR-39 RSDS and the AN/AAR-47 BITs have passed.

CONTINUED

1. AN/ALE-47 safety switch pin . . . . . INSTALLED
2. CMDS MODE switch . . . . . .OFF
3. CHAFF/FLARE, FLARE DISP L, FLARE DISP R C/Bs . . . . . IN
4. CMDS RWR, JMR, MWS switches . . . . . .OFF
5. CMDS MODE switch . . . . . STBY
6. CMDS O1, O2, CH, and FL switches. . . . . ON
7. CMDS PRGM switch . . . . . BIT
8. CMDS CCU GO light . . . . . ILLUMINATED (after approx. 15 seconds)

WARNING

A stray voltage check must be accomplished prior to installing loaded magazines in the dispenser housings. Failure to detect stray voltages present in the dispense lines may result in inadvertent dispensing upon installation of loaded magazines. The stray voltage checks are accomplished using the ALM-286 Flight Line Payload Simulator (FLPS) and V-22 Conventional Weapons Release and Control Checklist - Electronic Countermeasures ALE-47 (A1-V22AB-LWS-720X).

AN/ALE-47 Normal Operation

WARNING

Do not “Reset Inventory” in-flight after expendables have been dispensed. Doing so may cause the remaining inventory to be miscalculated, resulting in the incorrect execution of subsequent dispenses, to include no dispensing. Incorrect dispensing may result in significantly reduced countermeasures effectiveness.

CAUTION

Some expendable components (e.g., spacers, pistons, end caps, and payload components) represent possible FOD hazards. If dispenses below 30 KCAS occur, borescope inspection of the engine compressor section and visual inspection of the SDC inlet area is to be performed. Dispensing with the cabin door and ramp open has not been tested, and represents a potential FOD hazard to aircrew and cabin equipment.

CONTINUED

1. AN/ALE-47 safety switch pin . . . . . REMOVE
2. CMDS MODE switch . . . . . AS REQUIRED
3. CMDS PRGM switch . . . . . AS DESIRED
4. CMDS O1, O2, CH, and FL switches . . . . . ON
5. CMDS RWR, JMR, MWS switches . . . . . AS REQUIRED

To dispense:

6. MAN mode: TCL MAN/SEMI switch . . . . . MAN (AFT)
7. SEMI mode: TCL MAN/SEMI switch . . . . . SEMI (FWD)
8. Program 5:TCL 5/6 switch . . . . . 5 (FWD)
9. Program 6:TCL 5/6 switch . . . . . 6 (AFT)

AN/ALE-47 Penetration Checklist

1. MODE select switch . . . . . MAN/SEMI/AUTO

CAUTION

With loaded magazines, AUTO mode shall only be activated on a designated range or in a combat zone.

AN/ALE-47 Post Dispense Checklist

1. MODE select switch . . . . . OFF
2. O1/O2/CH/FL switches . . . . . OFF
3. RWR/JMR/MWS switches . . . . . OFF
4. ALE-47 safety pin . . . . . INSTALL

EXTERNAL LOAD PREFLIGHT

1. FCCS CARGO HOOKS switch . . . . . DESIRED HOOK
2. Cockpit HOOK switch . . . . . ON
3. FCCS HOOK light . . . . . VERIFY ON
4. Electrical releases . . . . . CHECK
5. Manual releases . . . . . CHECK
6. Cockpit HOOK switch . . . . . OFF

EXTERNAL LOAD FLIGHT CHECKS

1. Cockpit HOOK switch . . . . . SET
2. ICS/radios . . . . . SET
3. INTERIM POWER . . . . . AS REQUIRED

EXTERNAL CARGO HOOK CHECKS

Preflight Procedures

1. HST team/crew . . . . . BRIEFED
2. Cargo hook well cover(s)/ door(s)/hook(s) . . . . . OPEN/INSPECT/RIG
3. Perform the following checks:

Single Hook Check

1. APU/external electrical power . . OPERATING/APPLIED
2. Cargo hook door . . . . . OPEN
3. External doors . . . . . OPEN
4. Hook. . . . . CHECK TRAVEL
5. Hook. . . . . .CHECK CONNECTIONS/ MANUALLY OPEN/CLOSE HOOK
6. MFD SYST, CARGO HOOKS . . . . . LOAD HOOK/ VERIFY WEIGHT INCREASE ON MFD
7. Select FCCS HOOK/Select HOOK ON in cockpit.
8. HWOG/cyclic release buttons . . . . . CHECK
9. Aft manual release handle . . . . . CHECK
10. Internal/external doors . . . . . CLOSE

NOTE

BOTH HOOKS OPEN advisory will not clear from EICAS until acknowledged even with both hooks closed.

Dual Hook Checks

1. APU/external electrical power . . OPERATING/APPLIED
2. Internal doors . . . . . OPEN
3. External doors . . . . . OPEN
4. Hooks . . . . . CHECK TRAVEL
5. Hooks . . . . . .CHECK CONNECTIONS/ MANUALLY OPEN/CLOSE HOOKS
6. MFD SYST, CARGO HOOKS . . . . . LOAD HOOK/ VERIFY WEIGHT INCREASE ON MFD

CONTINUED

7. SYST, PRES SYST STAT, EQUIP & FURN, WRA PRES STAT. Check CARGO HANDLING and WRA status.
8. Cargo System alerts. . . . . .CHECK FOR
9. Select CARGO HOOKS BOTH at FCCS. Select HOOK to ON in cockpit.
10. HWOG/cyclic release buttons . . . . . .CHECK
11. Aft manual release handle . . . . . .CHECK
12. Internal/external doors . . . . . CLOSE

TERM	MEANING
FORWARD BACK RIGHT LEFT UP DOWN	MOVE AIRCRAFT IN THIS DIRECTION, RELATIVE TO THE NOSE. GIVE REQUIRED DISTANCE IN INCREMENTS OF 5 FT (I.E., RIGHT 10, BACK 15, ETC.)
STEADY	HOLD CURRENT POSITION
CLEAR	FREE OF OBSTACLES
HOOK IS GROUNDED	THE GROUND CREW HAS GROUNDED THE HOOK
HOOK IS LOADED	THE LOAD IS CONNECTED TO THE HOOK
TENSION COMING ON THE LOAD	SLACK IS ABOUT TO COME OUT OF THE PENDANT/SLING, AND THE AIRCRAFT IS ABOUT TO START PULLING ON THE LOAD
GROUND CREW IS CLEAR	HST OR HOOK UP TEAM IS CLEAR OF THE LOAD
LOAD IS OFF THE DECK	LOAD IS OFF THE DECK
CHECK HOOK PANEL	CALL FROM CREWCHIEF TO PILOT TO ENSURE HOOK PANEL IS IN APPROPRIATE POSITION, AUTO JETTISON IS SELECTED WHEN NECESSARY
CLEAR FOR FORWARD FLIGHT	THE LOAD IS CLEAR OF OBSTACLES IN THE FORWARD DIRECTION
LOAD IS ON THE DECK	LOAD IS ON THE DECK
TENSION OFF LOAD	THERE IS SLACK IN THE PENDANT/SLING AND THE AIRCRAFT IS NO LONGER PULLING ON THE LOAD
LOAD IS RELEASED	LOAD HAS BEEN SUCCESSFULLY RELEASED FROM THE HOOK(S)
FORWARD HOOK IS CLEAR	FORWARD HOOK IS EMPTY
AFT HOOK IS CLEAR	AFT HOOK IS EMPTY
NO RELEASE - HOLD	HOOK(S) DID NOT RELEASE, HOLD CURRENT POSITION
LOAD FOULED	LOAD IS CAUGHT ON SOMETHING

ICS VOICE SIGNALS

RESCUE HOIST PROCEDURES

Hoist Preflight (Power On)

1. Cable cutter switch guards . . . . CLOSED and SAFETIED
2. Circuit breakers . . . . . CHECKED IN
3. Hoist boom head . . . . . DEPLOYED
   a. Ramp . . . . . LEVEL
   b. Ramp door . . . . . CLOSE
   c. Boom head retaining rod. . . . . RELEASE
   d. Ramp door access panel . . . . . OPEN
   e. Ramp door . . . . . OPEN
4. Hoist power switch . . . . . ON
   a. Hoist fan motor . . . . . VERIFY ON
   b. Lamp test . . . . . CHECKED
   c. Hoist control panel brightness. . . . . .SET
5. Hoist operators grip (HOG) . . . . . .CHECKED DOWN, CHECKED UP (W) (C)
   a. Inspect hoist hook for free rotation
   b. Hoist cable pays out/in; cable speed varies with associated HOG thumbwheel movement
   c. Check limit switches for proper operation
   d. Check that thumb wheel returns to center
   e. Run out cable if live pickups are anticipated
6. Cabin hoist control . . . . . CHECK DOWN, CHECK UP
7. Hoist hook . . . . . STOWED
8. Hoist operators ICS . . . . . .CHECK HOT MIKE
9. Hoist boom head . . . . . .STOWED (if required)
   a. Ramp door . . . . . .CLOSED
   b. Boom head retaining rod . . . . . INSTALLED
   c. Ramp door access panel . . . . . .CLOSED
   d. Ramp/Ramp door . . . . . .AS REQUIRED
10. Hoist power switch . . . . . OFF
11. HOG . . . . . STOWED
12. Hoist and equipment . . . . . CHECKED and STOWED

Hoist Operator's Before Pickup Checklist

1. Safety harness . . . . . ON
2. Hoist boom head . . . . . DEPLOYED
   a. Ramp . . . . . LEVEL
   b. Ramp door . . . . . .CLOSED
   c. Boom head retaining rod. . . . . RELEASED

CONTINUED

d. Ramp door access panel . . . . . OPEN
3. Ramp/Ramp door . . . . . AS REQUIRED
4. Gloves . . . . . ON
5. Hoist power switch . . . . . ON
6. Hoist . . . . . CHECKED
7. Rescue device . . . . . ATTACHED
8. HOG ICS . . . . . CHECKED/SET (W)
9. Hoist operators before pickup checklist . . . . . REPORT COMPLETE (W) (C)

Hoist Operator's After Pickup Checklist

1. Survivor/Team member . . . . . SURVIVOR SECURE, clear for forward flight
2. Hot mike . . . . . OFF (as required)
3. Hoist hook . . . . . STOWED
4. Hoist boom head . . . . . STOWED (as required)
   a. Ramp door . . . . . CLOSED
   b. Boom head retaining rod . . . . . INSTALLED
   c. Ramp door access panel . . . . . CLOSED
   d. Ramp/Ramp door . . . . . AS REQUIRED
5. Hoist power switch . . . . . OFF
6. HOG . . . . . STOWED
7. Hoist and equipment . . . . . CHECKED and STOWED

CARGO RAMP AND DOOR OPERATION

WARNING

Before raising or lowering the ramp, visually ensure that the ramp and ramp area are clear of personnel.

CAUTION

- Before lowering the ramp, ensure the ramp extensions are up, the area under the ramp is clear, and the ground is of equal load carrying capability to avoid twisting the ramp when loads are applied.
- Do not use the POWER DOWN plunger while the aircraft is on the ground. Failure to comply may result in damage to the ramp.

To open door:

1. BATTERY. . . . . ON (if required)

NOTE

The battery must be ON for the HYDRAULIC MAINTENANCE PUMP switch at the FCCS to operate. The battery is not required to be ON to use the HYDRAULIC MAINTENANCE PUMP switches on the aft cabin control station or the external ramp control station.

2. HYDRAULIC MAINTENANCE PUMP switch. . ACTUATE

NOTE

The maintenance pump is only required when the APU or the main engines are not driving the MWGB, and the No.3 hydraulic system is not operating.

3. DOOR switch or control lever. . . . . OPEN
4. Pump switch and DOOR switch/lever . RELEASE WHEN FULLY OPENED

To open ramp:

CONTINUED

1. HYDRAULIC MAINTENANCE PUMP switch . . ACTUATE
2. RAMP switch or control lever . . . . . OPEN
3. HYDRAULIC MAINTENANCE PUMP switch and RAMP switch or control lever. . . . . RELEASE AT DESIRED POSITION
4. BATTERY. . . . . OFF

To close ramp and door:

1. HYDRAULIC MAINTENANCE PUMP switch . . ACTUATE
2. RAMP/DOOR switches/control levers . . . . . CLOSE
3. RAMP/DOOR switches/control levers . RELEASE WHEN FULLY CLOSED
4. HYDRAULIC MAINTENANCE PUMP switch . . RELEASE

BLADE FOLD/WING STOW

RETRY, SKIP, and OVERRIDE Keys

If the operator releases the FOLD/STOW ENABLE button, the RETRY and the SKIP keys will become available. If the system halts because of a fault, the OVERRIDE HALT key will also be available.

BFWS System Setup

CAUTION

- Conducting BFWS operations above 45 kts (including gusts) may damage the Blade Fold Planetary Assembly.
- Engaging the wing lock pins with the wing spread and nacelles not in helicopter mode may cause bearing damage due to the increased forward cg load in this configuration.

NOTE

Personnel should be positioned to observe BFWS operation and ensure adequate clearance during the entire operation:

1. ECLs . . . . . .OFF
2. Nr 0%
3. ROTOR BRAKE . . . . . .OFF
4. CHOCKS/CHAINS . . . . . In/As required

CAUTION

The aircraft will shift during wing stow/unstow operations. Ensure all tiedown chains are installed with sufficient slack to allow aircraft to shift during wing movement or damage may occur to the aircraft.

5. BATTERY. . . . . ON
6. APU . . . . . .RUN/ENGAGED
7. GEN 1 . . . . . ON
8. HYD 3 Pressure . . . . . Normal
9. WFPS switch . . . . . .DISABLE
10. BFWS/ABIU/WIU/NIU C/As . . . . . None posted
11. PRES SYS SYST. . . . . Checked

CONTINUED

12. AREA . . . . . Clear

NOTE

All personnel not directly involved in the BFWS operation should be clear of the aircraft.

13. MFDs/CDU/EICAS . . . . . Set as required
14. FLT RDY to FULL STOW or FULL STOW to FLT RDY . . . . . Execute.

Flight Ready to Full Stow

1. FLT RDY . . . . . Verify white with *
2. FULL STOW. . . . . Select
3. BLADE FOLD/WING STOW switch . . . . . Actuate
4. Observe:
   - NAC positioned to 90 °
   - SWPL retraction
   - Proprotor blades index and lock
   - Left and right blades fold
   - Flaps position to 0 °
   - Nacelles lower
   - Wing lockpin retraction
   - Wing stow
   - Wing lockpin extension

CAUTION

If a BFWS FAULT OID is displayed, do not select OVERRIDE until the problem is determined as aircraft damage may occur if the BFWS component is not in the correct position for the step.

NOTE

If a sequence time-out occurs, select RETRY after determining there are no other faults.

5. BLADE FOLD/WING STOW switch . . . . . Release

CONTINUED

CAUTION

An uncommanded wing rotation may occur due to a BFWS hydraulic system failure, whereby releasing the switch will not stop the sequence and nacelle to fuselage contact may occur. Hydraulic power supplied by the APU or external cart must be removed immediately upon recognition of this malfunction. After hydraulic power is removed the wing will coast to a stop within approximately 4 ft.

6. FULL STOW. . . . . Verify white with *
7. Wing lock pins . . . . . Verify CAT-EYES (4) are black.

Full Stow to Flight Ready

1. FULL STOW. . . . . Verify white with *
2. FLT RDY . . . . . Select
3. BLADE FOLD/WING STOW switch . . . . . Actuate
4. Observe:
   - Flaps positioned to 0 °
   - Wing lockpin retraction
   - Wing unstow
   - NAC raise
   - Wing lockpin extension
   - Blades unfold
   - RPU unlock
   - SWPL return to FLT POS

CAUTION

If BFWS FAULT OID is displayed, do not select OVERRIDE until the problem is determined as aircraft damage may occur if the BFWS component is not in the correct position for the step.

NOTE

If a sequence time-out occurs, select RETRY after determining there are no other faults.

5. FLT RDY . . . . . Verify white with *

CONTINUED

6. BLADE FOLD/WING STOW switch . . . . . Release

CAUTION

An uncommanded wing rotation may occur due to a BFWS hydraulic system failure, whereby releasing the switch will not stop the sequence and nacelle to fuselage contact may occur. Hydraulic power supplied by the APU or external cart must be removed immediately upon recognition of this malfunction. After hydraulic power is removed the wing will coast to a stop within approximately 4 ft.

7. Wing lock pins . . . . . Verify CAT-EYES (4) are black
8. WFPS switch . . . . . ENABLE

ON SCENE COMMANDER'S CHECKLIST

If a mishap site is discovered and no OSC is on station.

1. Establish OSC flight profile:
   a. Safe altitude
   b. Conserve fuel, determine Bingo fuel
   c. Ensure radio line of sight with survivors and external agencies
   d. Maintain visual contact with crash site (consider FLIR)
   e. Remain clear of potentially hazardous fumes or post crash explosions (ordnance).
2. Squawk 7700, monitor guard.
3. Direct appropriate actions for wingmen (refuel to provide relief, radio relay, land, etc.).
4. Brief crew responsibilities:
   a. Aircraft control, flight director use
   b. Systems monitoring and Navigation
   c. Radio procedures
   d. Lookout responsibilities
5. Establish contact with nearest controlling agency. Provide:
   a. Identification of downed aircraft
   b. Situation (chutes, survivors, fire, ect.)
   c. Position (Lat/Long, radial/DME, VFR point)
   d. Intentions (assume OSC, request SAR, fire department, etc.).
6. Attempt radio contact with survivors (Guard or 282.8). Relay location and injuries as required.
7. A landing to render assistance should only be made to prevent further loss of life or injury to personnel.
8. Be prepared to assist ground units responding to the crash site.
   a. Establish working frequency
   b. Provide landing zone brief to incoming SAR aircraft.
9. Remain OSC until reaching bingo fuel or relieved by competent authority. In the case of the latter, ensure a thorough pass down is given to the OSC relief.

SEE IC # 36

M240D MACHINE GUN

Preflight/Function Check

- Failure to ensure weapon is safe and clear before proceeding with any weapon operations may result in accidental discharge of the weapon.
- Never clear the weapon in the stowed position. Ensure the weapon is pointed in a safe area.

1. Weapon ……FIRING POSITION

2. Weapon ……SAFE AND CLEAR

   a. Trigger safety ……"F" (FIRE) position

   b. Charging handle …… ….AFT

M240D components can be damaged if weapon is charged with safety in the "S" (SAFE) position.

   c. Trigger safety ……"S" (SAFE) position

   d. Cover/Feed tray …… ...OPEN

   e. Bolt/chamber …… .....CLEAR

WARNING

Failure to ensure the chamber and feed tray are clear of ammunition may result in accidental discharge of the weapon.

.

f. Feed tray/cover……CLOSE

3. Weapon/mount ……INSPECT

a. Missing/loose/damaged parts .. …CHECKED
   (1) Flash Suppressor ……..Secure
   (2) Front Sight …….. ……Secure
   (3) Gas Regulator ……. Inspect, verify correct gas port setting
   (4) Barrel assembly…….. ……Secure
   (5) Cover assembly/feed tray……Secure, serviceable
   (6) Feed pawls ….Verify spring tension, security
   (7) Firing Pin…….. Visually inspect (Protruding from bolt)
   (8) Buffer/spade grip assembly…..Locked down secure
   (9) Extractor/Ejector ……Visually inspect
   (10) Trigger Spring Pin…....Installed/safety wired

b. Gun mount ……VISUALLY INSPECT

WARNING

Failure to notify ordnance personnel of missing, loose, or damaged components may result in a catastrophic weapon malfunction.

SEE IC # 36

4. Weapon function check …… ….COMPLETE

a. Trigger safety ……. …….“F” (FIRE) position

b. Weapon charging handle……. CHARGED

M240D components can be damaged if weapon is charged with safety in the “S” (SAFE) position.

c. Trigger safety ……“S” (SAFE) position

d. Trigger—Depress (ensure bolt does not move forward)

e. Trigger safety……“F” (FIRE) position

f. Trigger……Depress (ensure bolt moves forward)

NOTE

- Ensure forward bolt movement is smooth and positive.
- If charging of the weapon and positioning of safety to “S” or “F” is not smooth and positive, the function check has failed.

5. Weapon system security……..CHECKED

a. Weapon Mount …….. Secure
b. Quick release pins (5) ……Installed
c. Brass collector bag/chute……. Installed
d. Ammo Tray / and lanyard…….Installed

NOTE

Either brass bag or chute may be used.

6. Weapon mount operation…… CHECKED

a. Quick release pins……..Verify operation
b. Azimuth/elevation stops- …..Verify operation

WARNING

Failure to ensure azimuth/elevation limit stops are installed/functioning will result in the aircraft structure falling within the weapon's field of fire.

7. Ammunition type/quantity……CHECKED

ARMING PROCEDURES

1. Helmet visor/Eye protection…… .DON

2. Ammunition Can……..Installed and secured

3. Ramp……LEVEL (via cockpit control panel)

4. Weapon……..Deployed to Firing position

5. Field of Fire……CHECKED

WARNING

Ensure that no portions of the aircraft are in the weapons field of fire.

6. Ammunition……LOAD

   a. Trigger safety……"F" (FIRE) position
   b. Weapon charging handle…….CHARGED

M240D components can be damaged if weapon is charged with safety in the "S" (safe) position.

   c.. Trigger safety……. ..."S" (SAFE) position
   d. Feed tray cover……OPEN
   e. Ammunition belt……...Positioned on feed tray
   f. Feed tray cover……..CLOSE

7. Weapon……"F" (FIRE) (As required)

8. Weapon…..Report "LOCKED AND LOADED"

The gun safety button should only be placed on "F" (FIRE) immediately prior to firing, and then returned to "S" (SAFE) immediately upon cease firing to preclude any unintentional firing, keeping weapon pointed in a safe direction.

DEARMING/SAFING PROCEDURES

1. Charging handle……AFT

M240D components can be damaged if weapon is charged with safety in the “S” (SAFE) position.

2. Trigger safety……..“S” (SAFE) position

3. Weapon……..CLEAR and SAFE

a. Cover/Feed tray……..OPEN

b.Bolt/chamber…… .....CLEAR

Failure to ensure the chamber and feed tray are clear of ammunition may result in accidental discharge of the weapon.

NOTE

If weapon will be stowed after de-arming, ensure barrel has cooled.

WEAPON FIELD MAINTENANCE PROCEDURES

Barrel Replacement

1. Trigger safety……"F" (FIRE) position
2. Charging handle……AFT

M240D components can be damaged if weapon is charged with safety in the "S" (safe) position.

3. Trigger safety……..."S" (SAFE) position
4. Weapon……CLEAR and SAFE

   a. Cover/Feed tray……..OPEN
   b. Bolt/chamber……CLEAR

Failure to ensure the chamber and feed tray are clear of ammunition may result in accidental discharge of the weapon.

NOTE

Utilize the weapon mount maintenance position for barrel replacement.

5. Weapon……Maintenance position

6. Barrel locking latch……Depress and hold

7. Barrel handle……..Rotate (12 o'clock position)

8. Barrel……REMOVE

9. Barrel……INSTALL (ensure handle is at the 12 o'clock position)

10. Barrel handle. …...ROTATE (2 o'clock position)

NOTE

When rotating barrel during install, ensure that the number of clicks are noted. Fewer than two, or more than seven clicks indicate defective parts and the weapon should be returned for maintenance.

11. Proceed with Arming checklist.

WEAPON STOPPAGE PROCEDURES

- Always keep an unsafe weapon pointed in a safe direction.

1. Wait 5 seconds prior to attempting to clear or repair malfunctioning gun.

WARNING

Failure to wait the specified time limit may result in a "hang fire" of the weapon

2. Charging handle — Lock to the rear, within the next 5 seconds, while observing ejection port.

WARNING

Failure to wait the specified time limit may result in a "cook off" of the weapon.

If a cartridge case, belt link, or round is ejected, proceed to step 6.

If nothing is ejected and the barrel is hot (200 rounds or more in $\leq$ 2 minutes):

3. Trigger safety — "S" (Safe) position. **DO NOT OPEN COVER.**

4. Weapon --- Point down range and remain clear for 15 minutes.

5. Weapon --- Clear
   a. Cover/Feed tray --- Open
   b. Bolt/chamber --- Clear

6.. Trigger safety……"F" (FIRE) position

7. Weapon……..Charge/Attempt to fire

SEE IC # 36

8. If weapon fails to fire, repeat steps 1 and 2. If weapon still fails to fire, perform the following:

a. Trigger safety……..“F” (FIRE) position

b. Weapon — Charge (ensure bolt is locked to the rear)

c. Trigger safety……..“S” (SAFE) position

d. Cover/Feed tray……OPEN

e. Ammunition belt….Removed from feed tray

f. Feed tray……OPEN

NOTE

If a round is lodged in the chamber and cannot be removed, replace barrel.

g. Weapon……RE-ARM (If required)

RUNAWAY GUN PROCEDURES

WARNING

- In the event of a runaway gun, notify pilot immediately so weapon can be kept in a safe firing area.
- Keep the weapon pointed on target.

1. Ammunition belt—Attempt to break link (twist link belt)

2. Weapon……CLEAR and SAFE

   a. Cover/Feed tray…… OPEN

WARNING

If cover is opened on a hot cartridge, an open cover cook off could occur.

   b. Bolt/chamber……...Clear

WARNING

- Failure to check the chamber and feed tray to ensure ammunition is not in the weapon or in a position to be fed into the weapon may lead to accidental discharge of the weapon.

- If the source of a runaway gun is not determined and corrected, do not attempt to rearm gun as another runaway may occur.

NOTE

- After stopping and clearing a runaway gun, ensure the trigger assembly retaining pin is installed, the spade grip mechanical linkage is not damaged, and the sear and sear latch functions properly.
- If the weapon will be stowed after dearming, ensure gun barrel has cooled.

POWERPLANT LIMITATIONS

MGT LIMITATIONS		
	STARTING	
YEL	>807 to 835 °C	TRANSIENT (1 SEC)
YEL	799 to 807 °C	TRANSIENT (3 SEC)
	OPERATING	
RED	>852 to 874 °C	TRANSIENT (3 SEC)
YEL	>803 to 852 °C	MAX (10 MIN)
YEL	>766 to 803 °C	INTERMEDIATE (30 MIN)
GRN	0 to 766 °C	MAX CONTINUOUS

Ng LIMITATIONS		
RED	101%	MAX TRANSIENT (3 SEC)
GRN	100%	MAX STEADY STATE

Np LIMITATIONS		
RED	119.7%	MAX TRANSIENT (3 SEC)
RED	114 to 119.7%	FADEC FUEL SHUTOFF (2)
YEL	105%	MAX STEADY STATE (1)/ FADEC FUEL CUTBACK
YEL	104%	INTERIM/CONTINGENCY POWER
GRN	100%	VTOL/CONV NORMAL
GRN	84%	APLN NORMAL
GRN	20 to 33%, 53 to 67%	AVOID RANGE

(1) Unlimited continuous operations at 105% Np is permissible if no other engine time limits are exceeded.

(2) Fuel shutoff Np is dependent on the rate of change of the power turbine speed detected by the FADECS.

ENGINE OUTPUT SHAFT TORQUE LIMITATIONS		
	>139%	INVALID
RED	>111 to 139%	HIGH WARNING
YEL	>101 to 111%	HIGH CAUTION
GRN	0 to 101%	NORMAL

ENGINE OIL PRESSURE LIMITATIONS		
RED	>90 psi	HIGH WARNING
YEL	>60 to 90 psi	HIGH CAUTION
GRN	35 to 60 psi	NORMAL
YEL	30 to <35 psi	LOW CAUTION
RED	<30 psi	LOW WARNING

ENGINE OIL TEMPERATURE LIMITATIONS		
RED	>140 °C	HIGH WARNING
YEL	>135 to 140 °C	HIGH CAUTION
GRN	40 to 135 °C	NORMAL
YEL	30 to <40 °C	LOW CAUTION
RED	<30 °C	LOW WARNING

TRANSMISSION LIMITATIONS

PRGB/TAGB OIL PRESSURE LIMITATIONS		
	AEO	
RED	>150 psi	HIGH WARNING
YEL	>95 to 150 psi	HIGH CAUTION
GRN	60 to 95 psi	NORMAL
YEL	30 to <60 psi	LOW CAUTION
RED	<30 psi	LOW WARNING
	OEI	
RED	>150 psi	HIGH WARNING
YEL	>95 to 150 psi	HIGH CAUTION
GRN	60 to 95 psi	NORMAL
YEL	50 to <60 psi	LOW CAUTION
RED	<50 psi	LOW WARNING

MWGB OIL PRESSURE LIMITATIONS		
RED	>100 psi	HIGH WARNING
YEL	>65 to 100 psi	HIGH CAUTION
GRN	40 to 65 psi	NORMAL
YEL	25 to <40 psi	LOW CAUTION
RED	<25 psi	LOW WARNING

OIL TEMPERATURE LIMITATIONS		
MWGB AEO/OEI/PRGB/TAGB AEO		
RED	>132 °C	HIGH WARNING
YEL	≥110 to 132 °C	HIGH CAUTION
GRN	20 to 110 °C	NORMAL
YEL	<20 °C	LOW CAUTION
PRGB/TAGB OEI		
RED	>121 °C	HIGH WARNING
YEL	>110 to 121 °C	HIGH CAUTION
GRN	20 to 110 °C	NORMAL
YEL	<20 °C	LOW CAUTION

PROPROTOR LIMITATIONS

Nr LIMITATIONS		
VTOL/CONV MODE		
RED	109%	MAX TRANSIENT
RED	>105%	HIGH WARNING
YEL	>101 to 105%	HIGH CAUTION
YEL	104%	TAKEOFF
GRN	100%	NORMAL
GRN	96%	MIN - POWER ON
RED	<94%	LOW WARNING
APLN MODE		
RED	109%	MAX TRANSIENT
RED	>105%	HIGH WARNING
YEL	101 to 105%	HIGH CAUTION
GRN	82 to <101%	NORMAL
RED	<82%	LOW WARNING

NOTE: Unlimited continuous operation at 105% Nr is permissible if no engine limits are exceeded.

AVERAGE MAST TORQUE (Qm)		
RED	>125%	HIGH
YEL	>110 to ≤125%	CON PWR
GRN	>12 to ≤110%	NORMAL/INT
RED	≤12%	LOW WARNING

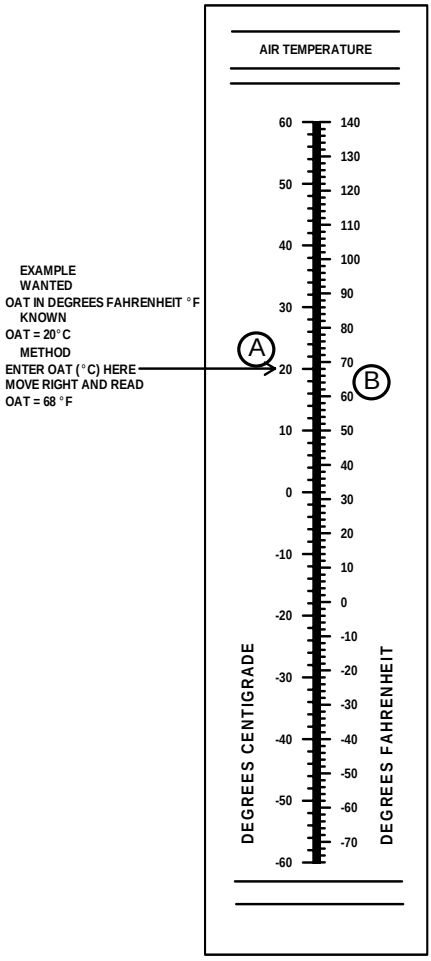
NOTE: PRTR OVERTORQUE (L/R) will post when either Qm is ≥ 132% for 5 seconds or ≥ 150% Qm instantaneous.

HYDRAULIC SYSTEM LIMITATIONS

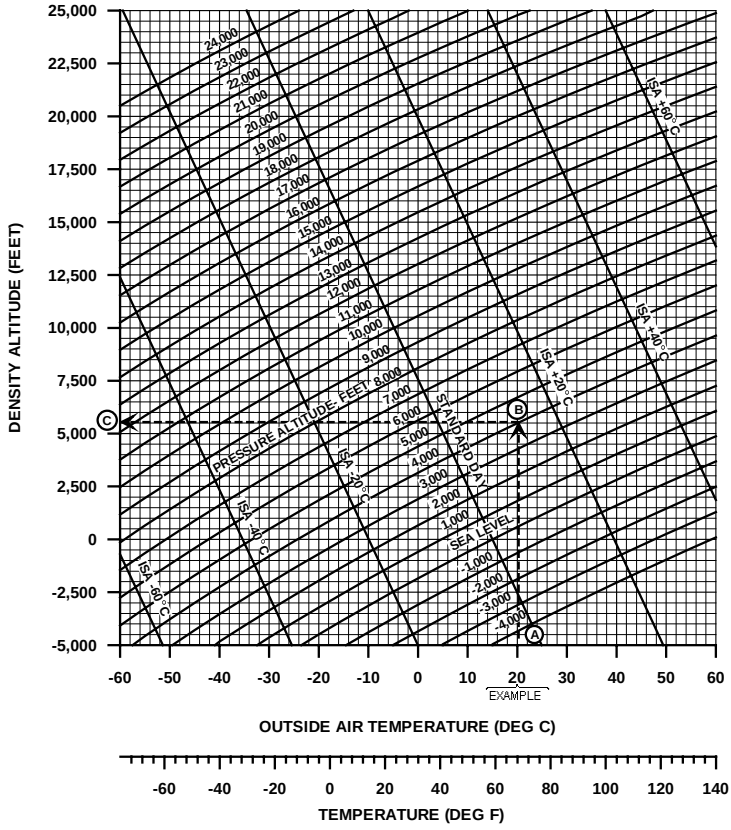
HYDRAULIC PRESSURE		
RED	5500 psi	HIGH WARNING
YEL	5250 to <5500 psi	HIGH CAUTION
GRN	4600 to <5250 psi	NORMAL
YEL	4200 to <4600 psi	LOW CAUTION
RED	<4200 psi	LOW WARNING

STO / RUN-ON Landing	MAX CROSSWIND / TAILWIND
60-70 °	10 kts
≥ 70 °	20 kts

TEMPERATURE CONVERSION CHART



ALTITUDE CONVERSION CHART



DATE	EVENT	MODEX
PILOT	COPILOT	CREW

	DEPARTURE POINT	DESTINATION POINT
OAT/PA/DA/WINDS	°c/ / /	°c/ / /
BASIC WEIGHT	lbs	lbs
+ CREW	lbs	lbs
+ MISCELLANEOUS (MSN SPECIFIC KITS)	lbs	lbs
= **OPERATING WEIGHT**	**lbs**	**lbs**
+ FUEL	lbs	lbs
+ PAYLOAD	lbs	lbs
= **MISSION WEIGHT**	**lbs**	**lbs**

	DEPARTURE POINT	DESTINATION POINT
MAST TORQUE AVAIL (N/I) (a)	(N) /(I)	(N) /(I)
MAST TORQUE REQ (N) (b)	(HOGE /HIGE)	(HOGE /HIGE)
MAST TORQUE REQ (I) (c)	(HOGE /HIGE)	(HOGE /HIGE)
MAST TORQUE MARGIN (N) (a-b)	(HOGE /HIGE)	(HOGE /HIGE)
MAST TORQUE MARGIN (I) (a-c)	(HOGE /HIGE)	(HOGE /HIGE)
MAX HOGE WEIGHT WITH (_____)% TORQUE MARGIN (I) (c)	lbs	lbs
MISSION WEIGHT (d)	lbs	lbs
MAX ALLOWABLE PAYLOAD (c-d)	lbs	lbs
MAX HOGE WEIGHT (I) zero Qm margin (e)	lbs	lbs

MAX RANGE AIRSPEED (f)
MAX ENDURANCE AIRSPEED (g)
PWR-OFF STALL SPEED (FLAPS AUTO) (h)

SINGLE ENGINE LEVEL FLIGHT
(@ MISSION WEIGHT)

MAX ALT OEI (CONV MODE) (i)	@	(aspd)	MAX ALT OEI (APLN MODE)(j)	@	(aspd)
A/S ENVELOPE (CONV MODE) (i)	KCAS to		KCAS @	ft MSL	
A/S ENVELOPE (APLN MODE) (j)	KCAS to		KCAS @	ft MSL	

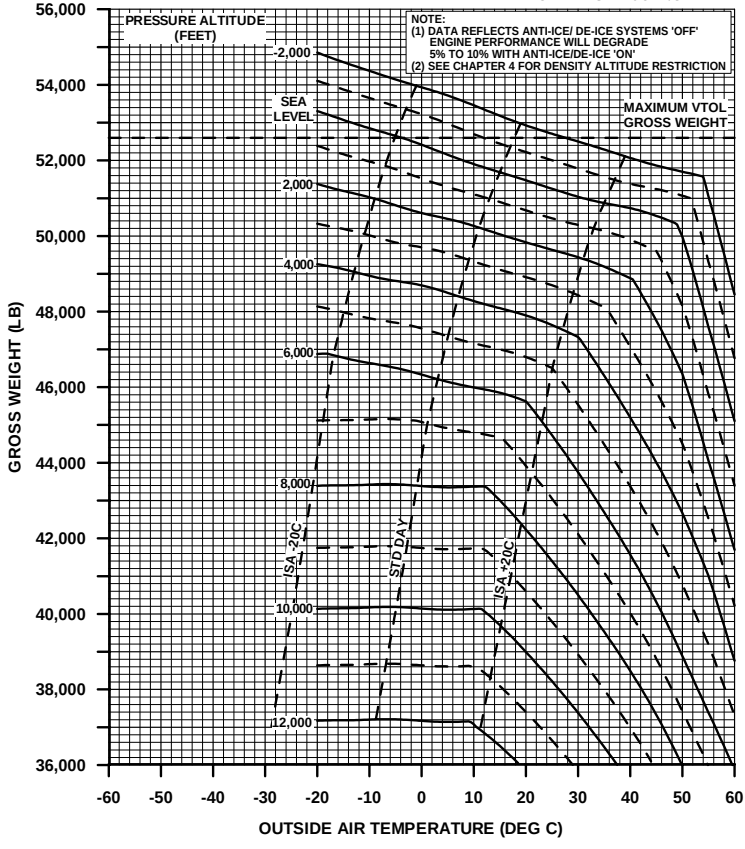
Load Computation Chart

MAXIMUM HOVER GROSS WEIGHT

OUT OF GROUND EFFECT (WHEEL HEIGHT ≥ 50 FT)
MAXIMUM POWER RATING
100% N_R (NORMAL POWER)
0% TORQUE MARGIN
AUTOFLAPS
ZERO WIND

MODEL: MV-22B
DATE: DECEMBER 2002
DATA BASIS: FLIGHT TEST

ENGINE: (2) AE1107C
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL

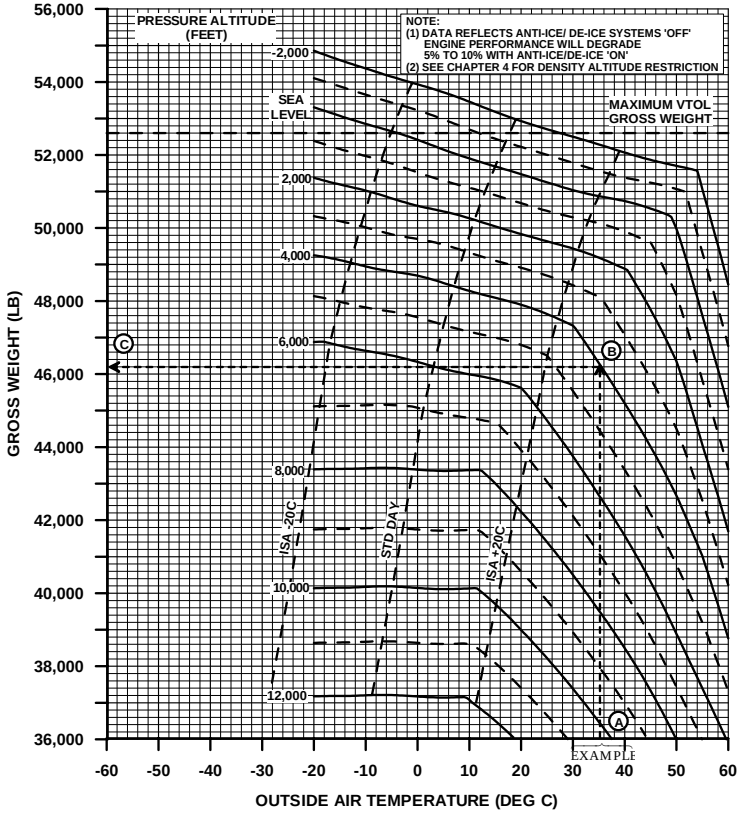


MAXIMUM HOVER GROSS WEIGHT

OUT OF GROUND EFFECT (WHEEL HEIGHT ≥ 50 FT)
MAXIMUM POWER RATING
104% N_R (INTERIM POWER)
0% TORQUE MARGIN
AUTOFLAPS
ZERO WIND

MODEL: MV-22B
DATE: DECEMBER 2002
DATA BASIS: FLIGHT TEST

ENGINE: (2) AE1107C
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL

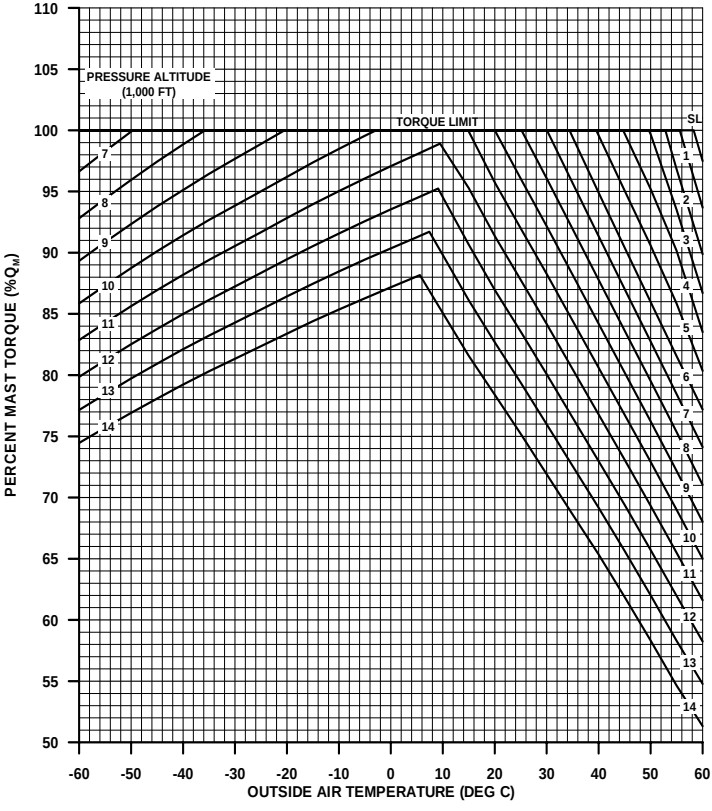


MAST TORQUE AVAILABLE

MAXIMUM POWER RATING
10 MIN, MGT 803°C-852°C
100% N_R (NORMAL POWER)
HOVER (ZERO WIND)

MODEL: MV-22B
DATA: DECEMBER 2002
DATA BASIS: 17608J / NACAM 6JR0 MODEL

ENGINE: (2) AE1107C
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL

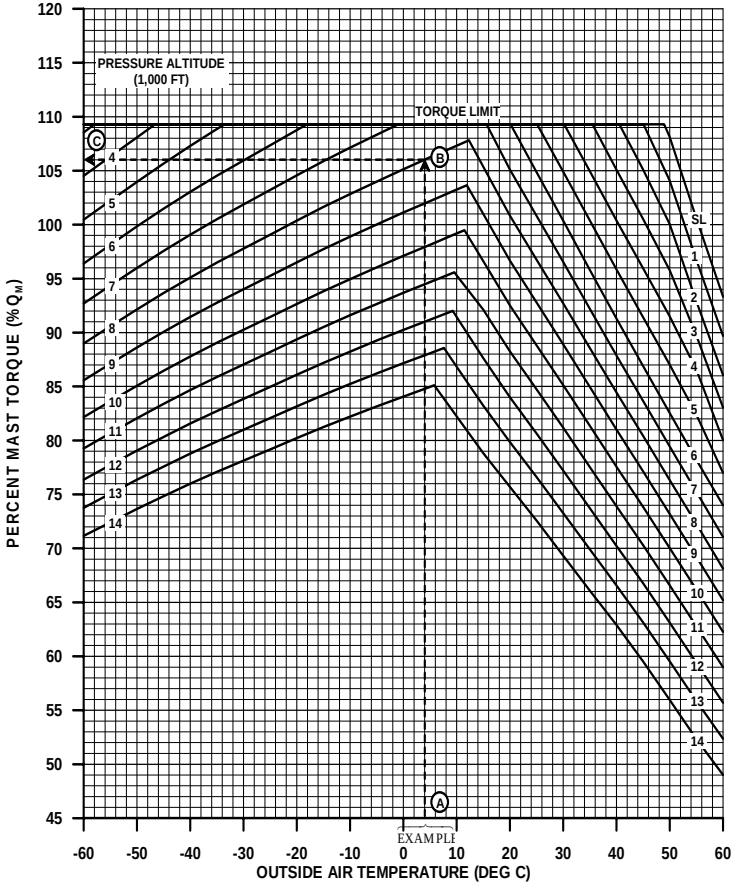


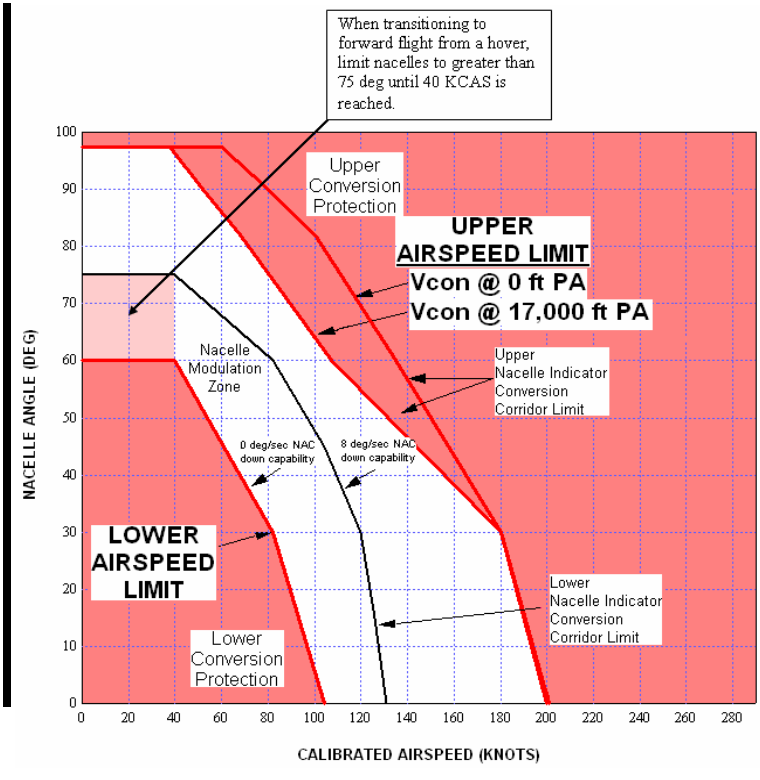
MAST TORQUE AVAILABLE

MAXIMUM POWER RATING
10 MIN, MGT 803°C-852°C
104% N_R (INTERIM POWER)
HOVER (ZERO WIND)

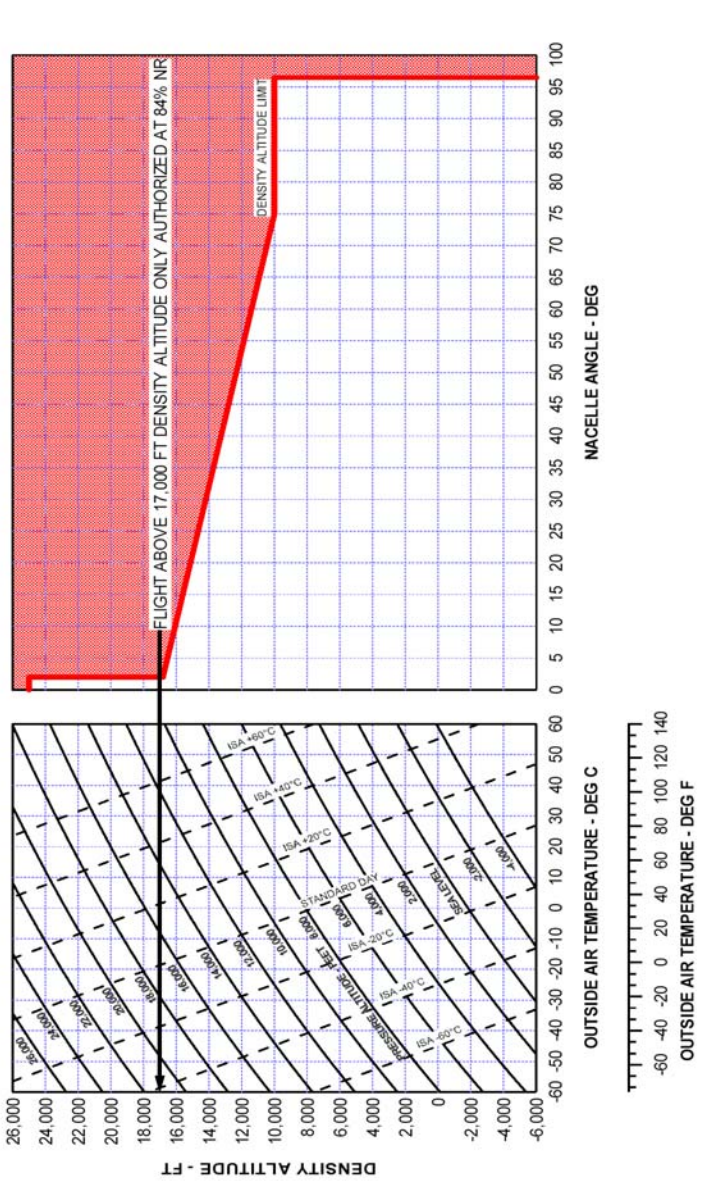
MODEL: MV-22B
DATA: DECEMBER 2002
DATA BASIS: 17608J / NACAM 6JR0 MODEL

ENGINE: (2) AE1107C
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL





Conversion Corridor



Density Altitude VS. Nacelle Angle

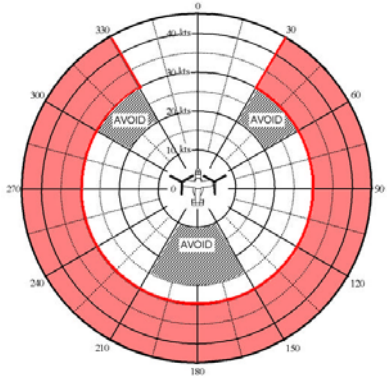
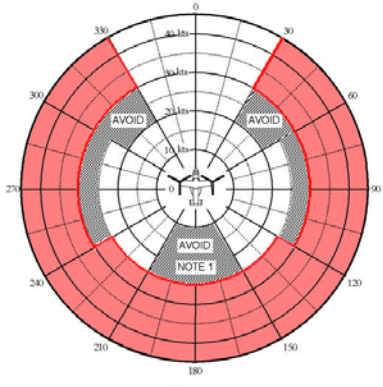


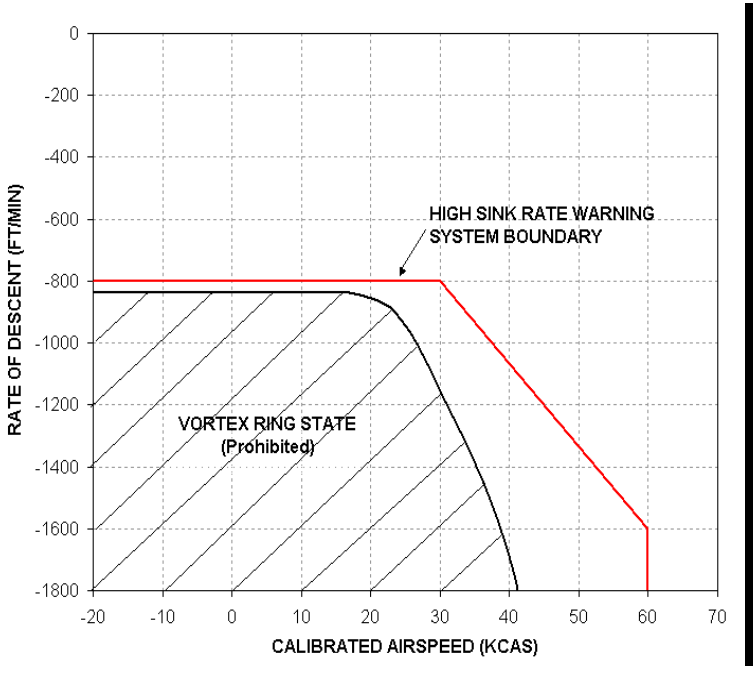
Figure 4-23 (a) VTOL Mode Hover and Low Speed Flight Airspeed Limits



Note 1: When performing a VTO or VL in this region, set nacelles to attain a near level pitch attitude prior to ground/air or air/ground transition.

Figure 4-23 (b) Vertical Takeoff and Vertical Landing Airspeed Limits

Vertical Takeoff and Vertical Landing Airspeed Limits



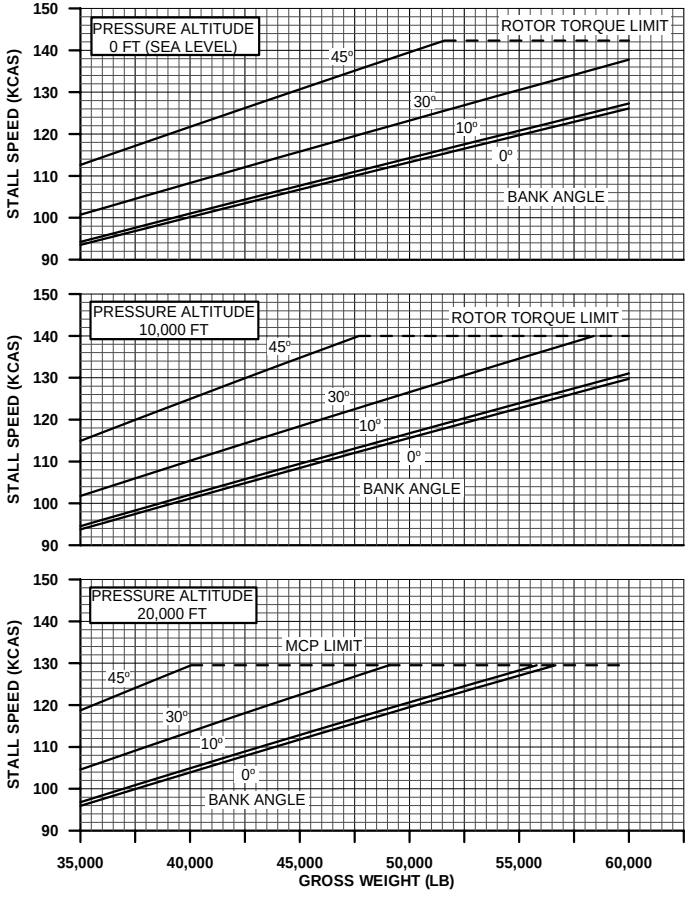
Vortex Ring State Limitations

STALL SPEEDS

AIRPLANE MODE
84% N_R
AUTOFLAPS

MODEL: MV-22B
DATE: DECEMBER 2002
DATA BASIS: FLIGHT TEST
CONFIGURATION: FE =33 .0 SQ. FT.

ENGINE: (2) AE1107C
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL



Date	Aircraft Type	From	Home Station
Mission	Serial No.	To	Pilot

Remarks	Ref	Item	Weight	Moment
	1	Basic Aircraft		
Fuel Type: J-5 @ 6.5 p/p/g	2	*Blank*		
	3	Crew (2, 3, 4)		
	4	Crew Baggage		
	5	Mission Aux Tank(s)		
	6	Emergency Equip.		
	7	Extra Equipment		
	8	Operating Weight		
	9	Main Fuel		
	10	Mission Aux Fuel		
	11	Takeoff Fuel Total		
Msn Planning Version:	12	Total Aircraft Weight		
			Zero Fuel Weight	

Corrections				Ref 13	Zero Fuel Moment		
Item	Comp/Arm	Weight	Moment	Cargo/Passengers	Weight	Arm	Moment
Total Of All Corrections							

Limitations			Total Of Ref 13			
Condition	TAKEOFF	LANDING	14	TAKE OFF CONDITION		
Allowable Gross Weight			15	TAKE OFF FUEL TOTAL		
Total Aircraft Wt. (Ref 12)			16	CORRECTION (AS REQ')		
Ref 8 + Ref 23 Total			17	CORRECTED T/) COND.		
Operating Weight (Ref 8)			18	TAKEOFF C.G. (INCHES) VTOL ONLY		
Allowable Load						
NOTE: Permissable C.G. for VTOL ONLY			19	LESS FUEL		
Permissable Takeoff C.G.			20	LESS AMMO		
Permissable Landing C.G.			21	LESS FLARES/CHAFF		
Airplane Mode C.G. (For CMS Input)			22	LESS AIRDROP		
STOL Mode C.G. (For Reference only!)						
Computed By:			23	EST. LANDING FUEL		
Weight & Balance Auth:			24	EST. LANDING WEIGHT		
Pilot Signature:			25	EST. LANDING C.G. (INCHES) VTOL		

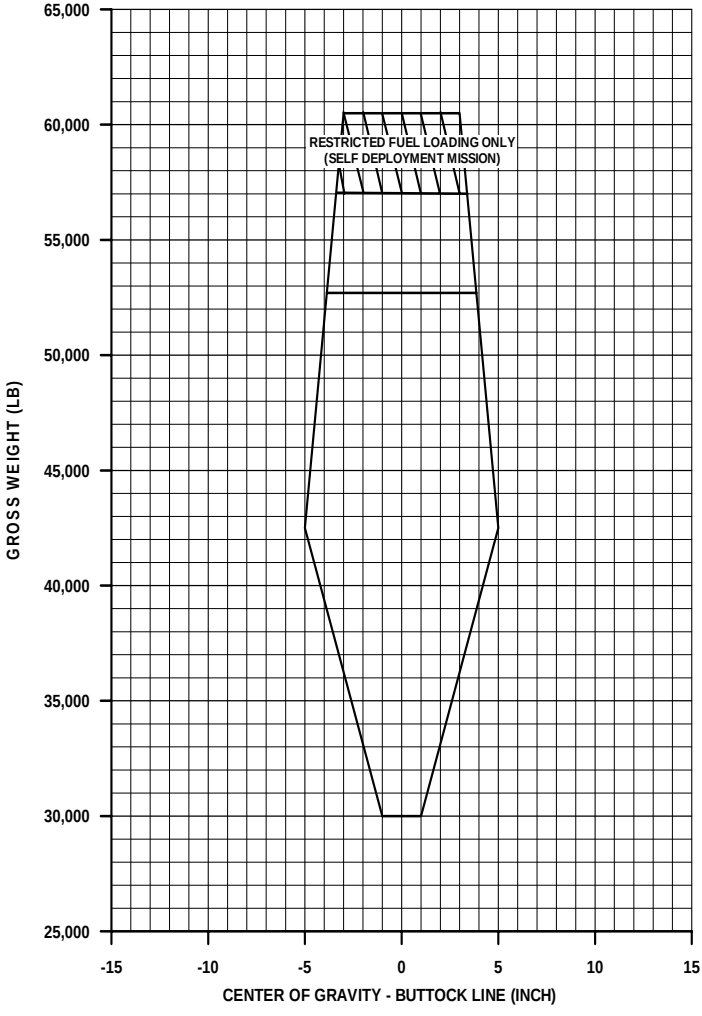
901900_6_2

FORM F

LATERAL CENTER OF GRAVITY ENVELOPE

MODEL: MV-22B
DATE: DECEMBER 1999
DATA BASIS: ANALYSIS

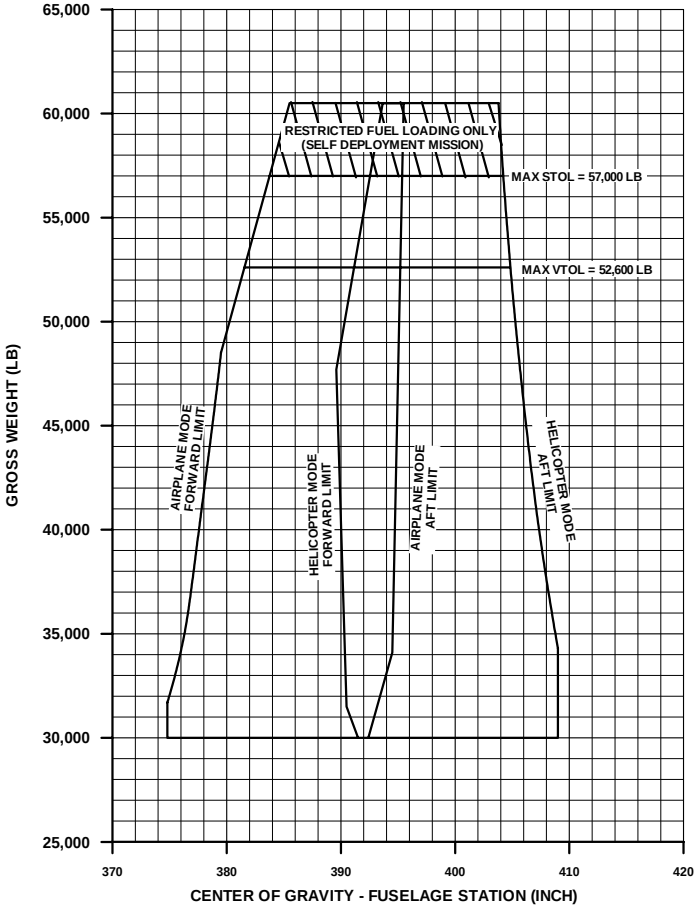
ENGINE: (2) T406-AD-400
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL

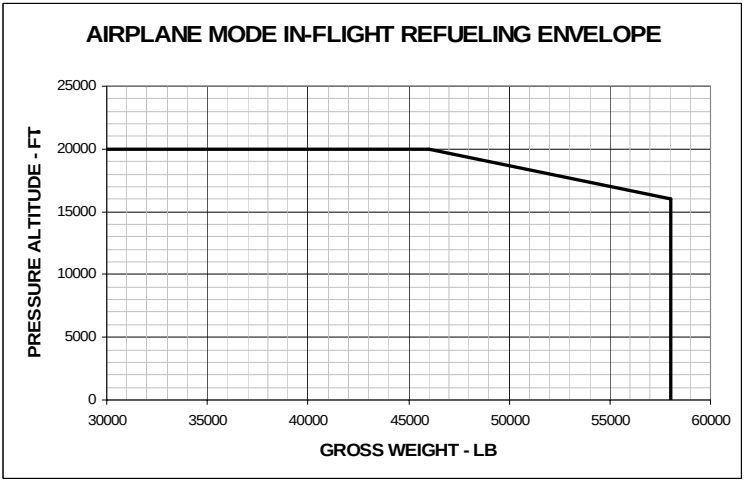


LONGITUDINAL CENTER OF GRAVITY ENVELOPE

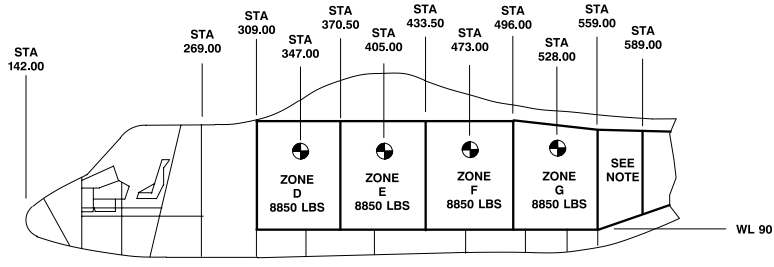
MODEL: MV-22B
DATE: DECEMBER 1999
DATA BASIS: ANALYSIS

ENGINE: (2) T406-AD-400
FUEL GRADE: JP-5, JP-8
FUEL DENSITY: 6.8 LB/GAL

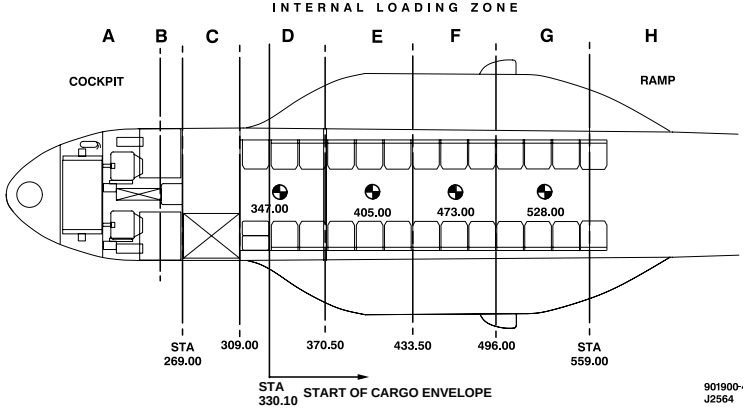




APLN Mode Aerial Refueling Envelope



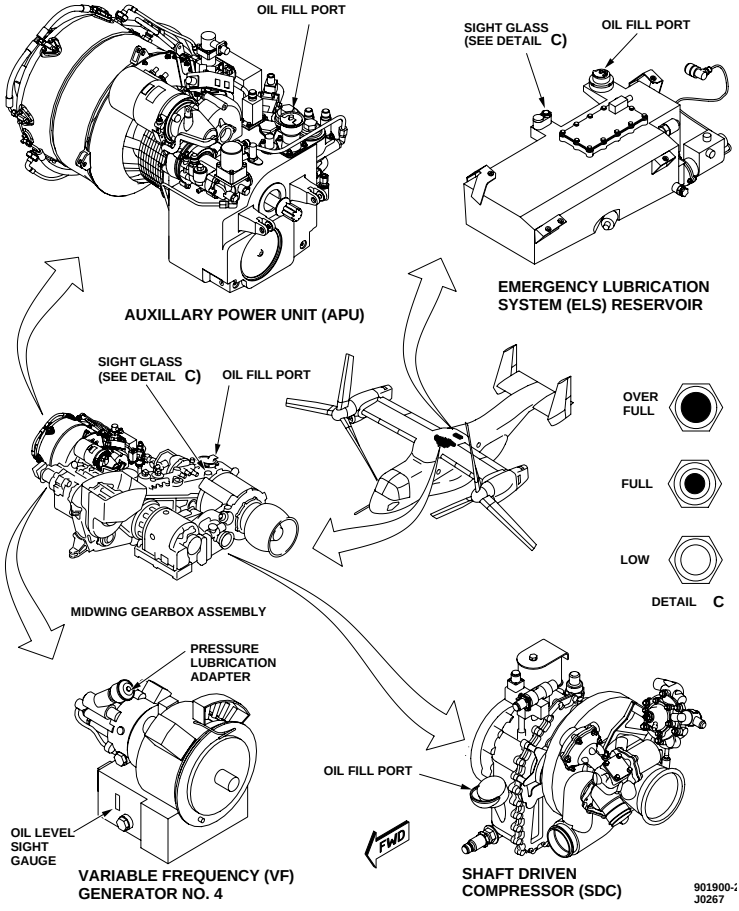
NOTE: FOR LOADS IN EXCESS OF 1000 POUNDS, POSITION CG OF LOAD WITHIN EXTREMES PRIOR TO LEVELING RAMP



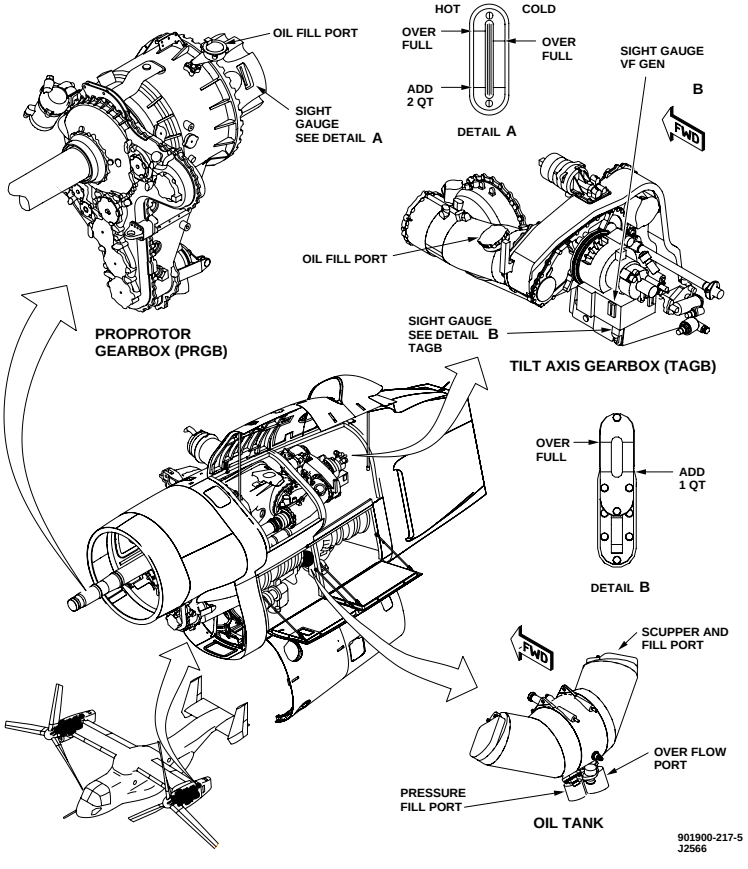
CARGO LOADING ZONES

QUICK STRIP LIST

ITEM	WEIGHT
1. TROOP SEAT (1)	9.4 lb
2. TROOP SEATS (24+CC's)	235 lb
3. COCKPIT JUMP SEAT	11.7 lb
4. CARGO ROLLER RAIL (1)	9.6 lb
5. CARGO ROLLER RAILS (8)	76.8 lb
6. CARGO WINCH	43.8 lb
7. LIFE RAFTS (2/ 14 MAN)	156 lb
8. LITTER STANCHION (1)	20.6 lb
9. LITTER STANCHIONS (8)	164.8 lb
10. INSULATION BLANKETS	39 lb
11. RAMP FLIPPERS (2)	16.4 lb
12. DUAL ATTEN. CARGO STRAP (1)	8.7 lb
13. SINGLE ATTEN. CARGO STRAP (1)	5.3 lb



Servicing (Sheet 1 of 2)



Servicing (Sheet 2 of 2)

SYSTEM	SPECIFICATION	CAPACITY (U.S.)
Fuel (1)	See Figure 3-4	Feed: 88 gal,Sponson: 478 gal,Aft (right) sponson: 316 gal, Wing aux: 294 gal, MATS: 430 gal
Engine (2)	PRI: MIL-PRF-23699 (NATO O-156) ALT: MIL-PRF-7808 (NATO O-148)	3 gal (12 qt)
APU (2) SDC (2)	PRI: MIL-PRF-23699 (NATO O-156) ALT: MIL-PRF-7808 (NATO O-148)	APU: 1.32 gal (5.3 qt) SDC: 0.32 gal (2.6 pints)
PRGB (3)	PRI: DOD-L-85734 ALT: MIL-PRF-7808 (NATO O-148) RES: MIL-PRF-23699 (NATO O-156)	8.0 gal (32 qt)
Left TAGB (3) Right TAGB/ CFG (3), (4)	PRI: DOD-L-85734 ALT: MIL-PRF-7808 (NATO O-148) RES: MIL-PRF-23699 (NATO O-156)	3.5 gal (14 qt)
MWGB/CFG (3), (4)	PRI: DOD-L-85734 ALT: MIL-PRF-7808 (NATO O-148) RES: MIL-PRF-23699 (NATO O-156)	2.25 gal (9 qt)
ELS Reservoir	DOD-L-85734	6.12 gal (24.5 qt)
VFGs	PRI: MIL-PRF-23699 ALT: DOD-L-85734	0.87 gal (3.5 qt)
Hydraulic (5)	PRI: MIL-H-83282 ALT: MIL-H-5606	HYD 1, 2: 1.42 gal (5.7 qt) HYD 3: 2.85 gal (11.4 qt)
Oxygen	MIL-O-27210	2100 PSI @ 70 °F
Landing Gear Tires	NITROGEN	NLG: 260 PSI MLG: 115 PSI

(1) During normal operations the MATS should be limited to the following fuel levels to maximize crash worthiness : Forward: 344 gal, Middle: 323 gal, Aft: 323 gal.

(2) Use only MIL-PRF-7808 at continuous ground temperatures below -40 °C (-40 °F). MIL-PRF-7808 shall not be used at continuous ground temperatures above -18 °C (0 °F). Either MIL-PRF-23699 or MIL-PRF-7808 may be used at temperatures between -18 °C (0 °F) and -40 °C (-40 °F). Do not mix oils.

(3) Use only MIL-PRF-7808 at continuous ground temperatures below -40 °C (-40 °F). MIL-PRF-7808 shall not be used at continuous ground temperatures above -18 °C (0 °F). Either DOD-L-85734 or MIL-PRF-7808 may be used at continuous ground temperatures between -18 °C (0 °F) and -40 °C (-40 °F). Flushing is required when changing from MIL-PRF-7808 back to DOD-L-85734. In emergency situations, MIL-PRF-23699 may be used in place of DOD-L-85734 (maximum operating time is restricted to 15 hours). Do not mix oils.

(4) Because the CFGs share oil with their respective gearboxes, they may be serviced in one of the two following ways: 1) (Preferred) Remove the CFG from the gearbox and properly drain and fill each one separately, or 2) (Alternate) Leave the CFG on the gearbox and drain and flush the gearbox. For the TAGB, drain/fill/flush 2 times (the third fill completes the process). For the MWGB, drain/fill/flush 3 times (the fourth fill completes the process). A flush is defined as running a filled gearbox at 75% Nr for 2 minutes and then draining. If the CFG is removed for servicing (preferred), the upper case, full case, and case drain plugs must be removed from each reservoir and the CFG oriented such that each gravity drain sufficiently. At ground temperatures below -40 °C (-40 °F), the CFGs must be removed and serviced separately to avoid cold-flush damage.

(5) Use only MIL-H-5606 when ground temperatures are below -40 °C (-40 °F). Flushing is requried when changing from MIL-H-5606 back to MIL-H-83282.

	US MIL CODE	NATO CODE	MIL SPEC	COMM DESIGN (SPEC)	BRIT SPEC (DESIGN)	WT (lbs/ gal)	NOTES
PRIM FUELS	JP-5	F-44	MIL-DTL-5624	NONE	DEF STN 91-86 (AVCAT/FSII)	6.8	1, 4A
	JP-8	F-34	MIL-DTL-83133		DEF STAN 91-87 (AVTUR/FSII)	6.7	1, 4A, 5
ALTERN FUELS	NONE	F-35	MIL-DTL-83133	JET A-1 (ASTM D-1655)	DEF STAN 91-91 (AVTUR)	6.7	2, 3, 4B, 5, 6
	NONE	NONE	NONE	JET A (ASTM D-1655)	NONE	6.7	2, 3, 4B, 5, 6
	NONE	NONE	NONE	GOST 10227 GRADE TS-1	NONE	6.7	2, 3, 4B, 5, 7
RESTRICTED FULES	JP-4	F-40	MIL-DTL-5625	JET B (ASTM D-6615)	DEF STAN 91-88 (AVTAG/FSII)	6.5	2, 3, 4C, 5, 6, 8, 9

CAUTION

To ensure that they can be saftely hangared aboard ship, helicopters should be fueled with JP-5 (F-44) prior to sea basing. When fueling with JP-5 is not possible, helicopters shall not be hangered until the flashpoint of the fuel in the helicopter fuel tanks is above 120 °F. NAVAIR 00-80T-109, Section 6.2.10 contains those procedures that must be followed when hangering helicopters containing fuel other than JP-5 (F-44).

NOTES

1. All US Military and NATO fuels, except F-35, contain an additive package which includes fuel system icing inhibitor (FAII).

2. Commerical fuels are available with and without FSII.

3. PRIST. A commerical FSII additive, PRIST, may be used with commerical jet fuel (Jet A/Jet-A1/ Jet B). PRIST is equivalent to the Military FSII additive. It is available in two forms: (1) Aerosol cans which are discharged into the fuel. As it is pumped into the aircraft and (2) Pre-mixed into the fuel. When PRIST is premixed with the fuel it provides anti-icing protection equivalent to that provided by military jet fuel and is authorized for use. PRIST in aerosol cans is not authorized for use since it does not mix well with fuel, has a tendency to settle to the bottom of fuel tanks, and may damage fuel system seals and fuel tank materials.

4. Fuel definitions:

A. Primary Fuel — A fuel that the aircraft was designed to use for continuous unrestricted operations.

B. Alternate Fuel — A fuel that the aircraft can use without operational restrictions. Alternate fuels may have long-term durability or maintainability impacts if used for extended periods of operation (several months).

C. Restricted Fuel — A fuel which imposes operational restrictions on the aircraft. These fuels may be used only if primary or alternate military or commercial fuels are available.

5. JP-4, JP-8, and all commerical jet fuels shall not be defueled into shipboard JP-5 fuel storage tanks because the flash point of these fuels is less than 140 °F.

6. These fuels may also be designated JP-1 or J-1 by commerical suppliers.

7. TS-1 is a commerical aviation kerosene made to the Russian Fuel Specification GOST 10227. It is very similar to ASTM Jet A-1 with the exception that the flash point is approximately 20 °C lower than Jet A-1. This fuel is commonly available in Russia, parts of central Europe, the Central Asian Republics and Afghanistan.

8. JP-4 (F-40) has been replaced by JP-8 (F-34) in US and NATO Service. JP-4 (F-40) and Jet B are no longer widely available worldwide but may still be encountered in some areas.

9. With either JP-4 or Jet B, the aircraft is limited to a maximum altitude of 7500 ft pressure altitude. Use of either JP-4 or Jet B is limited to a maximum OAT of 75°F (24 °C).

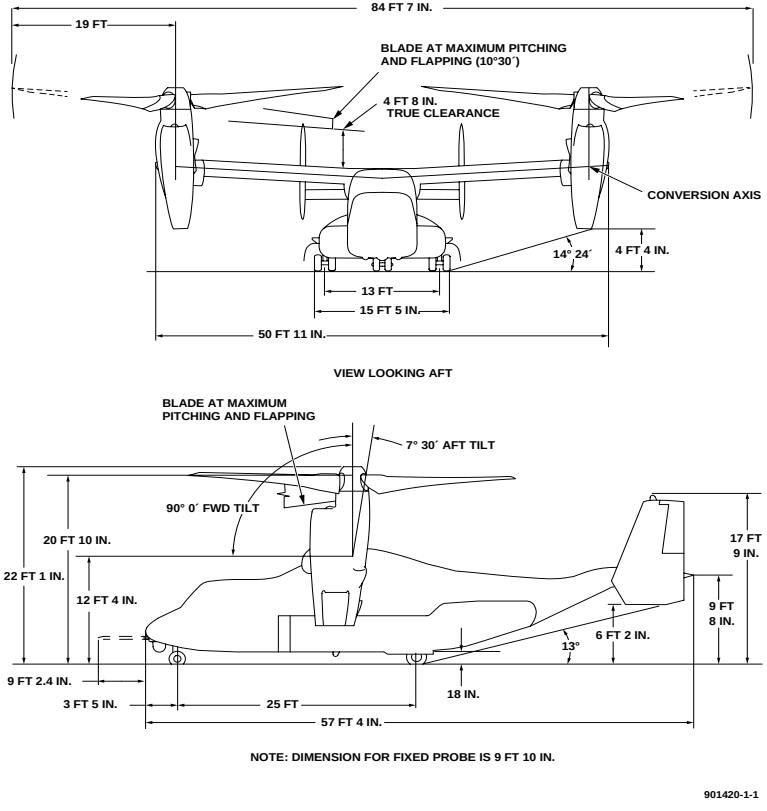
FOR ADDITIONAL INFORMATION ON AVIATION FUELS, CONSULT THE FOLLOWING:

1. NAVAIR 00-80T-109, Aircraft Refueling NATOPS Manual.

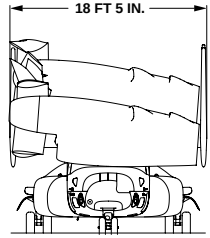
2. MIL-HDBK-844A (AS) Refueling Handbook for Navy/Marine Corps Aircraft.

SYSTEM	LIMITATION
Engine	10.24 ounces per operating hour
APU	0.77 ounce (23 cc) in operating hour
SDC	4 cc in 1 SDC operating hour
PRGB/ TAGB/ MWGB	16 ounces (1 pint) in 12 flight hours
VFG	2 cc in 1 flight hour

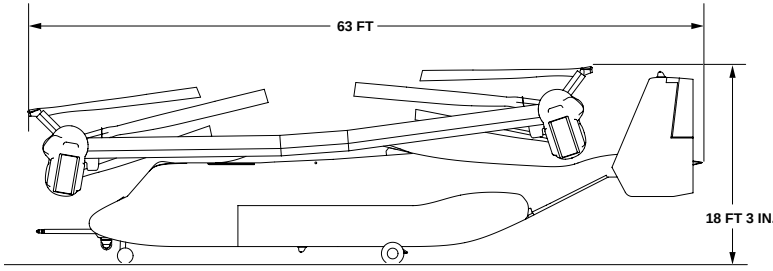
Maximum Oil Consumption Rates


84 FT 7 IN.
19 FT
BLADE AT MAXIMUM PITCHING AND FLAPPING (10°30´)
4 FT 8 IN. TRUE CLEARANCE
CONVERSION AXIS
14° 24´
4 FT 4 IN.
13 FT
15 FT 5 IN.
50 FT 11 IN.
VIEW LOOKING AFT
BLADE AT MAXIMUM PITCHING AND FLAPPING
7° 30´ AFT TILT
90° 0´ FWD TILT
20 FT 10 IN.
22 FT 1 IN.
12 FT 4 IN.
17 FT 9 IN.
9 FT 8 IN.
6 FT 2 IN.
13°
9 FT 2.4 IN.
3 FT 5 IN.
25 FT
18 IN.
57 FT 4 IN.
NOTE: DIMENSION FOR FIXED PROBE IS 9 FT 10 IN.
901420-1-1

Dimensions



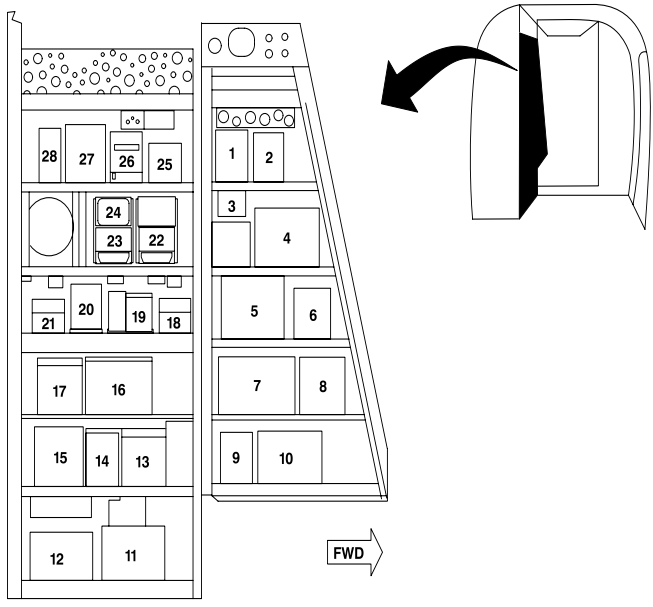
VIEW LOOKING AFT



VIEW LOOKING INBOARD LEFT SIDE

901420-1-
J2566

BFWS DImensions

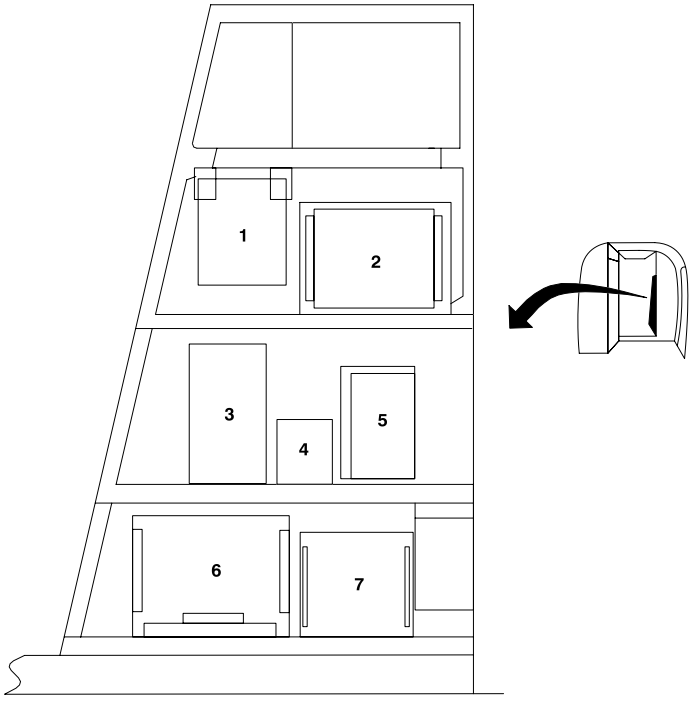


LEFT AVIONICS BAY

1. PRIMARY LIGHTING CONTROL UNIT
2. SATCOM DATA MODEM
3. FLIGHT CONTROL COMPUTER BATTERY
4. FLIGHT CONTROL COMPUTER NO.2
5. MISSILE/LASER WARNING PROCESSOR
6. COCKPIT INTERFACE UNIT NO. 2
7. FLIR SYSTEMS ELECTRONIC UNIT
8. LWINS NO. 2
9. COMMUNICATIONS SWITCHING UNIT
10. ADVANCED MISSION COMPUTER NO. 1
11. AVIONICS BAY INTERFACE UNIT
12. FLIGHT CONTROL COMPUTER NO. 1
13. LWINS NO. 3
14. SATCOM HIGH POWER AMPLIFIER
15. DISPLAY ELECTRONICS UNIT
16. NVG/HUD
17. LWINS NO. 1
18. VHF/UHF RADIO NO. 1
19. RADAR DETECTION TARGET DATA PROCESSOR
20. ANDVT UNIT
21. VHF/UHF RADIO NO. 2
22. VHF/UHF NO. 1 VX SECURITY
23. VHF/UHF NO. 2 VX SECURITY
24. CHAFF/FLARE PROGRAMMER
25. IFF TRANSPONDER
26. IFF SECURITY DECODER/ENCODER
27. DIGITAL MAP
28. MAGR GPS

901900-367-4-2

Left Avionics Bay



Right Avionics Bay

SUBSYSTEM	FAILURE IMPACT
FLIR	No power shedding (always ON).
IFF	Mode 4 Code Hold No power shedding (always ON).
MC 1 and MC 2	No power shedding.
UHF/DF	No power shedding (always ON). No bandwidth selection (defaults to narrow bandwidth).
RADALT	Inoperative.
Windshield wipers	No control.
Landing gear	No system status. Extend inhibit remains in last commanded state.
Ice protection	No true airspeed or OAT signals.
ECS	ECS control and status are lost and emergency vent fan both set to OFF. Recirculation fan defaults to ON.
Avionics cooling	Cooling intake fans default to ON. No status for fans, filters, temps, or low airflow condition.
Doors/ramp	Cabin door lock/unlock to last commanded state. Ramp position and ramp door status lost.
Electrical System	The following component status are lost: external power, converters No.1, 2 and 3, reverse current cutout relay, dc controller No.1 and No.2, dc bus No.1, 2, and 3, dc essential bus, and monitor bus contactor, dc crosstie, ac buses No.1 and 2, and generators 1 and 2.
Lighting	MFD and CDU lighting control and status are lost. All the following lights are OFF: position, formation, anticollision, and refuel probe. The secondary lighting controller will operate normally.
MASTER ALERT lights	Inoperative
NVIS lighting	Inoperative.
FM homing	Loss of control; No ON/OFF
Drive system	MWGB oil overtemperature and low oil pressure backup discrete signals lost.
Rotor brake	No ON/OFF status or solenoid test.
Cockpit switches	Troop commander antenna inhibit is ON. Fire system press-to-test and engine lever switch activation indication are lost.
BFWS	Inoperative.
Cargo handling	No status or test. No hook load info.
O2N2	Oxygen monitor status is lost.
Track handle	FLIR mode, FLIR polarity, FOV, and slew mode lost.

ABIU Failure (Sheet 1 of 2)

SUBSYSTEM	FAILURE IMPACT
FM homing/ ADF	Inoperative.
Control grip switches	No MFD cursor control, GA switch function, or TCL slew
ICS	Fallback mode. Loss of aural alerting

ABIU Failure (Sheet 2 of 2)

SUB-SYSTEM	FAILURE IMPACT
Drive System	The following data is lost: MWGB oil temperature, oil pressure, oil filter impending bypass, generator No.1 oil filter impending bypass, and debris sensor. Drive system values appear with a red X through the data. TAGB oil overtemperature and low oil pressure, and PRGB overtemperature discretes lost.
Hydraulics	Hydraulic system No.3 pressure indication will be lost.
APU	No APU status.
Electrical	No generator No.1 or No.4 status.
ECS	No shaft driven compressor duct leak indication.
Fire Warning	Loss of all wing fire alerts. No wing fire detector/ suppressor status or BIT.
BFWS	Loss of wing position and RPU indications.
Flight incident recorder	Loss of ability to write to or status.

WIU Failure

SUB-SYSTEM	FAILURE IMPACT
Engine parameters	Loss of indication of: oil pressure, oil level, oil filter impending/actual bypass status, fuel filter impending bypass, fuel flow, anti-ice valve position, and EAPS control (defaults to OFF).
Hydraulics	No hydraulic system 1/2 pressure indication on affected side. A red X will appear through the data.
Electrical	No generator 3/2 status on affected side.
VSLED	No data to VSLED from affected side.
Drive System	TAGB and PRGB oil pressure, oil temperature indications lost on affected side.
Blade Fold	Inoperative on affectedaffected side.

NIU 1/2 Failure

EMERGENCY PROCEDURE

A1-V22AB-NFM-500

NATOPS PILOT'S/
AIRCREW
POCKET CHECKLIST

MV-22B
TILTROTOR

WARNING

CAUTION

ADVISORY

GROUND

IN-FLIGHT

LANDING

LANDING GEAR

CREWCHIEF
EPs

NATOPS PILOT'S/ AIRCREW POCKET CHECKLIST

MV-22B TILTROTOR

EMERGENCY PROCEDURES

1 OCTOBER 2006

FLIP TITLE

ITEMS INDICATED BY AN ASTERISK (*) SHALL BE COMPLETED WITHOUT REFERENCE TO THE CHECKLIST. TIME PERMITTING, REVIEW/COMPLETE THE PROCEDURE UTILIZING THE POCKET CHECKLIST TO ENSURE COMPLETENESS.

WARNING	ACTION
FIRE (L/R) (On Ground)	**NOTE** The possibility exists that bleed air or other hot gas leakage in the engine compartment could trigger an engine fire warning without associated secondary indications or other confirming evidence of fire. ***1. ECL (affected engine) — OFF** ***2. T-handle — ARM** *If fire persists in the engine compartment:* ***3. DISCHARGE button — PRESS** *If fire persists:* ***4. Emergency Shutdown — Execute** ***5. Crew — Egress.**
FIRE (L/R) (In-Flight)	***1. Single Engine Profile — ESTABLISH** ***2. ECL (affected engine) — OFF** **NOTE** It is possible that bleed air or other hot gas leakage in the engine compartment could trigger an engine fire warning. Secondary indications may include increased fuel flow and elevated MGT with low torque on affected engine. It is possible to have a fire indication due to a bleed air leak without associated secondary indications or other confirming evidence of fire observable from the cockpit. ***3. T-handle — ARM** *If fire persists:* ***4. DISCHARGE button — PRESS** *If fire persists:* ***5. Land immediately**

CONTINUED

WARNING	ACTION
FIRE (L/R) (In-Flight)	*If fire is extinguished:* **6. Single Engine Failure In-Flight Checklist — CONDUCT.**
FIRE (WING)	**WARNING** Wing fires may weaken structural integrity of aircraft. **CAUTION** • Following midwing fire suppression, expect the extinguishing agent to filter into the cabin and cockpit areas. This agent has been described as a grayish-white, acrid smelling (like composite burning) smoke. • A sustained midwing MFD FIRE annunciation is a positive indication of a persistent fire. The Fire Suppression Panel Midwing Warning light, however, may or may not provide positive indication of a sustained fire since the panel warning may remain illuminated even after the WFPS is discharged if the cause of the discharge was a faulty midwing optical fire detector. MFD and Fire Suppression Panel indications for Left and Right Wing fires will always coincide with one another. **NOTE** With WFPS ENABLED, wing fire detection and suppression are completely automatic. Indications of a wing fire will include a voice warning, wing fire indications on the FIRE SUPPRESSION panel and MFDs, and an explosive discharge when the WFPS operates, accompanied by L/M/R WING FIRE DISCHARGE advisories on the CDU/EICAS. *If fire persists:* ***1. Land immediately** *If fire is extinguished:* **2. Land as soon as possible.**

WARNING	ACTION
ENG (L/R) (HOVER)	***1. TCL — FULL FORWARD** ***2. Airspeed — INCREASE** **WARNING** Aircraft vertical velocity is extremely sensitive to nacelle beep rate. During climbout, ensure beep rate is slow enough to command an acceleration without inducing an uncommanded sink rate. **NOTE** Beep nacelles forward at maximum rate for 2 seconds (approximately 15° forward of hover setting), and lower nose to accelerate. Level pitch attitude prior to touchdown. *If a safe landing can be accomplished, land.* *If a safe landing cannot be made, or a single-engine flyaway is to be attempted:* **3. Single Engine Failure In-Flight Checklist —CONDUCT.**
ENG (L/R) (IN-FLIGHT)	**WARNING** • Subsequent loss of the ICDS may result in loss of aircraft control. • Aircraft vertical velocity is extremely sensitive to nacelle beep rate. Ensure beep rate is slow enough to command an acceleration without inducing an un-commanded descent. *If at low altitude:* ***1. Single Engine Configuration — Adjust towards wings level, max rate of climb** **CONTINUED**

WARNING	ACTION
ENG (L/R) (IN-FLIGHT)	

CONV Mode	APLN Mode
FLAPS - AUTO	FLAPS - AUTO
60 ° Nacelle	Nr - 100%
80-90 KCAS	80% Stall (~140 KCAS)

***2. Gross Weight — REDUCE as required**

If level flight cannot be established:

***3. Landing Checklist — CONDUCT**

***4. Roll-On or No-Hover Landing — COMPLETE as required**

If climbing flight can be established:

***5. Climb — As required to safe altitude**

***6. Transition to APLN — COMPLETE (170 KCAS, Nr - 84%, FLAPS - AUTO)**

7. ECL (Affected Engine) — OFF

If engine restart is to be attempted:

8. ENGINE RESTART IN-FLIGHT Checklist — CONDUCT

NOTE

If engine restart is anticipated, crank engine within one minute of shutdown to reduce the possibility of Ng thermal lock-up.

9. Cross Transfer Valve — OPEN

10. Land as soon as practical (ROL Recommended)

NOTE

If there is a risk of losing the remaining engine, intercept and fly the emergency landing profile at 170 KCAS, FLAPS - 40° TCL full aft. If conditions permit, do not convert above 30° nacelle ~140 KCAS until the field is made. If the remaining engine fails, remain on the emergency landing profile and complete the DUAL ENGINE FAILURE procedures.

CONTINUED

WARNING	ACTION
ENG (L/R) (IN-FLIGHT)	**If it is desired to restart the affected engine on the ground:** **11. INTERIM POWER — Checked/OFF** **12. ECL of non-running engine — Checked/OFF** **13. ECL of running engine — Out of FLY detent (move until Nr starts to decrease)** **NOTE** ECL of running engine must be pulled out of FLY in order to reset TCRS and prevent transients on second engine start. **14. Ng, Np, Nr — Stabilize. Nr should be approx. 84%** **15. ECL of running engine — FLY** **16. ECL of shut-down engine — START** **17. Resume remainder of engine start checklist as required.**

WARNING	ACTION
ENG (L/R) (NAC ≥ 60)	**WARNING** Loss of 2nd engine may result in an Nr decay to below 70% within 6 seconds, and a subsequent loss of generator power. **NOTE** • Flaps at 0° are to unload the airframe (better L/D) and load/drive the proprotors to increase rotor speed. • A pitch-up may be required to help preserve Nr during nacelle movement. ***1. TCL — FULL AFT** ***2. Nacelles — MAX RATE TO AFT STOP** ***3. Airspeed — 110 KCAS** ***4. FLAPS — 0 °** **NOTE** Expect 4500-5000 fpm descent, 10 ° nose low, 2:1 glide ratio once stabilized in autorotation. ***5. APU — EMERG RUN/ENGAGE** ***6. Landing Gear — DOWN** ***7. Flare — EXECUTE** **NOTE** Attempt a 60 KCAS run-on landing. *Immediately prior to touchdown, to cushion landing:* ***8. Landing attitude — SET** ***9. TCL — FULL FORWARD.**

WARNING	ACTION
ENG (L/R) (NAC < 60)	Aircraft operating single engine can also fly the emergency landing profile (to mitigate the risk of the remaining engine failing) provided the FLAPS are set to 40° and TCL full aft. In this configuration the glide characteristics of the aircraft closely approximate a dual engine failure. If the remaining engine fails during a single engine (FLAPS - 40°) descent, the pilot needs only to select FLAPS - AUTO to remain on profile and complete the fixed nacelle dual engine failure landing. ***1. TCL — FULL AFT** ***2. NACELLES — MAX RATE TO DOWN STOP / THEN 84% Nr** ***3. Airspeed — 170 KCAS** **NOTE** Expect 3800 - 4000 fpm descent, 4° nose low, and 4.5:1 glide ratio. ***4. FLAPS — AUTO** ***5. APU — EMERG RUN/ENGAGE** **NOTE** After configuring for glide, attempt engine restart if conditions permit. ***6. Emergency Landing Profile — Intercept (20° - 30° AOB Spiral Descent)** HIgh Key — 9000 ft AGL Low Key — 4500 ft AGL Base — 2300 ft AGL Final — 500 ft AGL *At 1500 ft AGL and landing assured:* ***7. Landing Gear — EMERG DOWN (If required) (Allow 20 seconds for extension)**

CONTINUED

WARNING	ACTION
ENG (L/R) (NAC < 60)	**WARNING** Extension of landing gear is recommended only if assured of landing on a prepared surface. Landing with gear extended on a unprepared surface may result in loss of aircraft control. **NOTE** Expect 200 to 600 fpm increase in rate of descent with landing gear extended. *At approximately 400 - 200 ft AGL:* ***8. Mild Flare — EXECUTE, holding 8 - 10° nose up. Smoothly fly to landing at minimum sink rate; expect airspeed to decay to 120 - 115 KCAS on touchdown.** **NOTE** Full flaps can be used on short final to slightly extend the flare.
RPM LOW	**1. Maneuver Severity — Reduce** **2. Monitor Qm for potential power limiting** **3. Land as soon as possible.**

WARNING	ACTION
SINGLE ENGINE LANDING	**CAUTION** If a ROL is not possible (i.e., shipboard, confined area, immediate landing required), maintain highest suitable airspeed until deceleration is required for no-hover touchdown. As airspeed decreases below minimum airspeed for level flight, excessive sink rates may develop and exceed landing gear touchdown acceleration rates. **1. Gross Weight — Reduce (As required)** **2. Crew Brief — Complete** **3. Flaps — AUTO** **4. Cargo Ramp/Door— Check position** **5. Harnesses — Locked** **6. Landing Gear — Down** **7. Brakes — As required** **8. NOSE LOCK — As required** **9. Gross Weight — Reduce (As required)** **1. When landing is assured:** **2. Nacelles — VTOL Mode** **3. Airspeed — Decelerate to 60-55 KCAS** **4. ROL — Perform if possible.** **NOTE** With adequate WOD, during shipboard operations, the pilot may be able to conduct a no-hover landing. Recommended approach to stern at or above minimum SE airspeed.

WARNING	ACTION
ICDS	**WARNING** Subsequent loss of an engine may result in loss of aircraft control. **NOTE** The ICDS Failure warning will post in the event of a triple Nr sensor failure on one side. ***1. Maneuver Severity — Reduce** ***2. Airspeed — <200 KCAS** ***3. PFCS — RESET** ***4. Land as soon as possible, (ROL recommended)** *If safe landing cannot be accomplished without delay:* ***5. APLN — Transition (100% Nr)** **CAUTION** • Backup flapping controller provides trimmed-flight flapping protection; however, in maneuvering flight, aircraft is still vulnerable to critical flapping condition. (Minimize manuevering). • The flapping information for FFR and flapping high hot/feathering high hot/rotor load cautions and advisories is inoperative. Maintain balanced flight and centered pedals as practical. • Extended operations between 10 ° and 75 ° nacelle should be avoided due to heat buildup and possible elastomeric bearing failure. • As much as practicable, reduce high GW, forward cg and high DA.

NAC	A/S (KCAS)
0 °	180
30 °	150
60 °	100

CONTINUED

WARNING	ACTION
ICDS	**NOTE** In CONV, expect increase pilot longitudinal cyclic workload due to pitch power coupling. ***6. Density altitude — REDUCE, as practical** ***7. Gross Weight — REDUCE, as practical** **WARNING** Severe vibration levels may indicate impending elastomeric bearing failure *If high vibration levels are present:* ***8. Nacelles — 10 °** *If severe vibration levels are present and rotor system failure seems imminent:* ***9. Land immediately, (ROL recommended).** **CAUTION** Expedite simultaneous engine shutdown (no rotor brake) after landing to minimize aircraft damage. **NOTE** Matching Nps through TORQUE BEEP switch immediately prior to landing (after conversion) may improve aircraft handling qualities. Increase torque on the engine with lower Np. Inducing a Qe split to match Np increases susceptibility to triple mast torque sensor failure.

WARNING	ACTION
PRGB/ TAGB	*If secondary indications confirm impending gearbox failure:* ***1. Land immediately** *If no secondary indications exist:* **2. Land as soon as possible.**

WARNING	ACTION
ELEV	**WARNING** • Nacelle beep rate must be modulated to gain/maintain longitudinal control of the aircraft. • Pitch authority is reduced in VTOL and CONV. Expect strong power-to-pitch coupling. Avoid descent with very low power setting (< 30% engine torque). • If the elevator fails trailing edge down at forward cg, unrecoverable loss of longitudinal control may occur above 40 KCAS with nacelles less than 85°. • Pitch-up with sideslip autonacelle beep forward is disabled during elevator 3-fail conditions. Excessive pitch-up may occur because the nacelles will not automatically compensate for the pitch-up response. If the pitch-up becomes excessive, execute the pitch-up with sideslip procedure described in Chapter 11. *First three steps shall be conducted simultaneously:* ***1. Maneuver Severity — Reduce** **NOTE** FCCs inhibit PFCS RESET above 200 KCAS for certain elevator actuator faults. A reduction below 200 KCAS may be necessary to possibly reset a fault and regain redundancy. ***2. PFCS — RESET** ***3. VTOL — CONVERT** *Regardless of whether failure clears:* **4. Land as soon as practical.**

WARNING	ACTION
SINK	*In VTOL, if application of TCL alone does not correct sink rate and/or lateral directional control problems are experienced, conduct the following.* **WARNING** VTOL flight at combinations of low forward airspeed and high rate of descent can drive the aircraft into vortex ring state (VRS) flight regime. Operation in the VRS regime could lead to loss of aircraft roll control and subsequent loss of aircraft. **NOTE** A maximum-rate application of forward nacelle for approximately 2 seconds (approximately 15° forward rotation) is recommended. Nacelle angle should be limited to approximately 75° during recovery, to avoid excessive pitch down and/or loss of altitude. Forward cycle should be applied immediately (simultaneous with the rotation of the nacelles), to gain forward airspeed and regain normal control response. ***1. Nacelle — BEEP FORWARD (Max rate for 2 sec/< 15°)** ***2. Cyclic — FORWARD TO ACCEL** **3. TCL — FIXED (ALT PERMITTING)** **CAUTION** TCL power applications within VRS may cause uncommanded/uncontrollable roll. *After recovery has been effected:* **4. Level flight — ESTABLISH** **5. Climb rate — ESTABLISH.**

WARNING	ACTION
STALL	***1. Maneuver Severity — Reduce to decrease angle of attack and load factor** ***2. TCL — Forward to increase airspeed** *If unable to complete steps 1 and 2:* ***3. CONV — Convert, max rate** ***4. TCL — As required for level or climbing flight.**

WARNING	ACTION
LO ALT	**1. Simultaneously** **a. Roll wings level** **b. Apply TCL to attain maximum allowable torque** **c. Apply momentary nacelle forward to disengage autonacelle control** **2. Apply stick as necessary to obtain maximum rate of climb airspeed. Stick movement and rate is dependent upon aircraft state at time of the LO ALT as described below:** **a. APLN — Pitch to 20 ° nose up with pitch rate approximating 5 to 10 ° per second** **b. CONV — Initial pitch angle depends on nacelle angle. With higher nacelle angles, less pitch angle will be required. Initial pitch will be applied to obtain best climb speed for the given nacelle angle. At airspeeds 60 KCAS and below, no pitch is required. Suggested target speeds by nacelle angle are given:** (1) 60 ° nacelle — 80 KCAS (2) 75 ° nacelle — 70 KCAS (3) 85 ° nacelle — 60 KCAS **c. VTOL — No initial pitch movement required.**

CAUTION	ACTION / INFORMATION
ABIU FAIL	**1. Affected equipment — Evaluate** **2. If GENERATOR X FAIL (1/2) posts at the same time, cycle ABIU DC and AC circuit breakers (1E6 and 2C2)** **3. Land as soon as practical.**
ABIU FAULT	**1. Affected equipment — Evaluate** **2. Land as soon as practical.**
AC BUS X FAIL (1/2)	*For AC, Enviromental, or Icing Bus failure:* **1. Icing environment — Exit** *Regardless of which bus failed:* **2. BUS EQUIP layer — Evaluate unavailable equipment** **3. Land as soon as practical (except Icing Bus failure in a non-icing environment.**
ADS / AOA IPS FAIL	**CAUTION** ADS icing could eventually lead to ADS faults. Handling qualities above 200 KCAS and/or altitudes above 10,000 ft MSL will be significantly degraded, and become progressively worse with increased speed and/or altitude. **NOTE** Affected systems will default to ON. **1. Icing conditions — Exit.**

CAUTION	ACTION / INFORMATION
ADS 1/2/3 FAIL	**CAUTION** With ADS 1/2, 1/3, or 2/3 FAIL, interim power is still available, but is solely dependent on nacelle angle. At airspeeds > 60 KCAS, potential for design limit load exceedence exists if interim power remains engaged. ***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** **NOTE** Standby instruments can be cross checked to maintain situational awareness. *If ADS X/Y FAIL does not clear:* ***3. Land as soon as practical** **NOTE** With dual ADS failure, converting from APLN will result in SLL, AFCS and force feel failures. ***4. If ADS 1/2/3 FAIL does not clear:** ***5. Airspeed — < 200 KCAS** ***6. DA — Reduce as low as practical** ***7. Land as soon as practical (No hover or ROL recommended).**

CAUTION	ACTION / INFORMATION
ADS X/Y FAIL (1/2, 1/3, 2/3)	**CAUTION** With ADS 1/2, 1/3, or 2/3 FAIL, interim power is still available, but is solely dependent on nacelle angle. At airspeeds > 60 KCAS, potential for design limit load exceedence exists if interim power remains engaged. ***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails to clear:* **3. Airspeed — < 200 KCAS** **4. DA — Reduce as low as practical** **5. Land as soon as practical (no hover or ROL).**
AFCS DISENGAGE	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If caution fails to clear:* **3. Airspeed — < 200 KCAS** **4. Land as soon as practical (ROL recommended).** **CAUTION** If INS X/Y FAIL is also posted, initial PFCS Fail Reset may result in the loss of navigation display. **NOTE** If AFCS does not reset, handling qualities are degraded and coupled modes are not available.

CAUTION	ACTION / INFORMATION
ATT 1/2/3 FAIL	INS 1, 2, and 3 have invalid Attitudes. **1. Maintain VMC** **2. NAV ALIGN — Verify in progress or select INS for manual alignment** *If GPS NAV alignment fails:* **3. Power Shed Failed INS's Off/On to attempt GC alignment** **4. Land as soon as practical.** **NOTE** • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post.
ATT X/Y FAIL (1/2. 1/3, 2/3)	INS X and Y have invalid Attitudes. **1. Maintain VMC** **2. NAV ALIGN — Verify in progress or select INS for manual alignment** *If GPS NAV alignment fails:* **3. Power Shed Failed INS's Off/On to attempt GC alignment** **4. Land as soon as practical.** **NOTE** • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post.
ATTITUDE DISAGREE	There is a difference in pitch or roll of more than 1° between any of the INS.

CAUTION	ACTION / INFORMATION
AUTO JETT NOT ACTIVE	**WARNING** • Emergency release of external loads under tension may result in snap back of the pendant or load rigging that may damage aircraft or injure aircrew observers. • Release of one hook from a dual point load without automatic jettison protection could result in structural damage and/or loss of aircraft control. **1. AUTO JETT — Select** *If caution does not clear:* **2. Airspeed — < 100 KCAS** *As soon as possible:* **3. Load — Set down** **4. Hooks — Manually release.**
AVIONIC BAY HOT (L/R)	**CAUTION** Avionic bay over temperature can result in loss of critical avionics systems. **NOTE** On extremely hot days (OAT 45 °C), AVIONIC BAY HOT (L/R) caution may be observed. Caution may clear with aircraft movement. If caution does not clear then execute avionics bay hot procedures. **To increase avionic cooling:** **1. APLN — Transition** *If caution does not clear:* **2. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
BFWS NOT FLIGHT RDY	**1. Maneuver Severity — Reduce** **2. Maintain positive G flight** **NOTE** One or more of the wing lockpins may not be fully extended. **3. Land as soon as possible.**
BINGO FUEL	Flight Plan Bingo Fuel Required is greater than the aircraft Total Fuel minus the Flight Plan Bingo Fuel Reserve; or no Flight Plan Bingo Fuel required is greater than the aircraft total fuel minus the No Flight Plan Bingo Fuel Reserve. When this alert is displayed, STAT key selection will access the Bingo Flight Plan or Bingo No Flight Plan Control Layer, depending on whether or not a flight plan is active. This condition will also display the BINGO EXCESS FUEL REQD OID.
BLADE HEAT FAIL ON	**1. Icing conditions — EXIT** **2. 100% Nr — SET** **3. GEN 3 and 4 — OFF.** **CAUTION** Continuous uncontrolled heating of the proprotor blades will result in blade damage.
COMM SW UNIT FAIL	Comm Switching Unit has failed in a mode unknown to CMS. Parts of the ICS may or may not still work.

CAUTION	ACTION / INFORMATION
CRIT CVRSN ACTR FLT	**1. Maneuver Severity — Reduce** **NOTE** If auto-engagement to back-up HPDU's has occurred, deselection of back-up nacelle operation is inhibited. **2. PFCS — RESET** **CAUTION** Repeated PFCS resets may drive the nacelles into an asymmetric condition. *If caution fails to clear or system has reverted to backup mode:* **3. EAPS — OFF** **4. VTOL — CONVERT** *If nacelle(s) fail to move:* **5. NACELLE B/U — ENABLE MANUALLY** **6. Land as soon as practical.** **NOTE** B/U HPDUs can provide the normal maximum conversion rate of 8°/second during 1g flight. Expect reduced nacelle conversion rate in maneuvering flight using B/U HPDUs.
CRIT NR SENSOR FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If caution fails to clear:* **3. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
CRITICAL ELEV FAULT	**NOTE** FCCs inhibit PFCS RESET above 200 KCAS for certain elevator actuator faults. A reduction below 200 KCAS may be necessary to possibly reset a fault and regain redundancy. ***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *Regardless of whether failure clears:* **3. VTOL — CONVERT** **4. Land as soon as practical.**
CRITICAL SWPL FAULT	***1. Maneuver Severity — Reduce** ***2. Airspeed — < 200 KCAS** ***3. PFCS — RESET** *If caution fails to clear:* **4. Land as soon as possible** *If caution clears:* **5. Land as soon as practical.**
CUR FPLN CONFLICT	An EOB has contacted the current Flight Plan.
CURRENT GW EXCEED-ED	Current Gross Weight exceeds aircraft gross weight limit. When a flight plan is active and this alert is displayed, STAT key selection accesses the Flight Plan Leg Weight and Balance Control Layer for the current leg. This condition will also display the GW EXCEEDED FPx LGxxx variable OID, where FPx LGxxx are the flight plan and leg number where the error occurs. When no flight plan is active and this alert is displayed, STAT key selection accesses the No FPLN Weight and Balance Control Layer. This condition will also display the CURRENT GW EXCEEDED OID on the No FPLN Weight and Balance Layer.

CAUTION	ACTION / INFORMATION
CVRSN ACTR FAIL	**NOTE** • B/U enable should only be pressed in-flight if the nacelles are not responding to pilot commands. • Automatic engagement of B/U HPDU is side dependent and independent of opposite side. • B/U enable switch light only illuminates when both sides are in B/U whether through automatic engagement or manual pilot selection. • When auto engagement of B/U HPDUs occurs in-flight the system is inhibited against returning to PRI HPDUs. • The only exception to this case would be a subsequent loss of HYD SYS 3, which would permit a return to operation on PRI HPDUs. **1. Maneuver Severity — Reduce** **2. PFCS — RESET** **CAUTION** Repeated PFCS resets may drive the nacelles into an asymmetric condition. *If caution clears:* **3. Land as soon as practical** *If caution fails to clear:* **4. NACELLE B/U ENABLE — ON** **5. Nacelles — Attempt to move** *If nacelles do not respond:* **6. Airspeed — IN CONV CORRIDOR** **7. Fixed Nacelle Landing Checklist — CONDUCT.**

CAUTION	ACTION / INFORMATION
DC BUS X FAIL (1, 2, 3)	**NOTE** COMM 2 is unavailable with a DC Bus 2 failure. **1. BUS EQUIP layer — Evaluate unavailable equipment** **2. Land as soon as practical.**
DC ESS BUS ON BATT	**1. Land as soon as practical.**
DC ESS/ BATT BUS FAIL	**CAUTION** Do not cycle CONV 1, 2, or 3 circuit breakers if Essential/Battery Bus is lost and converters are operable. Cycling circuit breakers will reset fault logic status in the converters, reapply high current to the fault, and increases the chance of losing more than one bus. **NOTE** Standby Attitude Indicator and SFD are inoperative and all COMM 1 and COMM 2, ICS, Fire Detection and Protection System and audio warnings and tones are unavailable during a DC Essential/Battery Bus failure. **1. BUS EQUIP layer — Evaluate unavailable equipment** **2. Land as soon as practical.**
DIR FEEL FAIL	***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails clears:* **3. Land as soon as practical.**
DISPENSER FAIL (L/R)	Failed Dispenser will not fire. Dispense command routed to operational dispenser.

CAUTION	ACTION / INFORMATION
DSIU FAIL	**WARNING** Subsequent PRGB cautions (L/R PRGB PRESS LOST or L/R PRGB PRESS LOW) dictates an immediate landing. With DSIU and EMERGENCY LUBE FAIL, the ELS function is lost. **NOTE** All chip detectors (engine and gearboxes) and the ELS are inoperative with a failed DSIU. **1. Land as soon as practical.**
ECM PRGMR FAIL	Select BYPASS mode. Use TCL EW DISP switch for expendables.
ECS SDC LEAK	**CAUTION** With SDC or ECS failed, avoid icing conditions due to loss of leading edge deice, maneuvering above 1.5g's and airspeeds in excess of 220 KCAS to prevent disrupted airflow caused by leading edge deice boot deformation, and flight above 10,000 ft MSL due to loss of OBOGS. *If operating above 10,000 ft MSL:* ***1. EMERGENCY OXYGEN — As required** **2. Icing conditions — Exit** *When possible:* **3. Altitude — < 10,000 ft MSL** **4. Oxygen masks — Off** **5. EMERGENCY OXYGEN — OFF** **CONTINUED**

CAUTION	ACTION / INFORMATION
ECS SDC LEAK	**6. ECS — OFF or EMER VENT (As required)** *If SDC FAIL caution fails to clear:* **7. Land as soon as possible** *If ECS SDC LEAK caution fails to clear:* **8. Land as soon as practical** *If ECS SDC LEAK caution clears:* **9. ECS — ON.**
ECL NOT IN FLY	Caution will reset when either ECL is OFF or the L/R ECLs are in FLY. **1. ECLs — FLY.**
EMERGENCY LUBE FAIL	**WARNING** Subsequent PRGB cautions (L/R PRGB PRESS LOST or L/R PRGB PRESS LOW) dictates an immediate landing. With DSIU and EMERGENCY LUBE FAIL, the ELS function is lost. **NOTE** All chip detectors (engine and gearboxes) and the ELS are inoperative with a failed DSIU. **1. Land as soon as practical.**
ENG CHIPS (L/R)	**1. Single engine profile — Establish** *If engine indications abnormal/out of limits:* **2. ECL (affected engine) — OFF** **3. T-handle — ARM** **4. Single Engine Failure In-Flight Checklist — CONDUCT** *If engine indications are normal:* **5. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
ENG COMPR STALL (L/R)	**1. Maneuver Severity — Reduce** **2. Affected engine — EVALUATE MGT, Ng, Qe, and FUEL FLOW** *If abnormal engine indications persist, attempt to clear surge/stall:* **3. Single Engine Profile — ESTABLISH** **4. FADEC — SWITCH** *If abnormal engine indications persist:* **5. ECL (affected engine) — START** *If abnormal engine indications persist:* **6. ECL (affected engine) — OFF** **7. T-handle — ARM** **8. Single Engine Failure In-Flight Checklist — CONDUCT** *If normal idle parameters are indicated:* **9. ECL (affected engine) — Slowly advance to fly** **10. Land as soon as practical.**
ENG CTRL DEGRADED (L/R)	**1. Maneuver Severity — Reduce** **2. Land as soon as practical.**
ENG FUEL FLTR BYP (L/R)	**1. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
ENG HOT (L/R)	**1. Maneuver Severity — Reduce** *If engine remains out of limits:* **2. Malfunct. engine — CONFIRM Ng, Np, Qe, MGT and FUEL FLOW HIGH** **3. Single Engine Profile — ESTABLISH** **4. FADEC — SWITCH** *If engine cannot be maintained within limits:* **5. ECL (affected engine) — OFF** **WARNING** Securing the malfunctioning engine with lower TCL setting may result in RPM droop and excessive power loss until the operating engine spools up. **6. T-handle — ARM** **7. Single Engine Failure In-Flight Checklist — CONDUCT.**

CAUTION	ACTION / INFORMATION
ENG IPS FAIL	**1. Icing conditions — Exit** **2. EAPS — ON** *If increased vibration:* **3. PRTR OVERRIDE — Select** **4. Nr — 100%** **5. Ice Protection status layer — Access** *If BLADE HEAT FAIL ON is displayed on status layer:* **6. GEN 3 and 4 — OFF when clear of icing condition.** **CAUTION** • Risk of engine FOD is increased on affected nacelle(s). Uncontrolled continuous heating to the proprotor blades will result in blade damage. All affected rotor zone(s) will be uncontrollably latched ON; maintenance inspection of the proprotors is required before the next flight. • Extended operations in the ice could cause asymmetric ice buildup on the unprotected areas of proprotor blades causing increase airframe vibration. **NOTE** Affected systems are the Engine Inlets, drain strut, Spinner Dome, pendulum damper, spinner side frames and zones 7, 8, 9 of the blades.

CAUTION	ACTION / INFORMATION
ENG NG OVER-SPEED (L/R) **ENG NP OVER-SPEED (L/R)**	**WARNING** In an Np overspeed malfunction, Np and Nr for both engines are likely to be married and overspeeding in unison. This will make it difficult to identify the malfunctioning engine. Careful assessment of secondary engine parameters may be required to isolate and positively identify the malfunctioning engine before contemplating retarding an ECL or shutting down an engine as a remedial action. **NOTE** • Np coupling between the overspeeding engine, proprotor system and the non-malfunctioning engine may result in misleading indications since the Np for each engine and Nr may be high/overspeeding and/or oscillating due to cyclical fuel limiting action by the Np governor on the malfunctioning engine. In this case, pronounced oscillations, cycling or otherwise abnormal Ng, fuel flow and/or MGT on one engine will indicate Np overspeed governor action, and may help confirm and isolate the overspeed malfunction to that engine. • Nr/Np can be cross-checked using the SFD. **1. Maneuver Severity — Reduce** *If engine remains out of limits:* **2. Malfunct. engine — CONFIRM Ng, Np, Qe, MGT and FUEL FLOW HIGH** **3. Single Engine Profile — ESTABLISH** **4. FADECs — SWITCH** **CONTINUED**

<table>
<tr><th>CAUTION</th><th>ACTION / INFORMATION</th></tr>
<tr><td>ENG NG OVER-SPEED (L/R)

ENG NP OVER-SPEED (L/R)</td><td>If engine cannot be maintained within limits:
5. ECL (affected engine) — OFF

WARNING

Secure the malfunctioning engine with lower TCL setting may result in RPM droop and excessive power loss until the operating engine spools up.
6. T-handle — ARM
7. Single Engine Failure In-Flight Checklist — CONDUCT.</td></tr>
<tr><td>ENG OIL LEVEL LOW (L/R)</td><td>1. Land as soon as practical.

NOTE

If extended flight is required, consider shutting down the affected engine (refer to Single Engine Failure In-Flight Checklist) to conserve oil until approach and landing. Restart engine (Engine Restart In-Flight Checklist) in time to have affected engine operating within normal limits prior to landing, as required.</td></tr>
<tr><td>ENG OIL PRESS LOW (L/R)</td><td>1. Single Engine Profile — ESTABLISH

If engine oil pressure is below 30 psi:
2. ECL (affected engine) — OFF
3. Single Engine Failure In-Flight Checklist — CONDUCT

If engine oil pressure remains 30 to 35 psi:
4. Land as soon as practical.</td></tr>
</table>

CAUTION	ACTION / INFORMATION
ENG OIL PRESS HIGH (L/R) **ENG OIL TEMP HIGH (L/R)**	***1. Single Engine Envelope — Establish** *If single engine flight is not possible:* ***2. Land as soon as possible (ROL recommended)** *If secondary indication exists:* **3. ECL (affected engine) — OFF** **4. Land as soon as practical** *If no secondary indication exists:* **5. Land as soon as practical.** **NOTE** Consideration may be given to restarting the engine for landing if power requirements are critical.
ENG OVER-TORQUE (L/R)	**1. Maneuver Severity — Reduce** **2. TORQUE BEEP — MATCH TORQUES** *If no response to manual adjustments:* **3. Engine Torque Split Checklist — CONDUCT.**
ENVIR BUS X FAIL (1/2)	*For AC, Environmental, or Icing Bus failure:* **1. Icing environment — Exit** *Regardless of which bus failed:* **2. BUS EQUIP layer — Evaluate unavailable equipment** **3. Land as soon as practical (except Icing Bus failure in a non-icing environment).**

CAUTION	ACTION / INFORMATION
FADECS A/B FAIL (L/R)	**NOTE** With a dual FADEC failure (engine failed fixed), engine anti-ice will default ON. Engine anti-ice ON will reduce engine power available by ≈ 7%. The engine will operate in a failed fixed mode. The pilot will be unable to adjust Ng, Qe, or fuel flow on the malfunctioning engine with TCL movement or ECL movement (between FLY and START). However, movement of ECL to OFF will shutdown the engine as long as FADEC A has electrical power. *If adequate control cannot be maintained:* **1. Single Engine Profile — ESTABLISH** *When appropriate for malfunctioning engine Qe setting:* **2. ECL (affected engine) — OFF** **3. T-handle — ARM** **4. Single Engine Failure In-Flight Checklist — CONDUCT.**

CAUTION	ACTION / INFORMATION
FCC X FAIL (1, 2)	**1. Maneuver Severity — Reduce** **2. PFCS — Reset** *If failure does not reset:* **3. Airspeed — < 200 KCAS** **4. Altitude — < 10,000 DA** **5. Land as soon as practical.** **WARNING** • A single FCC failure without indication of associated control surface failures denotes a dual sync bit failure between FCC's. In this case, expect severely degraded handling qualities, especially in the roll axis, in high speed APLN. CONV handling qualities are better. A run on landing is recommended. • Expect reduced yaw authority and increased susceptibility to lateral-directional oscillations in APLN and CONV flight with a single rudder failure (RUDDER FAULT). **NOTE** Expect associated hydraulic system degradation. Leak isolation will be unavailable.

CAUTION	ACTION / INFORMATION
FCC 3 FAIL	**1. Maneuver Severity — Reduce** **2. PFCS — Reset** *If failure does not reset:* **3. Land as soon as practical.** **WARNING** A single FCC failure without indication of associated control surface failures denotes a dual sync bit failure between FCC's. In this case, expect severely degraded handling qualities, especially in the roll axis, in high speed APLN. CONV handling qualities are better. A run on landing is recommended. **NOTE** Expect associated hydraulic system degradation. Leak isolation will be unavailable.
FCC X/Y FAIL (1/2, 1/3, 2/3)	**WARNING** EXPECT: • Difficulty controlling the aircraft in all axes. • Loss of flapping controller/protection. • Loss of TCRS, ECL functionality, conversion protection, SLL, and reliable stall warning. • Associated hydraulic systems degraded. • AFCS inoperative. • Trim system degraded. **CONTINUED**

CAUTION	ACTION / INFORMATION
FCC X/Y FAIL (1/2, 1/3, 2/3)	**CAUTION** TCL forward softstop will automatically be removed (WCA will post). Pilot will need to manage Qm to prevent overtorque. TCL overtravel range will provide additional mast torque up to the engine limit. ***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails to clear:* ***3. Land as soon as possible (ROL recommended)** *If CCDL failure exists:* **4. NACELLE B/U ENABLE — ON** **5. CPLD and HVR CPLD— OFF** *If safe landing cannot be made without delay:* **6. APLN — Transition (100% Nr)** **CAUTION** Transition/convert according to table: NAC / (KCAS): 0° / 180; 30° / 150; 60° / 100 **7. Airspeed — < 200 KCAS** **8. DA — <10,000 ft** **9. Gross Weight — REDUCE, as practical** **CONTINUED**

CAUTION	ACTION / INFORMATION
FCC X/Y FAIL (1/2, 1/3, 2/3)	*If unable to transition to APLN:* **10. Rotor Condition/Airspeed — REDUCE (FFR in green)** **CAUTION** • Backup flapping controller provides trimmed-flight flapping protection; however, in maneuvering flight, aircraft is still vulnerable to critical flapping condition. (Minimize maneuvering) As much as practical, reduce high GW, forward cg and high DA. • Operations between 10 and 75 ° nacelle may result in destructive heat buildup in the elastomeric bearing. **NOTE** In CONV, expect increase pilot longitudinal cyclic workload due to pitch power coupling. *If caution clears:* **11. Land as soon as practical.** **NOTE** • Interim power is still available. • With a FCC X/3 failure, setting flaps to 0 in APLN may improve roll control. Reset flaps to AUTO before landing.
FCS PFBIT FAIL	**1. Ensure configuration is accurate and remain clear of the flight controls** **2. Attempt a second FCS PFBIT** *If Caution fails to clear:* **3. ACFT Startup Procedure — Abort.**

CAUTION	ACTION / INFORMATION
FEATHERING HIGH HOT	***1. Maneuver Severity — Reduce** ***2. APLN — Transition** *If unable to transition to APLN:* ***3. Rotor Condition/Airspeed — REDUCE (FFR in green or yellow)** **WARNING** • Severe vibration levels may indicate impending elastomeric bearing failure. • With high vibration, 0 ° nacelle may cause catastrophic failure of the nacelle downstop. • Delay conversion until immediately prior to landing with suspected damaged elastomeric bearing. *If severe vibration levels are present and rotor system failure seems imminent:* **4. Land Immediately (ROL recommended)** *If high vibration levels are present:* **5. Nacelles — 10 °** **6. Land as soon as possible (ROL recommended)** **CAUTION** FEATHERING HIGH HOT: CONV operations may not clear the caution. APLN at low angle of attack or VTOL at low airspeed (<40 KCAS) is recommended. Destructive heat buildup may occur in as little as 5 minutes after caution. **CONTINUED**

CAUTION	ACTION / INFORMATION
FEATHERING HIGH HOT	*If caution fails to clear:* ***7. Land as soon as possible (ROL recommended).** **NOTE** Once the condition has been alleviated, the FEATHERING HIGH HOT may take several minutes to clear.
FEATHERING HIGH HOT (ON GROUND)	**NOTE** Once condition has been alleviated, the FEATHERING HIGH HOT may take minutes to clear. **1. Stick and pedals — Centered (FFR in green)** **2. Once caution clears, continue operation** *If caution fails to clear:* **3. Shutdown — EXECUTE.**

CAUTION	ACTION / INFORMATION
FEED TANK LOW (L/R)	**NOTE** Upon annunciation of FEED TANK LOW, approximately 9 minutes of flight time remains before the associated feed tank reaches 300 lbs. **1. AIR/HIFR — Off (Confirm)** **NOTE** With AIR/HIFR selected, the FMU will not command the boost pumps ON even when BOOST mode is selected and indicating white with an asterisk on the Fuel System Status layer. Deselecting AIR/HIFR will restore operational control of the boost pumps to the pilots and proper status will be indicated on the Fuel System Status layer. **2. PROBE OFF — Confirm** **NOTE** Selecting STOW may introduce air from the refuel manifold and increase the time required to replenish the feed tanks. **3. XFER VALVE — AUTO** **4. TPUMP — BOOST** *If feed tank does not replenish:* **5. XFER VALVE — OPEN** *If feed tank does not replenish:* **6. Land as soon as possible** *If a safe landing cannot be made prior to the feed tank depleting below 300 lbs:* **7. Transition to APLN — COMPLETE (170 KCAS, Nr - 84%, FLAPS - AUTO)** **CONTINUED**

CAUTION	ACTION / INFORMATION
FEED TANK LOW (L/R)	**8. Pull both FMU 1 and 2 circuit breakers (1G10 and 1K10) simultaneously, wait 10 seconds and simultaneously push the circuit breakers.** *If feed tank does replenish:* **9. TPUMP — SUCT.**
FEED TANK OVERFILL (L/R)	**CAUTION** When landing with a fuel leak or venting, a run-on landing, avoiding the use of aft nacelle, is recommended to minimize ingestion of fuel into engines and wheel brakes. **1. Maneuver Severity — Reduce** **2. ALE-47 MODE — OFF** *If feed tank is overfilled, to manually deplete feed tank:* **3. Cross transfer (XFER) valve — CLOSED** **4. TPUMP — SUCT** **5. L/R SUCTION LIFT PUMP C/B (1J1/1L1) — PULL** *If condition persists:* **6. Land as soon as possible, expedite shutdown** *If condition is alleviated:* **7. L/R SUCTION LIFT PUMP C/B — As required** **8. Cross transfer (XFER) valve — AUTO** **9. ALE-47 MODE — As required.**

CAUTION	ACTION / INFORMATION
FIRE PROT SYS FAULT	**NOTE** If this caution fails to clear, nacelle fire detection and wing/midwing fire detection/ suppression capability has been lost. No fire warnings will be generated if a fire occurs in any of these compartments. **1. WFPC C/B (3E5) — PULL (3 sec) AND RESET** **2. FIRE DETR/LIGHT ENG L C/B (1C10) — PULL (3 sec) AND RESET** **3. FIRE DETR/LIGHT ENG R C/B (1F10) — PULL (3 sec) AND RESET** **4. Lamp Test — PRESS (1 sec minimum)** **NOTE** Reinitializes the wing fire protection logic by commanding the fire detection IBIT. *If caution fails to clear:* **5. Land as soon as practical.**
FLAP FAIL (L/R)	Both flaperon surfaces on one side are uncontrollable. **CAUTION** Expect reduced) roll authority in APLN and CONV. **NOTE** Loss of one or more flaperon surfaces may result in significant lateral stick requirement and aircraft side slip to maintain level flight and increase stall speed in APLN. Increasing flaps beyond the autoflap setting will further reduce lateral control margin. **CONTINUED**

CAUTION	ACTION / INFORMATION
FLAP FAIL (L/R)	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If caution fails to clear:* **3. VTOL — Convert** **NOTE** Setting flaps to 0 in APLN or CONV may improve handling qualities and reduce the requirement for lateral stick force. Reset flaps to AUTO before landing. **4. Land as soon as practical.**
FLAPPING CRITICAL	**CAUTION** Flapping stop contact indication may be indicative of rotor, drive system, or mast damage. ***1. Maneuver Severity — Reduce** **2. Land as soon as practical (ROL recommended)** *If landing must be delayed:* **3. APLN — TRANSITION** **4. VTOL/CONV — MINIMIZE.**

CAUTION	ACTION / INFORMATION
FLAPPING HIGH HOT	***1. Maneuver Severity — Reduce** ***2. APLN — TRANSITION** *If unable to transition to APLN :* ***3. Rotor Condition/Airspeed — REDUCE (FFR in green or yellow)** **WARNING** • Severe vibration levels may indicate impending elastomeric bearing failure. • With high vibration, 0 ° nacelle may cause catastrophic failure of the nacelle downstop. • Delay conversion until immediately prior to landing with suspected damaged elastomeric bearing. *If severe vibration levels are present and rotor system failure seems imminent:* ***4. Land Immediately (ROL recommended)** *If high vibration levels are present:* ***5. Nacelles — 10 °** ***6. Land as soon as possible (ROL recommended)** **CAUTION** FLAPPING HIGH HOT: Operations between 35 and 75 ° nacelle may not clear the caution. Flapping is most critical near 60 ° nacelle, high GW, forward CG, and high DA. Destructive heat buildup may occur in as little as 1 minute after caution. CONTINUED

CAUTION	ACTION / INFORMATION
FLAPPING HIGH HOT	*If caution fails to clear:* ***7. Land as soon as possible (ROL recommended).** **NOTE** Once condition has been alleviated, the FLAPPING HIGH HOT may take minutes to clear.
FLAPPING HIGH HOT (On Ground)	**CAUTION** Continued operations at high flapping levels causes rapid degradation of elastomeric materials and will result in elastomeric bearing failure. Unexpected high vibration levels may be indicative of elastomeric bearing failure. Continued operation with failed elastomeric bearings will cause increased vibration levels and may cause hard contact between components of the rotor system which may cause rotor, rotating control or mast system failure. **NOTE** Once condition has been alleviated, the FLAPPING HIGH HOT may take minutes to clear. **1. Stick and pedals — Centered (FFR in green)** **2. Once caution clears, continue operation** *If caution fails to clear:* **3. Shutdown — EXECUTE.**

CAUTION	ACTION / INFORMATION
FLAPPING SENSOR FAIL	***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails to clear:* **3. Maneuvering — Minimize** **4. Rotor Condition Severity — REDUCE (FFR in green)** **5. Land as soon as practical.** **CAUTION** • Backup flapping controller provides trimmed-flight flapping protection; however, in maneuvering flight, aircraft is still vulnerable to critical flapping condition. Minimize maneuvering. As much as practical, reduce high GW, forward CG and high DA. • Operation between 10 and 75 ° nacelle may result in destructive heat buildup in the elastomeric bearing. **NOTE** • Flapping information for FFR and flapping high hot/feathering high hot/rotor load cautions and advisories may be provided by one rotor. Maintain balanced flight and centered pedals as practical. • In CONV, expect increase pilot longitudinal cyclic workload due to pitch power coupling.

CAUTION	ACTION / INFORMATION
FMU INTER-LINK FAIL **FMU X FAIL (1/2)**	**NOTE** With a failed FMU, the affected side feed and sponson tanks will indicate 526 lbs and 0 lbs, respectively, on the FUEL STAT layer. The SFD will also indicate 526 lbs for the failed FMU side feed tank. Total fuel quantity will be indicated on the FUEL STAT layer, but the quantity for the failed FMU side will be estimated. The boost pumps on the failed FMU side will be activated and cross transfer valve will have to be manually opened or closed. With an FMU interlink failure, cross transfer valves must be operated manually. **NOTE** • With an FMU interlink failure, cross transfer valves must be operated manually. • Fuel Dump cannot be initiated with a single FMU failure. If an FMU fails during dump, automatic shutoff will not occur. **1. Land as soon as practical.**
FPLN MINI-MUM FUEL	Fuel remaining is less than the flight plan fuel reserve. When this alert is displayed, STAT selection key will access the Fuel Summery Control Layer for the subject flight plan. This condition will also display the EXCS FUEL REQ FPx LGxxx variable OID, where FPx LGxxx are the flight plan and leg number where the error occurs.
FUEL TRAPPED	**NOTE** • The FUEL STAT layer will indicate the last known fuel quantity in the red tank. The total USABLE FUEL quantity will decrease by the amount of fuel trapped. • Trapped fuel may have adverse impacts on aircraft longitudinal and/or lateral cg. Evaluate mission/cg impact of trapped fuel. **1. XFER VALVE — AUTO** **2. TPUMP — BOOST.**

CAUTION	ACTION / INFORMATION
GENERATOR X FAIL (1/2)	**CAUTION** Although consideration may be given to cycling a generator switch in an attempt to clear a generator fault or failure, certain failure modes and/or repeated generator reset attempts could cause a fire. *If one or both CFG (1 and/or 2) fails:* **1. Land as soon as practical** **NOTE** If ABIU FAIL posts, cycle ABIU DC and AC circuit breakers 1E6 and 2C2. **2. Icing Environment — Exit** *If both VFGs fail:* **3. Land as soon as practical** *If one VFG fails:* **4. PRTR OVERRIDE — Select (Every 3 minutes until clear of icing).**

CAUTION	ACTION / INFORMATION
GENERATOR X FAIL (3/4)	**CAUTION** Although consideration may be given to cycling a generator switch in an attempt to clear a generator fault or failure, certain failure modes and/or repeated generator reset attempts could cause a fire. *If one VFG fails:* **1. Icing Environment — Exit** *If both VFGs fail:* **2. Land as soon as practical.** **NOTE** With a single operating VFG, spinner dome anti-ice is no longer available, expect ice buildup on front face of the spinner dome. Proprotor deice cycles will not happen simultaneously due to increased power demand on operating VFG. Deice cycles will alternate between left and right proprotor, asymmetric shedding is possible causing increase airframe vibrations.
HDG 1/2/3 FAIL	INS 1, 2, and 3 have invalid heading. **1. Maintain VMC** **2. NAV ALIGN — Verify in progress or select INS for manual alignment** *If GPS NAV alignment fails:* **3. Power Shed Failed INS's Off/On to attempt GC alignment** **4. Land as soon as practical.** **NOTE** • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post.

CAUTION	ACTION / INFORMATION
HDG X/Y FAIL (1/2, 1/3, 2/3)	INS X and Y have invalid heading. **1. Maintain VMC** **2. NAV ALIGN — Verify in progress or select INS for manual alignment** *If GPS NAV alignment fails:* **3. Power Shed Failed INS's Off/On to attempt GC alignment** **4. Land as soon as practical.** **NOTE** • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post.
HOOK RLSE FLT (FWD/AFT) **HOOK SNSR FAIL (FWD/AFT)**	**WARNING** • Emergency release of external loads under tension may result in snap back of the pendent or load rigging that may damage aircraft or injure aircrew observers. • Release of one hoke from a dual point load without automatic jettison protection could result in structural damage and/or loss of aircraft control. **1. External Mission — Abort** *As soon as possible:* **2. Load — Set down** **3. Hooks — Manually release.**

CAUTION	ACTION / INFORMATION
HYD 1/2 FAIL **HYD 1/2 WITH HYD LEAK** **HYD 1 FAIL WITH HYD 2 LEAK** **HYD 2 FAIL WITH HYD 1 LEAK**	**WARNING** Stall will occur at a higher than normal airspeed (approximately 13% increase in stall speed). **NOTE** Loss of two hydraulic systems will decrease maximum pitch and roll rates available in APLN. For VTOL and CONV, the FCS/HYD system will prioritize remaining pressure to the swashplate actuators. In order to reduce hydraulic system flow demand on the single remaining system (No. 3), activation of high demand subsystems (EAPS, landing gear, and conversion actuators) should either be avoided or only actuated when primary flight control flow demands are low (straight and level flight). **1. Maneuver Severity — Reduce** **2. VTOL/CONV — CONVERT** Convert in accordance with table: DA / NAC: 0 — 5k / >60; 5 — 10k / >75; >10k / AVOID **3. EAPS — OFF** *Just prior to landing:* **4. Landing Gear — EMERG DOWN (Allow 20 seconds for extension)** **5. Back-up Brakes — ENABLE** **6. Land as soon as possible (No-hover or ROL recommended).**

CAUTION	ACTION / INFORMATION
HYD 1/2 LEAK	Hydraulic leaks have been detected in system 1 and 2 and isolated or the leak isolation process is occuring. The alert is displayed when each hydraulic system is powering at least one actuator. If all hydraulic power is lost, this alert is replaced (cascaded) with HYD 1/2 FAIL caution. The alerts associated with a HYD 1/2 LEAK will be cascaded as defined in the cascading logic table. This alert is not posted when due to a HYD pump failure. If CAUTION appears refer to HYD 1/2 procedures.
HYD X/3 FAIL (1/2) **HYD 3 FAIL WITH HYD X LEAK**	**WARNING** Both swashplates will be single boost with a dual failure. One swashplate will be single boost with a FAIL + LEAK. An outboard flaperon and opposite rudder will be failed and simulations have shown this will result in a significant lateral stick requirement and aircraft side slip to maintain level flight in APLN. Increasing flaps beyond the autoflap setting will further reduce lateral control margin. APLN stall and stall warning may occur at higher than normal airspeeds. **CAUTION** Utility hydraulic systems will be inoperative. **1. Maneuver Severity — Reduce** **2. Airspeed — < 200 KCAS** **3. VTOL/CONV — CONVERT (NAC > 60°).** **CONTINUED**

CAUTION	ACTION / INFORMATION
HYD X/3 FAIL (1/2) **HYD 3 FAIL WITH HYD X LEAK**	**NOTE** Setting flaps to 0 in APLN or CONV may improve handling qualities and reduce the requirement for lateral stick force. Reset flaps to AUTO before landing. **4. DA — ≤ 10,000 ft** **5. Landing Gear — EMERG DOWN (Allow 20 seconds for extension)** **6. Back-up Brakes — ENABLE** **NOTE** The back-up Brake System should only be engaged at the time of braking to prevent accumulator bleed-off. **7. Land as soon as possible (No-hover or low speed ROL recommended).**
HYD X LEAK (1/2) **HYD X FAIL (1/2)**	**NOTE** Lateral directional characteristics will improve at lower airspeeds and DA. **1. Maneuver Severity — Reduce** **2. Airspeed — < 200 KCAS** **3. DA — ≤ 10,000 ft** **4. HYD/FCS status layer — MONITOR** **5. Land as soon as practical.**
HYD 3 FAIL	**1. Land as soon as practical** *Prior to landing:* **2. Landing Gear — EMERG DOWN (Allow 20 seconds for extension)** **3. Back-up Brakes — ENABLE.** **NOTE** The back-up Brake System should only be engaged at the time of braking to prevent accumulator bleed-off.

CAUTION	ACTION / INFORMATION
HYD X HOT (1/2/3)	**1. EAPS — OFF (If sys 3)** **2. Maneuver Severity — Reduce** **3. HYD SYS (Affected) — OFF** **CAUTION** If a suitable landing area is not available or landing must be delayed, transition to APLN to reduce heat generation, provide more ram air cooling, and reduce time to land. **4. HYD 1 (2) (3) Fail Procedure — As required** **5. If HYD HOT continues, or posts following HYD PRESS HIGH — LAND AS SOON AS POSSIBLE.**

CAUTION	ACTION / INFORMATION
HYD X MONITOR FAIL (1/2/3)	FCS/HYD fluid level indication on the affected system will be inoperative. This caution indicates that the FCCs will be unable to detect and isolate leaks for the affected system. If a leak were to occur in that system, the FCS will shut down that system when total fluid loss has occurred (HYD X FAIL will post). If system 1 or 2 is the affected system, system 3 would then be switched into swashplate actuators but will still be monitored for fluid loss resulting from a common leak point. *If hydraulic leak is visually detected in the cabin area:* **1. Affected System — SHUTDOWN (at pilot discretion)** **NOTE** • Spraying hydraulic fluid is hazardous to personnel. • Shutdown of HYD 1 or 2 will restrict aircraft to 10,000 ft DA and 200 KCAS. **2. HYD X FAIL EP — Execute.**
HYD 1 PRESS LOW, or **HYD 2 PRESS LOW, or** **HYD 3 PRESS LOW**	For HYD 1/2/3 PRESS LOW FCC HYD system low pressure alert or hyd pressure is ≥ 225 psi and < 4600 psi, and Nr is > 80% or For HYD 1/2 PRESS LOW HYD pressure is ≥ 225 psi and < 4600 psi, Nr is ≤ 80% and ground check valve is set for more than 3 seconds and APU is clutched for more than 10 seconds or For HYD 3 PRESS LOW HYD pressure is ≥ 225 psi and < 4600 psi, Nr is ≤ 80% and APU is clutched for more than 10 seconds. **1. EAPS — OFF (If SYS 3)** **2. Maneuver Severity — REDUCE.**

CAUTION	ACTION / INFORMATION
ICE DETECTED/ IPS OFF	**1. IPS ALL MODES — Select ON** **2. EAPS — Visually confirm ON** *If all IPS subsystems fail to operate:* **3. Icing environment — EXIT.**
ICING BUS FAIL (L/R)	*The L/R Icing protection bus has failed:* **1. Icing Environment — Exit** **2. EAPS — Visually confirm ON** **3. BUS EQUIP layer — Evaluate unavailable equipment.** **CAUTION** Left and/or right Nacelle Ice Protection are/is degraded. Increased vibrations are possible due to asymmetric ice shedding from rotor blades during extended flight in an icing environment. Risk of engine FOD is increased on affected nacelle(s). **NOTE** Nacelle anti-ice and deice subsystems will not perform optimally.
IFF FAIL	Indicates failure in the IFF system; mode, antenna, transponder.
IFF MODE 4 FAIL	Mode 4 failure due to: 1) Mode 4 is off; 2) KIT-1C has failed or is not installed; 3) Mode 4 code mismatch; or 4) IFF codes were zeroized.

CAUTION	ACTION / INFORMATION
INBD FLAP FAIL (L/R)	**CAUTION** Expect reduced roll authority in APLN and CONV. **NOTE** Loss of one or more flaperon surfaces may result in significant lateral stick requirement and aircraft side slip to maintain level flight and increase stall speed in APLN. Increasing flaps beyond the autoflap setting will further reduce lateral control margin. **1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If caution fails to clear:* **3. AIRSPEED — < 220 KCAS** **NOTE** • Setting flaps to 0 in APLN or CONV may improve handling qualities and reduce the requirement for lateral stick force. Reset flaps to AUTO before landing. • Decreasing airspeed or converting to CONV or VTOL will improve lateral controlability and stick forces. • Lateral stick forces will increase with airspeed. **4. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
INS 1/2/3 FAIL	The INS 1, 2, and 3 has stopped communicating with the FCC or MC or has declared a BIT failure or the INS time tag is not incrementing. **1. Maintain VMC** **2. Land as soon as practical** **3. Power Shed Failed INS's Off/On to attempt GC alignment if other alignment attempts fail.** **NOTE** • When pulling both the primary (DC) and back-up (Battery Bus) LWINS CB's, wait a minimum of 5 seconds before resetting. If resetting only the primary CB's, wait a minimum of 15 seconds. • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post. • Failed INS cannot be re-aligned until aircraft lands and the unit is power cycled.

CAUTION	ACTION / INFORMATION
INS X/Y FAIL (1/2, 1/3, 2/3)	The INS X and Y has stopped communicating with the FCC or MC or has declared a BIT failure or the INS time tag is not incrementing. **1. Maintain VMC** **2. Land as soon as practical** **3. Power Shed Failed INS's Off/On to attempt GC alignment if other alignment attempts fail.** **NOTE** • If AFCS Disengage is also posted, initial PFCS Fail Reset may result in the loss of navigation display. • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post. • Failed INS cannot be re-aligned until aircraft lands and the unit is power cycled.
IPS FAIL	**NOTE** ADS icing could eventually lead to ADS faults. Handling qualities above 200 KCAS and/or altitudes above 10,000 ft MSL will be significantly degraded, and become progressively worse with increased speed and/or altitude. **1. Icing Conditions — Exit** *If OAT wamer than -10 °C:* **2. DE-ICE/LIGHT — Select** *If OAT -10 °C or colder:* **3. DE-ICE/Moderate — Select.**

CAUTION	ACTION / INFORMATION
IPS ON	The OAT is above 25 °C and all of the ICE Protection subsystems are not OFF. **1. IPS ALL MODES — OFF.** **NOTE** If icing conditions are expected or OAT deceases, consideration should be given to selecting IPS all modes to AUTO or ON.
LATERAL CG EXCEEDED	**NOTE** Lateral cg is calculated based exclusively on the distribution of fuel and is displayed on the FUEL STAT layer. The lateral cg limit is calculated based on aircraft total gross weight in the CMS. **1. Maneuver Severity — Reduce** **2. FUEL STAT — Check** **3. System Gross Weight — Check** *If lateral cg is confirmed to be out of limits:* **4. Cross Transfer (XFER) Valve — OPEN** **5. Transfer Pump (TPUMP) — BOOST** **6. Fuel Tank Isolation — As required** *If lateral cg remains out of limits or becomes more severe:* **7. Land as soon as practical (ROL recommended).**
LATERAL FEEL FAIL **LATERAL TRIM FAIL**	***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails to clear:* **3. Land as soon as practical.**
LG DN A/S EXCEEDED	Landing gear not UP and airspeed exceeds gear extension speed (140 KCAS).

CAUTION	ACTION / INFORMATION
LONG FEEL FAIL **LONG TRIM FAIL**	**NOTE** With LONG TRIM fail, longitudinal stick backdrive will be inoperative which may cause longitudinal AFCS saturation. Mag brake use will alleviate saturation, but is only available in VTOL/CONV. ***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails to clear:* **3. Land as soon as practical.**
LOW NITROGEN	Fuel tank inerting capability is reduced.
LOW OXYGEN	*If oxygen system is affected:* ***1. EMERGENCY OXYGEN — As required** **2. Altitude — < 10,000 ft MSL.**
MACH LIMIT	**NOTE** This alert is displayed when the speed is greater than or equal to 0.50 mach, airspeed limited to 0.48 mach. **1. Reduce Airspeed.**
MWGB CHIPS	*If MWGB oil temperature and/or pressure abnormal:* **1. Land as soon as possible** *If MWGB oil temperature and pressure are stable within normal range:* **2. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
MWGB HOT	**1. APLN — TRANSITION** **2. GEN 1 — OFF** **3. Land as soon as practical** *If oil temperature rises above 132°C (Red Range):* **4. Land as soon as possible.** **NOTE** MWGB oil cooler blockage/blower failure may result in MWGB oil temperature increases as well as temperature increases in other systems cooled by the MWGB oil cooler (VFG #4, CFG #1, SDC, and Hydraulic System #3).
MWGB PRESS CRIT HI	*100 psi < MWGB PRESS ≤ 150 psi (Red Range):* **1. Land as soon as possible** *65 psi < MWGB PRESS ≤ 100 psi (Yellow Range):* **2. Land as soon as practical.**
MWGB PRESS LOST	**NOTE** If MWGB oil pressure is lost, the No. 1 CFG may fail within minutes. **1. GEN 1 — OFF** **2. Land as soon as possible.**

CAUTION	ACTION / INFORMATION
NAC BLOWER FAIL (L/R)	*If a safe landing cannot be made without delay:* **1. APLN — TRANSITION** *If secondaries indicate increasing nacelle temp:* **2. Land as soon as possible, minimizing time in CONV/VTOL (ROL or No-hover landing recommended).** **WARNING** CONV/VTOL operations not to exceed 3 minutes starting from the time that the nacelles first come off the down stops. *If all other indications are normal:* **3. Land as soon as practical.**
NIU FAIL (L/R)	**1. Affected equipment — Evaluate** **2. Land as soon as practical.**
NIU FAULT (L/R)	**NOTE** In the event of a NIU FAILURE the following Land as soon as possible/immediately WCAs are lost: (W) - TAGB; (C) - PRGB Hot, TAGB HOT, TAGB Press Low OEI, TAGB Press High, TAGB Press Lost, TAGB Press Crit HI.
NOSE BAY HOT	Information. AVSS may fail with excessive temperature.

CAUTION	ACTION / INFORMATION
NOSEWHL NOT CNTRD	**CAUTION** Do not attempt to raise gear with a NOSEWHL NOT CNTRD caution. If gear retraction is attempted without a centered nosewheel, major structural damage may occur. **NOTE** FLIR, wingman, and ground personnel are all potential means to determine landing gear position/condition. **1. PFCS — RESET** *If caution does not clear:* **2. Vertical landing — Execute** *If hovering/vertical landing cannot be performed:* **3. Run-on landing — Execute.** **NOTE** During ROL, minimize airspeed as feasible, touching down on main gear and holding nosewheel off the ground as long as possible during deceleration. Utilizing slight forward nacelle (approximately 85°) during ROL will provide a higher nose-up attitude, delaying nosewheel touchdown. Maintain directional control using pedal inputs.
NOSEWHL STEER FAIL	Nosewheel steering/actuator fail failure. If posted upon engagement, nosewheel could be beyond its normal range limit ±75° of center. Taxi forward and attempt to re-engage.

CAUTION	ACTION / INFORMATION
O2 MONITOR FAULT	*If oxygen system is affected:* ***1. EMERGENCY OXYGEN — As required** **2. Altitude — Descend below 10,000 ft MSL (if able).**
OAT DISAGREE	OAT 1 and OAT 2 disagree by a difference of 5 °. *If Icing conditions are possible:* **1. ALL MODES — ON** **2. PROPROTOR DE-ICE to LIGHT if OAT is ≥ -10 °C/MODERATE if OAT is < -10 °C** **3. WING DE-ICE to LIGHT LIGHT if OAT is ≥ -10 °C/MODERATE if OAT is <-10 °C** **4. Determine OAT and set closest OAT sensor as default by:** **a. Compare OAT with Wingman** **b. Check OAT with ATC** **c. Use preflight planning data and lapse rate if necessary** *If in icing conditions and increased vibrations are encountered:* **5. Manual proprotor/wing Override — Initiate** **6. If increased vibrations continue — Exit ice.** **NOTE** If IPS all modes AUTO is selected, IPS will come on when ICE DETECTED Advisory post regardless of OAT.

CAUTION	ACTION / INFORMATION
OUTBD FLAP FAIL (L/R)	**CAUTION** Expect reduced roll authority in APLN and CONV. **NOTE** Loss of one or more flaperon surfaces may result in significant lateral stick requirement and aircraft side slip to maintain level flight and increase stall speed in APLN. Increasing flaps beyond the autoflap setting will further reduce lateral control margin. **1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If caution fails to clear:* **3. AIRSPEED — < 220 KCAS** **NOTE** • Setting flaps to 0 in APLN or CONV may improve handling qualities and reduce the requirement for lateral stick force. Reset flaps to AUTO before landing. • Decreasing airspeed or converting to CONV or VTOL will improve lateral controlability and stick forces. • Lateral stick forces will increase with airspeed. **4. Land as soon as practical.**

CAUTION	ACTION / INFORMATION
PLT NAC CONTR FAIL (L/R)	***1. NAC CONTR switches — OVER-RIDE NACELLE MOTION** *If nacelle movement is not arrested or reversed:* ***2. NAC CONTR DSBL switches — DSBL** *If nacelle movement is not arrested* **3. PFCS — RESET** *Regardless of whether nacelle movement stops:* **4. Climb — SAFE ALTITUDE** **5. NAC CONTR DSBL switches — NAC CONTR ONE AT A TIME TO ISOLATE** **6. Land as soon as practical.**
PRGB CHIPS (L/R)	*If normal secondary indications exist (oil pressure/temperature, noises, vibrations):* **1. Land as soon as possible** *If abnormal secondary indications exists (oil pressure/temperature, noises, vibrations):* **2. Land Immediately.**
PRGB HOT (L/R)	**1. Maneuver Severity — Reduce** **2. APLN — TRANSITION (if possible) to provide more ram air cooling** *If temperature not reduced to within limits:* **3. Land as soon as possible, minimizing time in VTOL/CONV during landing.**

CAUTION	ACTION / INFORMATION
PRGB PRESS CRIT HI (L/R)	*PRGB PRESS > 150 psi (Red Range):* **1. Land as soon as possible** *95 psi ≤ PRGB PRESS ≤ 150 psi (Yellow Range):* **2. Land as soon as practical.**
PRGB PRESS LOST (L/R)	**WARNING** • At 30 minutes of elapsed ELS operation, an immediate landing due to imminent catastrophic failure of the PRGB is required. • 30 minutes of PRGB operation with only ELS lubrication is predicated on minimum engine torque on the affected side (up to 29% in APLN and 62% in VTOL/CONV). • In any case, attempt not to exceed 90 seconds in VTOL/CONV (100% Nr), and use minimum TCL required for flight/landing. Lateral and directional control inputs and use of Interim PWR in VTOL/CONV will reduce time to failure and should be minimized. **1. Maneuver Severity — Reduce** *If an immediate safe landing cannot be made within the first 90 seconds:* **2. 30 Minute Timer — START** **3. APLN — TRANSITION (84% Nr)** **4. TCL — Qm 50-55%** **5. ECL (affected side) — Qe 24-29%** **6. TCL — ≤ 55% Qm** **7. Land as soon as possible, Single Engine Landing Checklist — CONDUCT.**

CAUTION	ACTION / INFORMATION
PRGB PRESS LOW (L/R)	**1. Maneuver Severity — Reduce** *If landing must be delayed:* **2. APLN — TRANSITION (to reduce Nr and gearbox loads)** **3. Land as soon as possible.**
PRTR IPS FAIL	**1. Icing conditions — EXIT** *If increased vibration:* **2. PRTR OVERRIDE — Initiate** **3. Nr — 100%** **4. Ice Protection status layer — Access** *If BLADE HEAT ON is displayed on status layer:* **5. GEN 3 and 4 — OFF when clear of icing conditions.** **CAUTION** • Extended operations in the ice could cause asymmetric ice buildup on the proprotor blades causing increase airframe vibration. • Uncontrolled continuous heating to the proprotor blades will result in blade damage. All affected rotor zone(s) will be uncontrollably latched ON, maintenance inspection of the proprotors is required before the next flight. Risk of engine FOD is increased on affected nacelle(s).
PRTR OVER-TORQUE (L/R)	**1. Maneuver Severity — Reduce** **2. Land as soon as practical.**
RALT TO BALT	Hover Hold mode and the radar altimeter fails and transitions to barometric altitude.

CAUTION	ACTION / INFORMATION
ROTOR BRAKE ON	**WARNING** An engaged rotor brake in-flight may result in a midwing fire. **1. Rotor Brake — CHECK OFF** **2. HYD 3 — SECURE** **NOTE** The following subsystems will be inoperative: Landing Gear normal operations; Cargo Ramp/Door operation; Engine Starters; EAPS; NWS and Nose Lock; Cargo Winch; Rotor Break; Wheel Brake operation (B/U available). **3. Land as soon as possible** *Prior to landing:* **4. Landing Gear — EMERG DOWN (Allow 20 seconds for extension)** **5. Backup brakes — ENABLE** *Once on the ground:* **6. Emergency Shutdown (No ROTOR BRAKE).**

CAUTION	ACTION / INFORMATION
ROTOR LOAD HIGH	***1. Maneuver Severity — Reduce** **WARNING** • Severe vibration levels may indicate impending elastomeric bearing or pitch link failure. • Excessive pitch link wear can lead to catastrophic failure without initially feeling severe vibration levels. Nacelle pitching motion may provide the best indication of increasing vibration levels. ***If severe vibration levels are present and rotor system failure seems imminent*:** ***2.Land immediately (ROL recommended).** ***If Caution fails to clear or high vibration levels are present:*** **WARNING** With high vibration levels, 0° nacelle may cause catastrophic failure of the nacelle downstop. **3. Nacelles — 10°** ***If unable to transition to 10° nacelle*:** **4. Rotor condition/airspeed — Reduce (FFR inner needle in green or yellow)** ***If Caution still fails to clear:***

CAUTION	ACTION / INFORMATION
ROTOR LOAD HIGH	**WARNING** Delay conversion until immediately prior to landing due to possible damaged elastomeric bearings or pitch links. **5. Land as soon as possible (ROL recommended)** **NOTE** • ROTOR LOAD HIGH should clear within seconds unless 1p vibrations are high. • If the ROTOR LOAD HIGH caution posts during Rotor Track and Balance without an RT&B STOP VIB HI OID or without the FFR inner needle in the red, continue published Rotor Track and Balance procedures.

<table>
<tr><th>CAUTION</th><th>ACTION / INFORMATION</th></tr>
<tr><td>RPM HIGH</td><td>NOTE
When operating in Interim Power, control inputs may trigger a momentary Nr overspeed.
1. Maneuver Severity — Reduce
If condition persists:
2. Land as soon as possible.</td></tr>
<tr><td>RUDDER FAIL</td><td>NOTE
With both rudders failed, expect divergent lateral-directional oscillations and sideslip excursions in APLN and CONV. Susceptibility to these conditions can be reduced by avoiding High DA and/or high power settings.
1. Maneuver Severity — Reduce
2. PFCS — RESET
If caution fails to clear:
3. VTOL/CONV — Convert (in accordance with table)
4. Land as soon as practical.
<table><tr><th>DA</th><th>NAC</th></tr><tr><td>0 — ≤ 5k</td><td>>60</td></tr><tr><td>5 — 10k</td><td>>75</td></tr><tr><td>>10k</td><td>AVOID</td></tr></table></td></tr>
</table>

CAUTION	ACTION / INFORMATION
SDC FAIL	**CAUTION** With SDC or ECS failed, avoid icing conditions due to loss of leading edge deice, maneuvering above 1.5g's and airspeeds in excess of 220 KCAS to prevent disrupted airflow caused by leading edge deice boot deformation, and flight above 10,000 ft MSL due to loss of OBOGS. *If operating above 10,000 ft MSL:* ***1. EMERGENCY OXYGEN — As required** **2. Icing conditions — EXIT** *When possible:* **3. Altitude — < 10,000 ft MSL** **4. Oxygen masks — OFF** **5. EMERGENCY OXYGEN — OFF** **6. ECS — OFF/EMER VENT** *If SDC FAIL caution fails to clear:* **7. Land as soon as possible** *If ECS SDC LEAK caution fails to clear:* **8. Land as soon as practical** *If ECS SDC LEAK caution clears:* **9. ECS — ON.**
STRL LOAD LIMIT FAIL	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If caution fails to clear:* **3. Maneuvering — Minimize** **4. Land as soon as practical.**

<table>
<tr><th>CAUTION</th><th>ACTION / INFORMATION</th></tr>
<tr><td>SWPL
SINGLE
BOOST</td><td>
1. Maneuver Severity — Reduce
2. Airspeed — < 200 KCAS
NOTE
Lateral directional characteristics will improve at lower airspeeds and DA.
3. DA — ≤ 10,000 ft
4. Land as soon as possible (No hover or ROL recommended)
If accompanied by a rudder failure:
5. Altitude — SEE TABLE
6. Land as soon as possible (No hover or ROL recommended).
Land in accordance with table:
<table>
<tr><th>DA</th><th>NAC</th></tr>
<tr><td>0 — 5k</td><td>>60</td></tr>
<tr><td>5 — 10k</td><td>>75</td></tr>
<tr><td>>10k</td><td>AVOID</td></tr>
</table>
WARNING
During precision hover operations asymmetric swashplate actuator rates can result in significant pilot induced oscillations and potentially jeopardize aircraft control. Recommend a landing with forward airspeed. Expect reduced yaw authority and increased susceptibility to lateral directional oscillations in APLN and CONV flight with a single rudder failure. High altitudes and/or high power settings increase susceptibility for lateral directional oscillations.
</td></tr>
<tr><td>TAGB
CHIPS
(L/R)</td><td>1. Land as soon as possible.</td></tr>
</table>

CAUTION	ACTION / INFORMATION
TAGB HOT (L/R)	**1. Maneuver Severity — Reduce** **2. APLN — TRANSITION (if possible) to provide more ram air cooling** *If temperature remains in red range:* **3. GEN 2 — OFF (If R TAGB)** **4. Land as soon as possible, minimizing time in VTOL/CONV** *If temperature does not return to normal (remains in yellow range):* **5. Land as soon as practical, minimizing time in VTOL/CONV.**
TAGB PRES LOW OEI (L/R)	**1. Maneuver Severity — Reduce** **2. Qm — MINIMUM REQUIRED** **3. Land as soon as possible.**
TAGB PRESS LOST (L/R)	**WARNING** Do not exceed 30 minutes of flight time. **NOTE** If right TAGB oil pressure is lost, the No. 2 CFG will fail within minutes. Switch the No. 2 CFG off. AC Bus 2 will transfer to another generator. **1. Maneuver Severity — Reduce** *If safe landing cannot be made without delay:* **2. APLN — TRANSITION** **3. Qm — MINIMUM REQUIRED** **4. GEN 2 — OFF (If R TAGB)** **5. Land as soon as possible.**

CAUTION	ACTION / INFORMATION
TAGB PRESS CRIT HI (L/R)	*TAGB PRESS > 150 psi (Red Range):* **1. Land as soon as possible** *95 psi < TAGB PRESS ≤ 150 psi (Yellow Range):* **2. Land as soon as practical.**
TCL TRIM FAIL	**NOTE** TCL Trim failure may render coupled modes inoperative. ***1. Maneuver Severity — Reduce** ***2. PFCS — RESET** *If caution fails to clear:* **3. Land as soon as practical.**
THREAT RING	The current aircraft position is in the threat ring radius.

CAUTION	ACTION / INFORMATION
TORQUE SENSOR FAIL (L/R)	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If condition persists:* **3. Qm — MAINTAIN ≤ 100%** **CAUTION** TCL forward softstop will automatically be removed (WCA will post). Pilot will need to manage Qm to prevent overtorque. TCL overtravel range will provide additional mast torque up to the engine limit. *If landing must be delayed:* **4. APLN — TRANSITION** **NOTE** The aircraft is less susceptible to overtorque in APLN. **5. Land as soon as practical (minimum power).**
UTIL SYSTEMS INOP	**NOTE** The following systems are inoperative: aerial refueling retractable probe (can still be manually extend and retract), landing gear normal operation, cargo ramp/door operation, NWS & nose lock, cargo winch, rotor brake, wheel brake operation (B/U available). *Prior to landing:* **1. Landing gear — EMERG DOWN (Allow 20 seconds for extension)** **2. Back-up brakes — ENABLE.**
WINDSHIELD IPS FAIL	**1. Icing Conditions —Exit** **2. Windshield anti-ice — AUTO or ON.**

CAUTION	ACTION / INFORMATION
WING IPS FAIL	**1. Icing Conditions — Exit** **2. Airspeed — Remain between 200 to 220 KCAS due to possible increase in Stall speeds** **3. Icing Protection status layer — ACCESS.** **NOTE** Wing boots will fail in pairs (inner/inner, middle/middle or outer/outer) to allow for symmetric ice buildup.
WIU FAIL **WIU FAULT**	**1. Affected equipment — Evaluate** **2. Land as soon as practical.** **NOTE** In the event of a WIU FAILURE the following Land as soon as possible WCAs are lost: (C) - MWGB Hot, MWGB Press CRIT HI, MWGB Press High, MWGB Press Lost.
WNG FIRE CONTR FAIL	**1. WFPC circuit breaker (3E5) — PULL and reset after 3 seconds AND RESET** **2. Lamp Test — PRESS (1 second minimum)** **NOTE** Reinitializes the wing fire protection logic by commanding the fire detection IBIT. *If caution fails to clear:* **3. Land as soon as practical.**
WNG FIRE CONTR OFF	The WFPS disable switch on PDP No.3 is positioned to DISABLE. System cannot discharge or detect. **1. WFPS circuit breaker (3E5) — IN** **2. WFPS — ENABLE.**

ADVISORY	ACTION/INFORMATION
+4 DEGREES C	OAT falls below 4° C and possible icing conditions exists.
ADS X FAIL (1/2/3)	**1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
AFCS FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
APU CHIPS	Chips have been detected in the APU accessory gearbox. Turn the APU OFF until required.
APU FAIL	**APU unable to start due to critical fault.** *If APU required:* **1. APU — EMERG/ENGAGE.** **NOTE** APU-EMER/RUN bypasses bit faults.
ATT X FAIL (1/2/3)	A Single INS has an invalid attitude. Two good INS units are still available. Mission and flight characteristics are unaffected.
AVIONIC COOLING FLT	L/R bay inlet fan failure, or L/R bay exhaust fan failure, or L/R bay inlet filter clogged, or a drop in cooling air pressure will activate this signal. Check for clogged inlet duct filter or failed exhaust fan.
AVSS FAIL	The AVSS failed and is not suppressing cockpit vibration. Cycle AVSS OFF/ON. If advisory persists, AVSS OFF.

ADVISORY	ACTION/INFORMATION
BATTERY UNAVAIL-ABLE	**1. Battery Switch — RESET** *If advisory fails to clear:* **2. Land as soon as practical.** **NOTE** APU start may require external power.
BFWS FAULT	ROTOR PHASE UNIT FAIL or any WRA from BLADE FOLD CONTROL UNIT FAULT (L/R) or BFWS IN PROGRESS and (Flight ready switch failed or stow switch failed or a 57° switch failed). Monitor EICAS for BFWS NOT FLT READY.
BINGO EXCESS PWR REQ	Flight Plan Bingo Power Required is greater than the Flight Plan Bingo Power Available; or No Flight Plan Bingo Power Required is greater than the No Flight Plan Bingo Power Available. When this alert is displayed, STAT key selection will access the Bingo Flight Plan or Bingo No Flight Plan Control Layer, depending on weather or not a flight plan is active. This condition will also display the BINGO EXCESS PWR REQD OID.
BUNO MIS-MATCH	The inserted cartridge has a different bureau number header than the current aircraft. Verify; Basic A/C Wt and cg, crew number, kit wt, cg and flat plate area, mission fuel tank empty wt and cg, and DMS threat radius buffer. **NOTE** Do not change the A/C BUNO number. Performance calculations may be based on incorrect A/C MAX Gross Weight and MAX Airspeed.

ADVISORY	ACTION/INFORMATION
CABIN CONTR STA FAIL	FCCS fail determined by PBIT, or loss of ARINC 429 communications.
CABIN ICS FAULT (AFT)	Aft Cabin ICS has failed and communication with that unit is not possible. Verify ICS monitor knobs are clicked into appropriate detent positions.
CAR-TRIDGE UNAVAIL-ABLE	The MDL cartridge is not inserted, or the MDL is not communicating on the bus, or the DTM has failed.
CBN RFL FAIL, FWD (AFT/MID)	This indicates that the motor operated refuel valve for its respective MAT has failed to reach the commanded position. If a valve indicates failed when selected to refuel, that tank will not fill. Manual Control of the refuel valve is available at the tank.
CBN XFER FAIL, FWD (L/R)	This indicates that the motor operated transfer valve for its respective MAT has failed to reach the commanded position. If the valve has failed in the closed position, while there is still fuel in that tank, the FMGS will flag that fuel as unavailable and it will be displayed as trapped. Manual control of the transfer valve is available at the tank.
CDU EICAS FAIL	CDU EICAS display has malfunctioned, Info may be displayed on MFD.

ADVISORY	ACTION/INFORMATION
CHAFF BINGO	Chaff low stores level reached in auto or semi-auto mode. No action required, expendables will continue to be dispensed. The bingo limit is programed into the ALE-47. ALE-47 can be programmed to stop dispensing when bingo limit is reached. If this occurs, cycle Chaff ON/OFF switch on cockpit control unit to reset bingo to 0.
CHIP DE-TECTOR FAIL	**WARNING** Subsequent PRGB cautions (L/R PRGB PRESS LOST or L/R PRGB PRESS LOW) dictates an immediate landing. With DSIU and EMERGENCY LUBE FAIL, the ELS function is lost. **NOTE** All chip detectors (engine and gearboxes) and the ELS are inoperative with a failed DSIU. **1. Land as soon as practical.**
COMM MODE ERROR	Mode transition has failed or Mode setup is incorrect causing IDENT key function errors, or WRA has been misconfigured. Attempt reentry of comm plan.
COMM SEC X FAIL (1/2)	No. 1 or No. 2 KY-58 has failed. Secure communication on COMM 1 or 2 is not possible**.**
COMM SW UNIT FAULT	The Comm Switching Unit has gone into fallback failure mode. Secure communication is not possible. ICS communication can be done with CALL mode only.
COMM TIME UPD FAIL	Radio time not updated. GPS or over the air time failed.

ADVISORY	ACTION/INFORMATION
COMM X FAIL (1/2)	The No. 1 or No. 2 ARC 210, upper antenna, or notch filter has failed in some mode, however some communication may still be possible.
CONV X FAIL (1/2/3)	Loss of a single converter should not affect any electrical equipment. If necessary, consider attempting to recover a failed converter by cycling the failed converter circuit breaker. Subsequent loss of an additional converter will result in loss of two DC busses. With a dual converter failure, minimize electrical load on the remaining converter. *With a dual converter failure:* **1. Land as soon as practical.**
CREW CHIEF ICS FAULT	Crewchief seat ICS has failed and communication with that unit is not possible. Verify ICS monitor knobs are clicked into appropriate detent positions.
CVRSN ACTR FAULT (AADV)	**1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
DATA LOADER FAIL	The MDL receptacle has failed.
DECOY X BINGO (1/2)	Other 1 or 2 low stores level reached in auto or semi-auto mode. No action required, expendables will continue to be dispensed. The bingo limit is programmed into the ALE-47. ALE-47 can be programmed to stop dispensing when bingo limit is reached. If this occurs Cycle OTHER 1 or OTHER 2 ON/OFF switch on cockpit control unit to reset bingo to 0.

ADVISORY	ACTION/INFORMATION
DEFAULT TORQUE CONST	This signal is generated by the FADEC in control when using the default engine torque constants. Expect as much as 3% Qe differential.
DEGRADED NAV READY	At least 1 INS is in degraded NAV mode. The other 2 INS's are only in ATT mode. Power Shed Failed INS's Off/On to attempt GC alignment if other alignment attempts fail.
DEU FAIL (L/R)	**NOTE** • With a dual DEU failure, MFDs will be inoperative, and CDU/EICAS will be fully functional. • With a single DEU failure, MFDs on failed side will mirror MFDs on operative DEU side. Attempt to recover failed DEU(s) using AVIONICS POWER SELECT page for the left DEU and/or DEU R circuit breaker (2D8). *If DEU(s) cannot be recovered:* **1. Land as soon as practical.**
DEU HOT (L/R)	DEU is hot. An overtemp condition may be alleviated by powering down the DEU until it is absolutely required. Coordinate MFD actions while powering down DEU's. **NOTE** • L DEU powered off on Avionics Power select page. • R DEU powered off with C/B (2D8).
DIR FEEL FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**

ADVISORY	ACTION/INFORMATION
EAPS FAIL (L/R)	O/B EAPS actuator fail, or I/B EAPS actuator fail, or O/B EAPS blower fail, or O/B EAPS blower pressure switch fail, or I/B EAPS blower fail, or I/B EAPS blower pressure switch fail, or EAPS solenoid valve fail. With EAPS off, the engines are more susceptible to FOD. EAPS - OFF (T4, L3, L3).
ECM AUTO FAULT	Auto dispense degraded.
ECM MANUAL FAULT	Manual dispense degraded.
ECM SEMI AUTO FAULT ALE-47	Semi-Automatic Mode has a functional failure; stores cannot be dispensed in this mode when failed.
ECS AUTO TEMP FAIL	Cabin temp sensor fail. Cockpit temp sensor FAIL. Finding of failure of temperature sensors causes notification to be sent to operator. Select ECS Manual in order to control proportioning valve.
ECS CON-TROLLER FAIL	A malfunction of the ECS controller of a command and response failure; e.g., when ECS ON/OFF state as commanded has not been reached within 5 sec, will cause this signal to be sent to the IAS.
ECS COOL-ING FAIL	ECS cooling system failure.
ECS DIS-TRIBUTE FAIL	ECS proportioning valve fail.

ADVISORY	ACTION/INFORMATION
ECS EMERG FAN FAIL	Emergency vent fan fail.
ECS HEATING FAIL	ECS heating system failure.
ECS RECIRC FAN FAIL	ECS recirculation fan failure.
ELEV FAULT **(AADV)**	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
EMERG LUBE HEAT FAIL	An ELS Wing Heater has failed and the system oil temperature is > 1.667 °C **1. Flight Operations can be continued as long as expected if flight temperatures are above +4 °C** *Otherwise* **2. Land as soon as practical.**
ENG CTRL FAULT (L/R)	**1. Land as soon as practical.**
ENG FADEC PWR FAIL (L/R)	**1. ECL (affected engine) — OFF** *If power restored to FADEC:* **2. PFCS — RESET.** **CAUTION** Nacelle overtemperature conditions will result in premature failure of engine components. Investigate for engine compartment bleed air leak**.**

ADVISORY	ACTION/INFORMATION
ENG FIRE DIS-CHARGE (L/R)	The respective engine fire bottle has been discharged. **1. Land as soon as practical.**
ENG HYD STRT VLV (L/R)	ENG hydraulic start valve failed (no pressure) or L ENG hydraulic start valve remains open (pressurized) with ENG commanded to FLY. Normal Engine Shutdown procedures may be executed.
ENG OIL TANK QTY (L/R)	ENG oil level is at 2.4 quarts remaining. If extended flight is require, monitor oil level and engine parameters. Consider shutting down the affected engine to conserve oil until approach and landing. **NOTE** Oil Quantity is provided from the NIU and the IAS performs the level check.
ENG TEMP (L/R)	ENG MGT is >766° C for three consective seconds. Operations between 766° C and 803° C are limited to 30 minutes.
ERF TIME-OUT	ERF has not completed within the 60 second limit (SINCGARS).
EXCESS CLIMB PWR REQ	Climb Power required is greater than climb power available. This condition will also display the EXCS CLIMB PWR FPx LGxxx variable OID, where FPx LGxxx are the flight plan and leg number where the error occurs. Access the flight leg modify control layers. Adjust profile as re-quired.
EXHAUST DFTR FAIL (L/R)	Coanda bleed valve fail or, exhaust deflector pressure switch fail.

ADVISORY	ACTION/INFORMATION
EXTERNAL ICS FAULT	The audio amp has failed and ICS communication with the external ICS station is not possible. All other communication is normal. Verify ICS monitor knobs are clicked into appropriate detent positions.
FADEC A FAIL (L/R) (AADV)	**1. Automatic FADEC transfer — CONFIRM** **2. Land as soon as practical.**
FADEC AUTO XFR FLT (L/R)	**1. Land as soon as practical.**
FADEC B FAIL (L/R) (AADV)	**1. Automatic FADEC transfer — CONFIRM** **2. Land as soon as practical.**
FADEC LIMITING (L/R) (AADV)	L/R ENG FADEC in control has detected that Ng, Np, Qe, or MGT has reached its steady state limit (Ng 100%, Np 105%, Qe 101% (engine torque), MGT 852° C).
FADEC MAN XFR FLT (L/R)	**1. Land as soon as practical.**
FEATHERING HIGH	FEATHERING HIGH: The advisory indicates impending heat buildup in elastomeric bearings. If the rotor conditions are high enough duration the advisory will progress to HIGH HOT caution. Although no immediate action is required, the FFR should be utilized to reduce the current rotor condition. Feathering is the highest during CONV operations. APLN at low angle or VTOL at low airspeed (< 40 KCAS) is recommended.

ADVISORY	ACTION/INFORMATION
FEED LEVEL CONTR (L/R)	Indicates that the FEED TANK LVL CONTROL VALVE or the Pressure Shut-Off valve has failed. This will also post when the feed tank quantity exceeds 675 lbs for 5 seconds. If feed tank quantity exceeds 675 lbs, the L/R FEED TANK OVERFILL will also post. If feed quantity falls below 675 lbs, the OVERFILL message will clear, but the FEED LEVEL CONTR message will not clear until FMGS is reset.
FLAPERON FAULT **(AADV)**	A single actuator has failed **1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
FLAPPING HIGH **(AADV)**	FLAPPING HIGH: The advisory indicates impending heat buildup in elastomeric bearings. If the rotor conditions are high enough duration the advisory will progress to HIGH HOT caution. Although no immediate action is required, the FFR should be utilized to reduce the current rotor condition. Flapping is the highest during operations between 35 and75 ° nacelle. Nacelle less than 35 ° will clear this advisory. Flapping is most critical during operations at approximately 60 ° nacelle, high GW, forward cg, and high DA.
FLAPPING SENSOR FLT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**

ADVISORY	ACTION/INFORMATION
FLARE BINGO	Flare low stores level reached in auto or semi-auto mode. No action required, expendables will continue to be dispensed. The bingo limit is programmed into the ALE-47. ALE-47 can be programmed to stop dispensing when bingo limit is reached. If this occurs cycle Flare ON/OFF switch on cockpit control unit to reset bingo to 0.
FLIR FAIL	FLIR periodic BIT is indicating a TFU of SEU failure, or there is a 1553 failure.
FLIR OVER-TEMP	FLIR TFU or SEU indicating an overtemp condition. If conditions permit, FLIR - OFF.
FLIR VIDEO READY	FLIR has sufficiently cooled and infrared imagery is available, and the FLIR gyros are ready.
FLT DATA RCDR FAIL	The flight incident recorder has failed.
FLT DIR PANEL FAIL	Flt director panel PBIT fail.

ADVISORY	ACTION/INFORMATION
FPLN CG EXCEED-ED	Planned (future) cg exceeds the aircraft forward or aft cg limit. When this alert is displayed, STAT selection key accesses the Flight Plan Leg Weight and Balance Control Layer for the Flight Plan Leg on which the error occurs. This condition will also display the EXCS AFT CGxxx FPx LGxxx or EXCS FWD CGxxx FPx LGxxx variable OID, where CGxxx is the fwd or aft amount by which the cg limit is exceeded and FPx LGxxx are the flight plan and leg number where the error occurs.
FPLN EXCESS PWR REQD	Future leg Hover Power Required out of ground effect is greater than future leg power available, or Cruise or loiter future leg power required is greater than the cruise or loiter future leg power available. When this alert is displayed for processing, STAT key selection will access the Flight Plan Leg Modify Control Layer Menu 1. This condition will also display the EXCS PWR REQ FPx LGxxx variable OID, where FPx LGxxx are the flight plan and leg number where the error occurs.
FPLN GW EXCEED-ED	Planned (future) Gross Weight exceeds aircraft gross weight limit. When this alert is displayed, STAT key selection accesses the Flight Plan Leg Weight and Balance Control Layer for the Flight Plan leg on which the error occurs. This condition will also display the GW EXCEEDED FPx LGxxx variable OID, where FPx LGxxx are the flight plan and leg number where the error occurs.

ADVISORY	ACTION/INFORMATION
FUEL DUMP VLV FAIL	Dump valve has failed. May be failed closed or partially open. This valve is not BIT checked so this will be undetected until Fuel Dump is selected.
FUEL ESTIMATE	A sensing element has malfunctioned, and an accurate measurement of fuel in a particular tank may not be possible. This alert is displayed if any tank quantity is being estimated. The affected tanks will turn yellow on the fuel status layer. Tanks include R/L Wing Aux, L/R Forward Sponson, R Aft Sponson, L/R Feed, and Mission AUX tanks. At power-up, the FMU determines which tanks are installed and equates absent tanks as zero quantity.
FUEL PROBE FAULT	This indicates that the ARRP has failed to reach its commanded position within 3 minutes. This condition may occur if the probe is jammed, the ABIU fails to communicate with JASS, or if the aircraft experiences a HYD 3 FAIL or UTIL SYSTEM INOP. Perform the following: 1. PROBE OFF/EXTEND. STOW — PROBE OFF 2. UTIL OPEN/ CLOSE — CLOSED (On the FCS/HYDRAULIC system status page) 3. Manually extend and lock or retract and lock the probe as required 4. Select UTIL isolation valve open as needed for other operations.

ADVISORY	ACTION/INFORMATION
GEAR EMERG DOWN FAIL	The emergency extend solenoid used for back up gear extension (Blow Down) is inoperative. Attempt to operate gear normally. If Gear unsafe indications, execute Landing With Hung Gear emergency procedure. **NOTE** The gear up/down switches are dual redundant. Complete loss of the up/down switches will be indicated by a gear unsafe or gear not down and locked indication.
GPS 2 HR TO INOP	There are 2 hours left for the current codes loaded in the GPS.
GPS DAY KEY INOP	Incorrect codes are in GPS and the best GPS quality data is not available.
GPS MONITOR FAULT	**[MAGR 2000 Block B]** The GPS horizontal or vertical limit has been exceeded or it is unable to detect and report an exceedence due to less than 5 satellite vehicles.
GPS PERFOR-MANCE DEGR	**[MAGR 2000 Block B]** The GPS solution is valid, but degraded due to poor satellite signal quality or GPS is not in sync with LWINS.
GPS FAIL	GPS has failed and is providing no data. It does not post if satellites are lost. Verify INS nav mode and perform manual updates with OVERFLY or TACAN.
HATCH OPEN (FWD/AFT/ BOTH)	External cargo hook hatch(s) open.

ADVISORY	ACTION/INFORMATION
HDG DISAGREE	There is a difference in heading of more than 1° between any of the INSs.
HDG X FAIL (1/2/3)	A single INS has an invalid heading. Attempt realignment of failed source.
HOIST SQUIB FAIL	The rescue hoist squib has failed.
HOOK OPEN (FWD/AFT/BOTH)	Cargo hook(s) open.
HYD HEATER ACTIVE	The FCS has activated warm-up of the hydraulic systems and ECLs are in the OFF positions. Do not attempt engine start or FCS PFBIT until hydraulic warm-up cycle is complete.
HYD HEATER FAIL (AADV)	Thermal control in any of the hydraulic systems failed with ECLs in the OFF positions.
HYD HEATER FAULT	Any of the hydraulic system control valves failed and the ECLs are in the OFF positions or any of the hydraulic systems temperature sensors failed and ECLs are in the OFF positions.

ADVISORY	ACTION/INFORMATION
HYD X COLD (1/2/3)	Hydraulic system No. X fluid temperature is indicating < -18 ° C **1. Land as soon as practical** **NOTE** Exercising the flight control with small cyclic inputs (approx 1/4 inch in amplitude) will warm up the hydraulic fluid and may be enough to extinguish this annunciation. If erratic or sluggish flight control response is noted in CONV or VTOL, prior to landing: **2. Affected system — OFF.**
HYD X HEAT CONT FAIL (1/2/3) (AADV)	Hydraulic system thermal control system failed.
HYD X PRESS HIGH (1/2/3) **(AADV)**	**1. EAPS — OFF (If sys 3)** **2. Maneuver Severity — Reduce** **3. HYD SYS (Affected) — OFF** **CAUTION** If a suitable landing area is not available or landing must be delayed, transition to APLN to reduce heat generation, provide more ram air cooling, and reduce time to land. **4. HYD 1 (2) (3) Fail Procedure — As required** **5. If HYD HOT continues, or posts following HYD PRESS HIGH — LAND AS SOON AS POSSIBLE.**

ADVISORY	ACTION/INFORMATION
HYD X RSVR LOW (1/2/3) **(AADV)**	Hydraulic system X reservoir has lost fluid and there is a potential leak. Reservoir level indications are yellow. This level will vary with HYD X fluid temperature. If the reservoir falls below the critical levels, the HYD X LEAK (UTIL SYSTEMS INOP for HYD3) and/or HYD X FAIL cautions are posted. HYD SYS 3 may be selected OFF to preserve HYD SYS 3 after a HYD 3 RSVR LOW indication. **WARNING** Do not turn OFF HYD SYS 1 or 2. Leak detection/isolation logic assumes HYD SYS 1 and 2 are primary to providing hydraulics to the swashplate actuator. Loss of HYD SYS 3 and the primary system can result from a single leak.
ICE DETECTED	Ice has been detected.
INBD MFD FAIL (L/R)	A malfunction has been detected in the inboard MFD. Attempt recovery through power cycle.
INBD MFD HOT (L/R)	Overheat condition has been sensed in the inboard MFD. This condition will likely lead to MFD FAIL. MFD off until/unless required.

ADVISORY	ACTION/INFORMATION
INS 1/2/3 ALIGN FAIL	INS 1, 2, and 3 are in an alignment mode and have exceeded the required time to complete the alignment. This time varies depending on the alignment mode. Power shed LWINS OFF. Verify correct LAT/LONG and Power shed LWINS ON and attempt realignment.
INS X/Y ALIGN FAIL (1/2, 1/3, 2/3)	INS X and Y are in an alignment mode and have exceeded the required time to complete the alignment. This time varies depending on the alignment mode. Power shed LWINS OFF and verify correct LAT/LONG. Power shed LWINS ON and attempt realignment.
INS X ALIGN FAIL (1/2/3)	The INS is in an alignment mode and has exceeded the required time to complete the alignment. This time varies depending on the alignment mode. Power shed LWINS OFF and verify correct LAT/LONG. Power shed LWINS ON and attempt realignment.
INS X FAIL (1/2/3)	A Single INS has stopped communicating with the FCC or MC or has declared a BIT failure or the INS time tag is not incrementing. TWO good INS units are still available. Mission and flight characteristics are unaffected.

ADVISORY	ACTION/INFORMATION
IPS AUTO MODE FAIL	Ice Protection Auto Mode Fail or, left or right ice detector has failed or, true airspeed is invalid. *If Icing conditions are possible or +4 °C advisory posted:* **1. IPS All Modes — ON** **2. PROPROTOR DE-ICE to LIGHT if OAT is ≥ -10 °C/MODERATE if OAT is < -10 °C** **3. WING DE-ICE to LIGHT if OAT is ≥ -10 °C/MODERATE if OAT is < -10 °C.**
JUMP SEAT ICS FAULT	Jump seat ICS has failed and communication with that unit is not possible. Verify ICS monitor knobs are clicked into appropriate detent positions.
KEY-BOARD FAIL (L/R)	CDU keyboard PBIT fail. Attempt recovery through power cycle [L-CDU KEYBD L (1L6); R-CDU KEYBD (OHB9)].
LANDING GEAR ABORT	The landing gear has not successfully completed an up or down transition cycle. If Gear unsafe indications, execute Landing Gear Fails to Extend/Retract emergency procedure. **NOTE** This alert is the same as the gear handle staying lit after a gear handle transition.

ADVISORY	ACTION/INFORMATION
LAND GEAR FAULT	The Landing Gear Control Unit has detected a BIT fault or the Landing Gear Control Solenoid Valve has failed. Normal Landing Gear operation may or may not be affected. Overspeed and Gear Up Landing protection may be inoperative. Attempt to operate gear normally. If Gear unsafe indications, execute Landing Gear Fails to Extend emergency procedure. **NOTE** The gear up/down switches are dual redundant. Complete loss of the up/down switches will be indicated by a gear unsafe or gear not down and locked indication.
LAT FEEL FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
LAT TRIM FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
LONG FEEL FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
LONG TRIM FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
MAP FAIL	Loss of 1553 communication with DMS or improper 1553 communication. Cycle DMS off, then on.

ADVISORY	ACTION/INFORMATION
MAP FAULT	Indicates that DMS has detected a fault or failure. Cycle DMS off, then on.
MAP MODE ERROR	When the Digital Map has not responded in the amount of time specified for that function, an alert will be set to alert the pilot that the DMS is not functioning properly. Upon a successful response from the Digital Map, the alert shall be cleared/reset.
MISSION CMPTR X FAIL (1/2)	*On ground,* **1. Failed MC — POWERSHED ON** *If displays do not recover within 20 seconds: Execute Dual MC FAILURE (On Ground) (Advisory) Procedures.* *If flight, if mission requires recovery of dual MC capability,* **1. Failed MC — POWERSHED ON.** **NOTE** All MSN data, CDU defaults, and ACFT INIT must be verified and/or reestablished. These include: MC 1, MC 2, FLIR, DIG MAP, INS 1/2/3 ON, ECS, LTS, CDU default layers, ACFT INIT INS alignment/position, heading, COMM modes, mission data, declutter levels, EAPS/EXDEF, transfer valve/pumps, AR/HIFR, SYS STATUS, C/A Summery, cockpit displays, and IFF modes checked/set.
MISSION CMPTR X HOT (1/2)	MC X is hot.
MODE 4 CMPTR FAIL	KIT-1C not installed or failed.

ADVISORY	ACTION/INFORMATION
MODE 4 REPLY	A valid Mode 4 interrogation has been received and a valid reply has been sent. Conditions: Mode 4 must be enabled, mode annunciator must be enabled.
MULT FLPING SNSR FLT	FCCs detect more than one flapping sensor failure on a side. Additional failures will lead to FLAPPING SENSOR FAIL. **1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
MULTI CVRSN ACTR FLT (AADV)	**1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
MULTI FLAP FAULT (AADV)	**1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
MULTI NAC CONTR FLT	This may lead to CVRSN ACTR FAULT or CRIT CVRSN ACTR FLT. **1. Maneuver Severity — Reduce** **2. PFCS — RESET.**
MULTI NR SENSOR FLT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET.**

ADVISORY	ACTION/INFORMATION
MULTI SWPL FAULT **(AADV)**	**1. Maneuver Severity — Reduce** **NOTE** FCCs inhibit PFCS RESET above 200 KCAS for certain swashplate actuator faults. A reduction below 200 KCAS may be necessary to possibly reset a fault and regain redundancy. **2. PFCS — RESET** *If advisory fails to clear:* **3. Land as soon as practical.**
MWGB CHIP BURN	Chips or debris have been detected in MWGB and burned off. There is no specific limit to the number of successful chip burns in-flight. Monitor for secondary failure indications.
MWGB PRESS HIGH **(AADV)**	*100 psi < MWGB PRESS ≤ 150 psi (Red Range):* **1. Land as soon as possible** *65 psi < MWGB PRESS ≤ 100 psi (Yellow Range):* **2. Land as soon as practical.**
MWGB PRESS LOW	**Land as soon as practical.**
NAC CONTR FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**

ADVISORY	ACTION/INFORMATION
NAV 1/2/3 FAIL	INS 1, 2, and 3 are unable to provide position, ground speed, and ground tract data. **1. Maintain VMC** **2. NAV ALIGN — Verify in progress or select INS for manual alignment if GPS NAV Alignment fails** **3. Land as soon as practical** **4. Power Shed Failed INS's Off/On to attempt GC alignment if other alignment attempts fail.**
NAV READY	All 3 INS have completed the alignments.
NAV X/Y FAIL (1/2, 1/3, 2/3)	INS X and Y are unable to provide position, ground speed, and ground tract data. **1. NAV ALIGN — Verify in progress or select INS for manual alignment if GPS NAV Alignment fails** **2. Land as soon as practical** **3. Power Shed Failed INS's Off/On to attempt GC alignment if other alignment attempts fail.** **NOTE** • Utilize standby instruments. • Pilot workload will increase due to loss of rate stability provided by gyros. • STRL LOAD LIMIT FAIL may post.
NAV X FAIL (1/2/3)	The INS is unable to provide position, ground speed, and ground tract data.
NEW EOB	A new EOB has entered the system. Clear EOB (T2, R6, L4) on EOB EDIT layer restores DME indication.

ADVISORY	ACTION/INFORMATION
NO AJ FILL	No valid MWOD or TRANSEC has been entered for the frequency list, radio, and mode selected.
NO HQ DOM	No valid HQ Day of Month (DOM) has been entered for the frequency list and radio selected.
NO HQ TIME	No valid HQ Time of Day (TOD) has been entered for the frequency list and radio selected.
NO RADIO SELECT-ED	When UPDATE is selected and ICS switch is not on radio 1 or 2.
NO SINC-GARS DOM/TIME	No valid SINCGARS day or time is available for the frequency list and radio selected.
NR SENSOR FLT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
OUTBD MFD FAIL (L/R)	A malfunction has been detected in the outboard MFD. Attempt recovery through power cycle.
OUTBD MFD HOT (L/R)	Overheat condition has been sensed in the outboard MFD. This condition will likely lead to MFD FAIL. MFD off until/ unless required.
PARTIAL NAV READY	At least 1 INS has completed a full align-ment.

ADVISORY	ACTION/INFORMATION
PFCS FAIL RESET	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
PILOT HUD FAIL (L/R)	SDC is not communicating with the Mission Computer, SDC fail, or Left pilot HUD status is failed and Right pilot HUD is failed. Attempt recovery through power cycle.
PILOT ICS FAULT (L/R)	Pilots ICS has failed and communication with that unit is not possible. Verify ICS monitor knobs are clicked into appropriate detent positions.
PLANNED SPD GATE ERR	When the computation of a Future Approach Leg of a current Flight Plan or any Approach Leg of an alternate Flight Plan results in a determination that the leg is too short to accommodate the calculated speed gate.
PMG X FAIL (1/2)	PMG BIT shall be set to one when the FCC PBIT detects a PMG failure. PMGs provide primary power for FCCs. However, backup power for FCCs is provided by the DC bus and the Ess/Bat Bus. GENERATOR 3/4 FAIL may also be posted.
POSITION DISAGREE	There is a difference in estimated horizontal error of more than 250 meters between any of the INS's. Check NAV Raw Data page for erroneous LWINS or GPS. Attempt INS realignment.

ADVISORY	ACTION/INFORMATION
POWER LIMITING **AADV**	L/R ENG FADEC in control has detected that Ng, Np, Qe or MGT has reached steady state limits: Ng (100%), Np (105%), Qe (108%), MGT (852 °C) or 100% Power Demand Signal (PDS) has been reached.
PRESSURE SOV IN TEST	Pressure shut off valve in test. This BIT is automatically initilized once per flight and may last as long as 15 minutes. The advisory posts simply to let the crew know it is running. It can be acknowledged to the C/A stack immediately. The crew cannot stop the test once it has begun. The following conditions must also be met for the PSOV test to begin: **1. BOTH engines running for more than 20 seconds** **2. BOTH engines burning more than 600 pph for at least 20 seconds.** **NOTE** Once the PSOV test has started, the FMU will exit the test if an engine burns less than 600 pph for greater than 5 seconds. The FMU will restart the test when the stated conditions are again met**.**
PRGB CHIP BURN (L/R)	**1. Advisory — ACKNOWLEDGE** *If 3 consecutive L (R) PRGB CHIP BURN advisories post during one continuous flight operation:* **2. Land as soon as practical.**
PRGB PRESS HIGH (L/R) **(AADV)**	*PRGB PRESS > 150 psi (Red Range):* **1. Land as soon as possible** *95 psi ≤ PRGB PRESS ≤ 150 psi (Yellow Range):* **2. Land as soon as practical.**

ADVISORY	ACTION/INFORMATION
PRI LIGHT CONTR FAIL	Primary lighting control unit has failed, or Lighting ARINC-429 serial control failure.
RAD ALT INOP	The radar altimeter has failed or is not providing a valid signal. This advisory will be posted at approximately 5000 ft AGL, which is the upper limit of the V-22 radar altimeter. A large roll angle can induce this advisory.
RFIS FAIL (L/R)	RFIS malfunction.
ROTOR BRAKE FAIL	L/R rotor brake caliper position sensor 1 or 2 failed. Normal shutdown is recommended. **NOTE** If rotor brake engages, first indication may not be annunciated with ROTOR BRAKE ON.
RUDDER FAULT **(AADV)**	**NOTE** Expect reduced yaw authority and increase susceptibility to lateral-directional oscillations in APLN and CONV flight. **1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If Alert Advisory fails to clear:* **3. Airspeed — < 200 KCAS** **4. DA — < 10,000 ft** **5. Land as soon as practical.**
SAME ATT SOURCE	The PF and PNF have selected the same INS for display of attitude data. Select different attitude sources if available.
SATCOM FAIL	The SATCOM has failed.

ADVISORY	ACTION/INFORMATION
SDC INOP	Inlet guide vanes and/or surge control valve fail to move to proper position. With a WRA failure and when the SDC INOP advisory is posted, the solenoid has failed.
SEC LIGHT CONTR FAIL	Secondary lighting control unit failed.
SPSN BST PUMP FAIL (L/R)	Sponson Boost Pump has failed. There are no altitude restrictions with this problem. However, if the suction lift pump looses prime, then the feed tank will eventually post a FEED TANK LOW. No impact to AR or hot refuel if failed off. However, if failed on, refueling may be impacted into the associated tank. Fuel Dump rate will be affected.
SPSN BYP VLV FAIL (L/R)	Sponson Pump Bypass Valve has failed. The motor for the bypass valve has failed to reach its commanded position. If valve fails closed, it will not be able to refuel this sponson during AR or hot refuel. If valve fails open, fuel will remain in fuel manifold underneath the cabin causing a potentially hazardous condition during hard landings.
SPSN RFL VLV FAIL (L/R)	Sponson Refuel Valve has failed. The motor for the refuel valve has failed to reach its commanded position. If valve fails closed, it will not be able to refuel this sponson during AR or hot refuel. If valve fails open, fuel will remain in fuel manifold underneath the cabin causing a potentially hazardous condition during hard landings.

ADVISORY	ACTION/INFORMATION
SRCH LIGHT ON (L/R)	Search/landing light unstowed/on. **NOTE** This advisory will be displayed immediately after the TCL button is pressed when unstowing.
SRCH LIGHT STOWED (L/R)	Search/landing light stowed.
STALL WARNING FAIL	**1. PFCS — RESET.**
STRL LOAD LIMIT FLT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
SWPL FAULT **(AADV)**	**1. Maneuver Severity — Reduce** **NOTE** FCCs inhibit PFCS RESET above 200 KCAS for certain swashplate actuator faults. A reduction below 200 KCAS may be necessary to possibly reset a fault and regain redundancy. **2. PFCS — RESET** *If advisory fails to clear:* **3. Land as soon as practical.**
TACAN RCVR FAIL	TACAN is failed and is providing no data or has a 1553 failure.
TAGB CHIP BURN (L/R)	**1. Advisory — Acknowledge.**

ADVISORY	ACTION/INFORMATION
TAGB PRESS HIGH (L/R) **(AADV)**	*TAGB PRESS > 150 psi (Red Range):* **1. Land as soon as possible** *95 psi < TAGB PRESS ≤ 150 psi (Yellow Range):* **2. Land as soon as practical.**
TAGB PRESS LOW (L/R)	**1. Maneuver Severity — Reduce** *If extended flight is required:* **2. APLN — TRANSITION** **3. Land as soon as practical.**
TCL OVER-TRAVEL	Signal is sent when TCL Overtravel is activated by a push of the TCL OTVL button.
TCL TRIM FAULT	**1. Maneuver Severity — Reduce** **2. PFCS — RESET** *If advisory/caution fails to clear:* **3. Land as soon as practical.**
TIME LIMIT MGT	Operating the engine above maximum continuous operating temperature reduces the life of engine components, but is not immediately detrimental to engine operation.
TORQUE SENSOR FLT (L/R) (AADV)	FCCs detect a single torque sensor failure on the side indicated. This may lead to TORQUE SENSOR FAIL.
TROOP CMDR ICS FAULT	Troop commanders ICS has failed and communication with that unit is not possible. Verify ICS monitor knobs are clicked into appropriate detent positions.

ADVISORY	ACTION/INFORMATION
UTIL VALVE JAMMED (AADV)	Utility Isolation Valve has been determined by FCCs to be jammed either in the open or closed position. This alert is cascaded by UTIL SYSTEM INOP caution.
VERIFY FPLN CARGO WT	This alert is displayed upon receipt of a flight plan activation operator command when a flight plan is already active. When this alert is displayed, STAT key selection accesses the Cargo Summary Control Layer for the newly activated flight plan.
VOR/ILS RCVR FAIL	VOR/ILS is failed and is providing no data or has a 1553 failure.
VSLED FAIL	VSLED has failed.
VSLED MEMORY FULL	VSLED memory is full and is not capable of performing current operation.
WNG FIRE DISCHARGE (L/M/R)	One or more of the five left or right wing gas generators has discharged, or failed BIT with an open squib in SBIT, or open squib in PBIT after a fire. **1. Land as soon as practical.**
WYPT INTERCEPT IMPOS	Impossible intercept of a waypoint.

ADVISORY	ACTION/INFORMATION
XFER VALVE FAIL	Cross transfer valve has failed. This indicates that the motor operated cross transfer valve has failed to reach its commanded position. This will affect fuel burn sequence if valve fails closed during the aft sponson burn phase. Will also affect fuel availability during single engine. Failed closed will lead to uneven fuel burn and potential LAT CG EXCEEDED.

ITEMS INDICATED BY AN ASTERISK (*) SHALL BE COMPLETED WITHOUT REFERENCE TO THE CHECKLIST. TIME PERMITTING, REVIEW/COMPLETE THE PROCEDURE UTILIZING THE POCKET CHECKLIST TO ENSURE COMPLETENESS.

ABNORMAL STARTS

Abnormal starts are categorized as Wet, Hung, or Hot Start.

NOTE

- Fuel Venting in a single steady stream from the FPMU/CVG actuator drain line throughout the start is indicative of the FPMU's mechanical Air Vent Valve (AVV) not fully seating. Air-entrained fuel venting from the IR suppressor FPMU/CVG actuator drain line may occur during start to allow purging of air from the FPMU following aircraft fuel system and/or engine maintenance actions. No fuel venting should occur at idle.

- Fuel dripping from several areas of the engine exhaust/IR suppressor is indicative of an abnormal fuel system leak or a failure to achieve ignition.

If fuel is exiting the IR suppressor, Ng fails to accelerate to idle within 60 seconds, or MGT exceeds the following values:

>835 ° C for more than 1 second, or

>807 ° C for more than 3 seconds, or

>779 ° C steady state

***1. ECL . . . . . CRANK (up to 60 seconds)**

If MGT is within normal limits and nacelle is dry:

***2. ECL — OFF**

3. FADEC — SWITCH

CONTINUED

4. Second Start — Attempt

If second start is abnormal, execute the above steps as required and discontinue additional start attempts until additional troubleshooting can be completed.

DIRECTIONAL CONTROL PROBLEMS

NOTE

If NOSEWHL STEER FAIL CAUT is posted upon engaging nosewheel steering, nosewheel could be beyond its normal range ±75 ° of center. Taxi forward and attempt to re-engage.

1. Brakes . . . . . APPLY
***2. Nacelles. . . . . As required TO STOP**

If aircraft cannot be stopped:

***3. Vertical takeoff . . . . . ATTEMPT**

If unable to takeoff:

***4. Emergency Shutdown . . . . . EXECUTE**

DUAL MC FAILURE (ON GROUND) (ADVISORY)

1. MC circuit breakers (1A3, 2A8, 3G6). . PULL
2. AFCS . . . . . Off

After 10 seconds:

3. MC 1 and MC 2 circuit breakers (1A3 and 2A8) . . . . . .RESET SIMULTANEOUSLY

If dual or single capability is restored within 20 seconds, go to step 8:

4. MC 1 and MC 2 and B/U circuit breakers (1A3, 2A8, and 3G6) . . . . . PULL
5. MC 1 circuit breaker (1A3). . . . . .RESET

CONTINUED

If MC 1 capability is restored within 20 seconds, go to step 8:

6. MC 1 circuit breaker (1A3). . . . . PULL
7. MC 2 circuit breaker (2A8). . . . . RESET

If MC 2 capability has been restored:

8. MC B/U PWR circuit breaker (3G6). . RESET
9. AFCS . . . . . ON
10. PFCS . . . . . Reset

NOTE

Following recovery procedures, all MSN data CDU defaults, and ACFT INIT information must be reestablished and/or verified. These include: MC 1, MC 2, FLIR, DIG MAP, and INS 1/2/3 ON, ECS, LTS, CDU default layers, ACFT INIT, INS alignment/position, heading, COMM modes, mission data, declutter levels, EAPS/EXDEF, transfer valve/pumps, AR/HIFR, SYS STATUS, C/A Summary, cockpit displays, and IFF modes checked/set.

EMERGENCY SHUTDOWN

***1. ECLs . . . . . OFF**
***2. T-handles . . . . . ARM**
***3. ROTOR BRAKE . . . . . ON**

CAUTION

If the reason for the emergency shutdown is due to a midwing fire or midwing accessories, do not use the ROTOR BRAKE for shutdown.

***4. APU . . . . . STOP**
***5. BATTERY . . . . . OFF**
6. Egress . . . . . As required

FADEC A/B FAIL (L/R) ON START/PRE-START

If EITHER FADEC A/B FAIL (L/R) caution or ENG FADEC PWR FAIL (L/R) is indicated prior to starting or re-starting the affected engine:

1. **ECL (affected engine) . . . . . Confirm OFF**
2. **FADEC C/Bs (affected engine) . . . . . Cycle**
3. **All FADEC WCAs . . . . . Verify clear**
4. **All FADEC WRAs . . . . . Verify set to (P)**
5. **PFCS . . . . . RESET**
6. **Engine start . . . . . Execute**

NOTE

- If the crew clears a caution, advisory or WRA F(P) status by cycling power to the FADEC, the crew shall re-attempt start on the FADEC that was in control when the fault(s) first occurred
- The affected engine will not be probhibited from starting with a FADEC fault. However, the Flight Control System will be degraded, resulting in excessive operation of the starter motor, suppression of engine failure WCA and loss of redundancy for the detection of TCRS failures. FADEC faults that occur after a successful engine start will not result in this degradation of the FCS.

UNCOMMANDED ENGINE ACCELERATION

If the aircraft becomes inadvertently airborne or is in-flight:

1. ***TCL . . . . . Full forward**
2. ***Aircraft Profile . . . . . STABILIZE**

If chained to the deck or still on the ground:

3. ***ECLs . . . . . OFF**

CONTINUED

Once stable:

4. **FADEC transfer, auto or manual . . . . . .CONFIRM or SELECT**
5. **Engine response to TCL . . . . . CHECK**

If both engines respond to TCL:

6. **Land as soon as practical**

If high side engine does not respond to TCL:

7. **Single Engine Profile . . . . . .ESTABLISH**
8. **ECL (high side engine) . . . . . .Slowly retard to off**
9. **T-handle (high side engine) . . . . . .ARM**
10. **SINGLE ENG LANDING (EW-4) . . CONDUCT**

UNCOMMANDED WING ROTATION

CAUTION

In the event of a BFWS hydraulic system failure, releasing the switch will not stop the sequence. Hydraulic power supplied by the APU or external hydraulic power must be removed immediately from an uncommanded wing rotation. After hydraulic power is removed, the wing will coast to a stop within approximately 4 ft. Delay in removing hydraulic power will result in damage to the aircraft.

***1. APU . . . . . STOP**

If using external hydraulic power:

***2. Notify power cart operator to shutoff hydraulic power**

NOTE

- While on external power, deselecting HYD 3 power from the FCS/HYD STAT page will not secure HYD 3 system and the wing will continue to be driven by external power.

CONTINUED

- If Uncommanded Wing Rotation is observed, a maintenance inspection of the system should be completed.

WHEEL BRAKE OVERHEAT/FIRE

WARNING

Wheel brake overheating/fire may cause wheel to explode. DO NOT approach or discharge portable fire extinguisher on a wheel brake fire.

WARNING

Do not retract landing gear in the event of brake overheating/fire or failure due to close proximity to fuel lines.

1. If excessive heat or fire are observed:

***1. Signal . . . . . HOT BRAKES**

***2. Crash, Fire, and Rescue personnel . . . . . ALERT**

***3. Nosewheel . . . . . CHOCK**

AIR REFUELING COMPONENTS STRIKES AIRCRAFT

If aerial refueling components impact the aircraft:

1. **Maneuver Severity . . . . . Reduce**
2. **Controllability Check . . . . . COMPLETE**
3. **Land as soon as possible**

If rotor vibration increases:

4. **Nacelles . . . . . 10°**
5. **TCL . . . . . As required to reduce vibration**
6. **Maintain 10° nacelle until conversion required for landing**
7. **Land immediately, minimize time in CONV/VTOL Mode (ROL recommended)**

AIR REFUELING, STUCK - CONNECTION / HOSE - GUILLOTINE

If a receiver tiltrotor is unable to disconnect from the tanker during air refueling after a significant breakaway force has been applied:

1. **Ensure tanker aircraft has turned off all pumps used for aerial refueling, to reduce system pressure.**
2. **Conduct normal disengagement procedure, taking care to position the aerial refueling probe directly inline with tanker refueling hose to prevent an offcenter disconnect.**

WARNING

Initiating a forceful breakaway may cause an air refueling component failure, creating FOD that could strike a proprotor. Impact could be catastrophic.

CONTINUED

NOTE

Disengaging while in a turn may cause an offcenter disconnect, making a probe failure more likely.

If disconnect was successful

3. **Maneuver down and outboard to an observation position**

If disconnect attempts are not successful:

4. **Step Up . . . . . Increase (Maintain sight with tanker and push into minimum A/R range)**
5. **Receiver Xmit . . . . . "Hose Jettison"**
6. **Tanker . . . . . .Guillotines Hose**

WARNING

After the hose has been cut from the tanker, it may whip back into the proprotor and result in severe damage.

NOTE

The receiver will experience a slight pitch down when the hose is jettisoned.

7. **Flaps . . . . . .Select 20°**
8. **Breakaway . . . . . .Initiate**

NOTE

Slow to an airspeed commensurate with stability and flight characteristics of the hose.

9. **Air Refueling Checklist . . . . . .Complete**
10. **Land as soon as possible. Conduct the approach and vertical landing from a high hover.**

AIR REFUELING WITH A FAILED FMU

When conducting aerial refueling with a failed FMU the following checklist should be used:

1. **EMERG AR VALVES Switch (mission auxiliary tank, failed side. . . . . .AR position**
2. **Record estimated total fuel quantity and start time. Monitor engine fuel burn rates.**
3. **FUEL STAT page . . . . . .Select**
4. **AERIAL REFUEL layer. . . . . .Select**
5. **AIR/HIFR . . . . . .Select**
6. **FCS AERIAL REFUEL . . . . . .Select**
7. **FCS STAT page . . . . . .Select**

Refuel the aircraft to desired capacity.

CAUTION

Immediately cease aerial refueling (normal disconnect) operations if any of the following tank levels are exceeded:

- Feed tanks — 650 lbs
- Wing auxiliary tanks (if installed) — 2050 lbs
- Fwd sponson tanks — 3300 lbs
- Aft sponson tank (if installed) — 2110 lbs
- MATS (if installed) — 2875 lbs

CAUTION

If the feed tank on the functional side reaches 675 lbs for 5 seconds an overfill advisory will be posted and the fuel system will automatically deselect from AR mode. Reselecting AIR/HIFR will reconfigure the aircraft to continue aerial refueling. However, automatic control of the failed feed tank will no longer be active and may lead to feed tank overfills and/or rupture disc failure and fuel venting.

CONTINUED

8. **AERIAL REFUEL layer . . . . . Select**
9. **AIR/HIFR . . . . . .Select off**
10. **FCS AERIAL REFUEL . . . . . OFF**
11. **EMERG AR VALVE switch . POST AR position**
12. **Obtain the transferred fuel quantity from the tanker. Calculate a new estimated total fuel quantity based on the following equation:**
    - Estimated total fuel quantity + transferred fuel quantity - [(start time - current time) x average combined engine fuel burn rate] = new estimated total fuel quantity.
13. **Enter the new estimated total fuel quantity to reset FMU estimated total fuel.**
14. **EMERG AR VALVE switch . . . . . .NORM position**

COCKPIT OR CABIN FIRE IN-FLIGHT

***1. EMERGENCY OXYGEN . . . . . ON**
***2. Oxygen Masks . . . . . DON**
***3. Portable fire extinguishers . . . . . EMPLOY**

If fire is not in cockpit:

***4. Cockpit door. . . . . CLOSE**

If fire persists:

***5. Land immediately**

If fire is extinguished:

6. Smoke and Fume Elimination Checklist. . . . . CONDUCT

DUAL MISSION COMPUTER FAILURE or FROZEN DISPLAYS (IN-FLIGHT)

If MCs recover:

1. Mission Computer Post Failure Cleanup . . . . . CONDUCT

If displays do not recover within 20 seconds:

NOTE

- Frozen “NO COMM“ flight displays are indicative of a dual mission computer failure. With frozen flight displays, the MFD’s and CDU/EICAS will not respond to bezel key inputs, but the standby flight instruments, SFD, and ARC-210 control head will function normally.
- For all MC failures, COMM 1 will remain turned to the last selected frequency with the ARC-210 control head off. Use ARC-210 control head.

2. MC C/Bs (1A3, 2A8, 3G6). . . . . PULL

CONTINUED

After 5 seconds:

3. MC 1 C/B (1A3) . . . . . RESET

If MC 1 capability is restored within 20 seconds, go to Step 5:

4. MC 1 C/B (1A3) . . . . . PULL
5. MC 2 C/B (2A8) . . . . . RESET
6. MC B/U PWR C/B (3G6) . . . . . RESET
7. PFCS . . . . . RESET

If single MC capability has not recovered after 20 seconds:

8. Land as soon as practical

NOTE

Following recovery of a dual MC fail:

- NORM FLIGHT OPS must be selected.
- Executing the dual MC fail procedure will result in single MC mode operation.

9. Landing gear . . . . . EMERG DOWN (AS REQUIRED) (Allow 20 seconds for extension)

CAUTION

With a Dual MC Failure there will be no airspeed signal to the ABIUs. If the Dual MC Failure occurred at an airspeed above 140 KCAS the extend inhibit BIT will prevent extension of the landing gear by the normal procedure.

10. Back-up Brakes . . . . . ENABLED

ENGINE RESTART IN-FLIGHT

1. **ECL (affected engine) . . . . . OFF**

NOTE

Determine reason for shutdown and evaluate requirement for restart.

2. **T-handle . . . . . NORM**
3. **FADEC in control . . . . . VERIFY**

When Ng is below 29% and no earlier than 10 seconds after moving T-handle to NORM:

CAUTION

Damage to starter, starter shaft, and/or engine accessory drive gearbox may occur if a start attempt is made with Ng > 29%.

4. **ECL. . . . . START**

If restart unsuccessful, repeat checklist with other FADEC:

CAUTION

Do not operate engine above idle with oil temperature below 20 °C.

After stable idle is reached:

5. **ECL . . . . . FLY**
6. **Engine torque. . . . . MATCH as required**

ENGINE TORQUE SPLIT

NOTE

Torque splits greater than 10% may result in less than 100% power available.

1. **Single Engine Profile . . . . . .ESTABLISH**
2. **FADECS . . . . . .SWITCH**
3. **Engine torque response to TCL inputs . . . . . CHECK**

If torque split exceeds 10%:

4. **TORQUE BEEP . . . . . Match torques**
5. **Land as soon as practical using single engine procedures**

INADVERTENT ICING

If ice detected advisory or ice accumulation is observed:

1. **Maneuver Severity . . . . . Reduce**
2. **Icing Environment . . . . Exit Step 3, 4 and 5**
3. **[B] Ice/ALL modes . . . . . .VERIFY AUTO**
4. **EAPS . . . . . [B] AUTO, [A] ON**
5. **Engine Anti-ice . . . . . [B] AUTO, [A] ON**

NOTE

Best configuration is AUTO mode, 84% Nr, airspeed of 200 to 230 KCAS until aircraft has exited icing and all indications of icing have cleared. Minimize operation in CONV or VTOL mode.

[B] if ice accumulation observed without ice detected advisory:

6. **De-Ice/light . . . . . Select (OAT warmer than -10 °C)**
7. **De-Ice/Moderate . . . . . Select (OAT -10 °C or colder)**

MISSION COMPUTER POST FAILURE CLEANUP

1. Avionics PWR SEL Page . . VERIFY STATUS
2. Comm/IFF . . . . . RECOVER
3. ARC-210 Control Head . . . . . As required
4. GPS/INS 1,2, and 3 . . . . . VERIFY STATUS
5. FLIR/DIG MAP. . . . . As required
6. ECS . . . . . ON and ADJUST
7. Mission Data. . . . . UPLOAD (As required)
8. External Lights . . . . . SET
9. CDU Default and Aircraft INIT . . . . . SET
10. EAPS & EXDEF. . . . . AUTO and AUTO
11. Transfer Valve . . . . . AUTO
12. Transfer Pump . . . . . SUCTION
13. AR/HIFR . . . . . As required
14. EAPS . . . . . VERIFY STATUS
15. WRA Status . . . . . CHECK

OUT OF CONTROL RECOVERY

NOTE

There are no repeatable indications of an imminent departure.

*1. TCL . . . . . IDLE
*2. Control . . . . . Neutral
*3. Pedals . . . . . Cancel Yaw
*4. AOA . . . . . Assess
   a. High AOA — FWD Stick
   b. Low AOA with Neg g — Aft Stick
*5. Flaps . . . . . AUTO

CONTINUED

If rates and/or AOA do not neutralize:

***6. Nacelles. . . . . AFT**

7. Execute unusual attitude recovery procedure

PFCS FAIL / RESET (WITHOUT ASSOCIATED CAUTION / ADVISORY)

1. Maneuver Severity — Reduce

2. PFCS — Reset

If PFCS does not reset:

3. FCS/HYD WRA status layer — Access

If FCS F (P), other than CIU exist:

4. Land as soon as possible

If multiple CIU F (P) exist:

5. Land as soon as practical

PRGB OIL PRESS/TEMP INVALID TAGB OIL PRESS/TEMP INVALID MWGB OIL PRESS/TEMP INVALID

WARNING

With PRGB oil pressure invalid, subsequent actual loss of PRGB oil pressure may lead to catastrophic failure in as little as 2 minutes due to associated loss of ELS protection.

1. Land as soon as practical

SMOKE AND FUME ELIMINATION

NOTE

The emergency oxygen system is designed to provide approximately 5 minutes of 100% oxygen.

***1. EMERGENCY OXYGEN . . . . . ON**
2. Oxygen Masks . . . . . DON
3. Cockpit vents . . . . . Open
4. Utility isolation valve . . . . . OPEN
5. Cargo door . . . . . Open

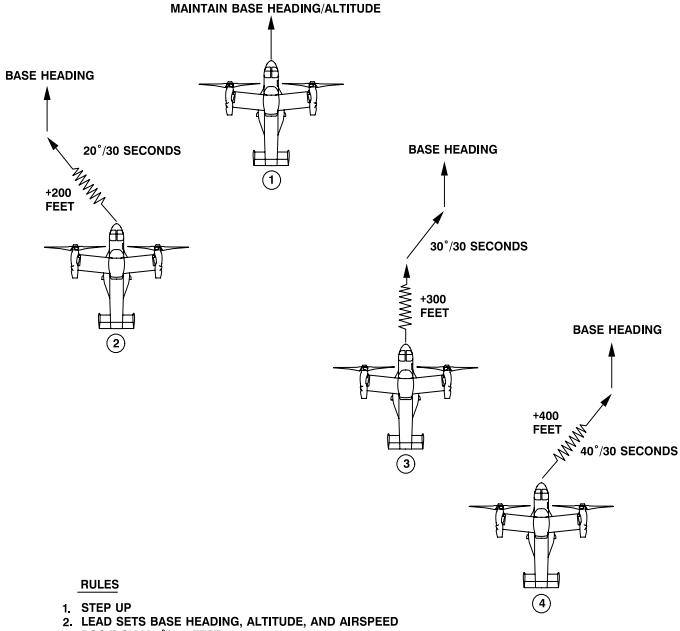
If ECS is suspected source:

6. Emergency vent fan. . . . . ON
7. Descend . . . . . As required
8. Land as soon as possible

If battery venting is suspected (putrid sulfur (rotten egg) smell):

9. Battery switch . . . . . OFF

FAN PROCEDURE FROM BALANCED, FINGERTIP, OR ECHELON FORMATIONS



RULES

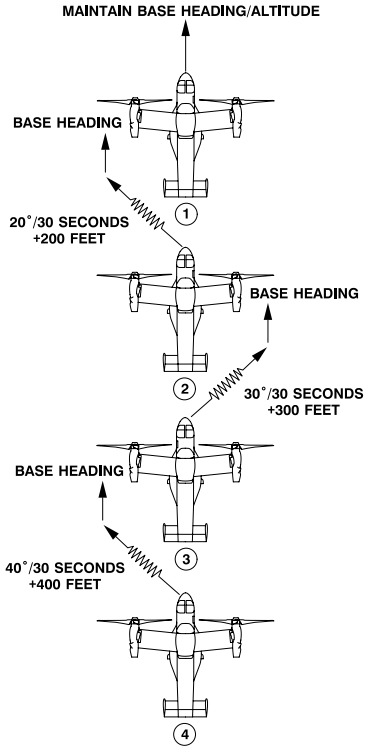
1. STEP UP
2. LEAD SETS BASE HEADING, ALTITUDE, AND AIRSPEED
3. POSITION X10˚/100 FEET
4. STANDARD RATE TURNS, 500 TO 1000 FPM CLIMB
5. 30 SECONDS ON HEADING, THEN RETURN TO BASE HEADING
6. OUTBOARD WINGMEN ANNOUNCE ONCE ESTABLISHED IN TURN
7. INBOARD WINGMEN CLIMB, BUT SHALL NOT TURN UNTIL OUTBOARD WINGMEN ANNOUNCE TURN

COMMUNICATIONS

WING: "TWO HAS LOST SIGHT."
LEAD: "OSPREY FLIGHT, FAN BREAK...BASE ALTITUDE X FEET. HEADING XXX."
FOUR: "FOUR BREAKING RIGHT."
TWO: "TWO BREAKING LEFT."
THREE: "THREE BREAKING RIGHT."
LEAD: ANNOUNCE JOIN UP/RENDEZVOUS INSTRUCTIONS WHEN VMC, OR SWITCH TO CONTROLLING AGENCY FOR IFR HANDLING.

901900-230-9
J2412

FAN PROCEDURE FROM TRAIL FORMATION



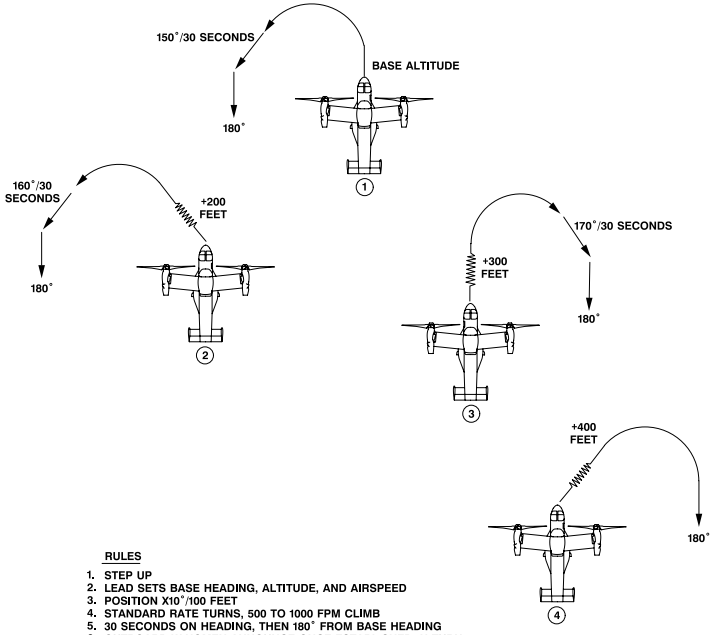
RULES

1. STEP UP
2. LEAD SETS BASE HEADING, ALTITUDE, AND AIRSPEED
3. POSITION X10°/100 FEET
4. STANDARD RATE TURNS, 500 TO 1000 FPM CLIMB
5. 30 SECONDS ON HEADING, THEN RETURN TO BASE HEADING
6. EVEN WINGMEN TURN LEFT, ODD WINGMEN TURN RIGHT
7. ALL TURNS ARE SIMULTANEOUS

COMMUNICATIONS

WING: "TWO HAS LOST SIGHT."
LEAD: "OSPREY FLIGHT, FAN BREAK...BASE ALTITUDE X FEET. HEADING XXX."
FOUR: "FOUR BREAKING LEFT."
THREE: "THREE BREAKING RIGHT."
TWO: "TWO BREAKING LEFT."
LEAD: ANNOUNCE JOIN UP/RENDEZVOUS INSTRUCTIONS WHEN VMC, OR SWITCH TO CONTROLLING AGENCY FOR IFR HANDLING.

REVERSAL PROCEDURE FROM BALANCED, FINGERTIP, OR ECHELON FORMATIONS



RULES

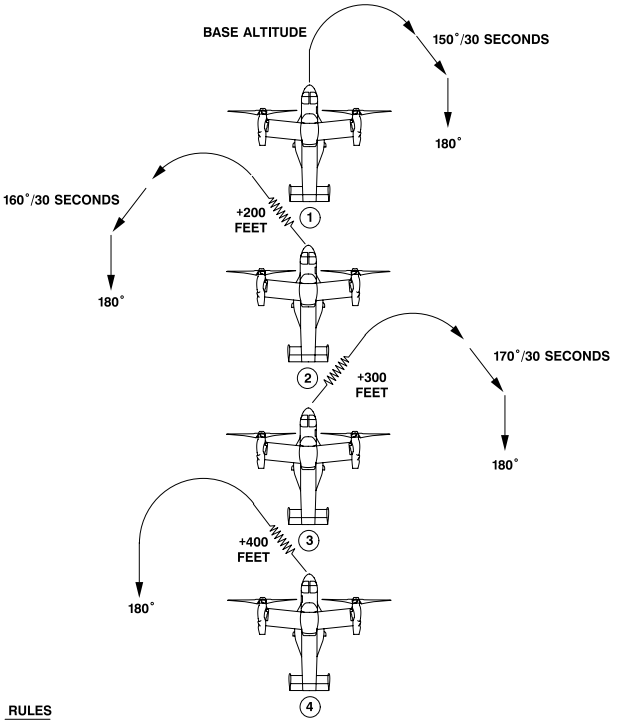
1. STEP UP
2. LEAD SETS BASE HEADING, ALTITUDE, AND AIRSPEED
3. POSITION X10°/100 FEET
4. STANDARD RATE TURNS, 500 TO 1000 FPM CLIMB
5. 30 SECONDS ON HEADING, THEN 180° FROM BASE HEADING
6. OUTBOARD WINGMEN ANNOUNCE ONCE ESTABLISHED IN TURN
7. INBOARD WINGMEN CLIMB, BUT SHALL NOT TURN UNTIL OUTBOARD WINGMEN ANNOUNCE TURN

COMMUNICATIONS

WING: "THREE HAS LOST SIGHT."
LEAD: "OSPREY FLIGHT, REVERSE HEADING BREAK...BASE ALTITUDE X FEET, HEADING XXX.
FOUR: "FOUR BREAKING RIGHT."
TWO: "TWO BREAKING LEFT."
THREE: "THREE BREAKING RIGHT."
LEAD: "ONE BREAKING LEFT."
WING: "(CALLSIGN) IS VMC, RENDEZVOUS AT POINT X."
LEAD: PROVIDE FLIGHT JOINUP PROCEDURES (FLIGHT ORDER).

901900-230-11
J2412

REVERSAL PROCEDURE FROM TRAIL FORMATION



RULES

1. STEP UP
2. LEAD SETS BASE HEADING, ALTITUDE, AIRSPEED
3. POSITION X10˚/100 FEET
4. STANDARD RATE TURNS, 500 TO 1000 FPM CLIMB
5. 30 SECONDS ON HEADING, THEN 180˚ FROM BASE HEADING
6. EVEN WINGMEN TURN LEFT, ODD WINGMEN TURN RIGHT
7. ALL TURNS SIMULTANEOUS

COMMUNICATIONS

WING: "THREE HAS LOST SIGHT."
LEAD: "OSPREY FLIGHT, REVERSE HEADING BREAK...BASE ALTITUDE X FEET, HEADING XXX."
FOUR: "FOUR BREAKING LEFT."
THREE: "THREE BREAKING RIGHT."
TWO: "TWO BREAKING LEFT."
LEAD: "ONE BREAKING RIGHT."
WING: "(CALLSIGN) IS VMC, RENDEZVOUS AT POINT X."
LEAD: PROVIDE FLIGHT JOINUP PROCEDURES (FLIGHT ORDER).

901900-230-12
J2412

CONTROLLABILITY CHECK

WARNING

Certain flight control degraded modes may substantially change based on the nature of the failure, nacelle angle, Nr, and airspeed. Pilots must exercise extreme caution not to depart from controlled flight while conducting controllability checks.

1. **Climb . . OPERATIONALLY SAFE ALTITUDE**
2. **Landing configuration . . . . . DETERMINE**

If an APLN approach and landing are intended:

3. **Approach speed . . . COMPUTE 1.3 VSTALL**
4. **Flaps . . . . . As required**
5. **APU . . . . . As required**
6. **Airspeed . . . . . SLOW TO INTENDED APPROACH SPEED**
7. **Landing gear . . . . . DOWN**
8. **Descent . . . . . ESTABLISH INTENDED LANDING ROD**

If CONV landing is intended, establish level flight at intended touchdown airspeed to ensure power available for safe landing:

9. **Simulated approach. . . . . .ASSESS**

DITCHING

WARNING

- Ditching survivability is reduced at touchdown speeds greater than 30 KCAS.
- Opening the lower crew door could lead to rapid water intrusion into the cabin, reducing available time for egress.
- Do not inflate flotation devices until clear of the aircraft.
- Ascending to the surface while breathing with a HABD bottle requires normal breathing to prevent injury. Inflating the LPU while still underwater will cause a rapid ascent rate which will require continuous exhalation.

***1. CDU EMER key . . . . . PRESS/EMER ALL**
***2. Passengers . . . . . NOTIFIED, SET FOR LANDING**

If time permits:

3. Mayday . . . . . BROADCAST
4. Gross weight . . . . . REDUCE

NOTE

Consider relocating, providing extra restraint, or jettisoning cargo.

5. Watertight integrity . . . . . VERIFY
6. Seatbelt . . . . . FASTENED
7. Personal survival equipment . . . . . ON AND CHECKED
8. Emergency equipment . . . . . READY
9. Cabin . . . . . REPORT READY

Prior to landing:

CONTINUED

10. Harnesses . . . . . LOCKED
11. Cockpit side windows . . . . . JETTISON (As required)
12. Landing . . . . . EXECUTE FROM A HOVER (If possible)

WARNING

Water contact with hot IR suppressor and engine turbines may lead to catastrophic engine failure which could result in the break-up of components and dispersal of shrapnel in the ditching area.

NOTE

Consider allowing passengers and crewchief to exit from a low hover prior to landing, if possible.

When ordered to abandon aircraft, or all motion has stopped:

13. Escape hatches . . . . . OPEN/JETTISON (As required)
14. Survival equipment . . . . . DEPLOY (As required)
15. Passengers . . . . . EVACUATE

When clear of the aircraft:

16. Flotation devices . . . . . INFLATE (As required)
17. Emergency Shutdown Checklist . . . . . CONDUCT (As required)

FIXED NACELLE LANDING

1. Gross weight . . . . . REDUCE

NOTE

- Lower gross weight will reduce required approach/touchdown speed, ground roll, and power required.
- To fully explore aircraft handling and troubleshoot, consider converting excess fuel into flight time versus dumping fuel.

2. Approach/touchdown speeds. . . . . DETERMINE

NOTE

Use a minimum speed of 1.2 V_{stall} for approach and 1.1 V_{stall} for landing to provide optimum landing performance with sufficient stall margin.

3. Controllability check . . . . . As required
4. Altimeter/RADALT . . . . . SET
5. Crew brief . . . . . COMPLETE
6. Landing gear. . . . . DOWN

NOTE

- If aircraft performance requires approach/touchdown speeds in excess of 140 KCAS and controllability permits, consider slowing below 140 KCAS at altitude and extending the gear normally. Successful gear extension via this method is more likely than attempting an emergency extension at high airspeed, and will retain availability of nosewheel steering and wheel brakes for landing rollout.
- Consider landing with gear retracted if forced to land on an unprepared surface.

CONTINUED

7. FLAPS . . . . . As required

NOTE

Manual flap settings may provide a more favorable pitch attitude for landing.

8. Cargo ramp/door . . . . . CHECK POSITION
9. APU . . . . . .RUN/ENGAGE
10. Harnesses. . . . . .LOCK

After touchdown:

11. ECLs . . . . . OFF
12. T-Handles . . . . . .ARM

After aircraft comes to a stop:

13. Emergency Shutdown . . . . . EXECUTE

LANDING GEAR FAILS TO EXTEND

If gear handle light remains on and/or any gear indicates unsafe following normal extension attempt:

1. **Airspeed . . . . . .< 140 KCAS**
2. **LAMP TEST. . . . . PRESS AND CONFIRM**
3. **UTIL OPEN/CLOSE. . . . . .OPEN**
4. **Gear position . . . . . CONFIRM**

NOTE

FLIR, wingman, and ground personnel are all potential means to determine landing gear position/condition.

If visual inspection indicates no apparent damage:

5. **GEAR handle . . . . . .CYCLE**

The purpose of cycling the GEAR handle is to reset a Landing Gear Control Fail advisory.During this cycling, the first movement of the handle is not a gear command. The first movement of the handle is the first step in a two step reset function. The second movement of the handle is the second step in the two step reset function. The second movement of the handle, which returns the handle to the originally intended position, will command the gear to the desired gear position.

If unsafe indication persists:

6. **Landing Gear . . . . . EMERG DOWN (Allow 20 seconds for extension)**

If landing gear indicates down and locked:

7. **Vertical landing . . . . . EXECUTE**
8. **Landing gear pins . . . . . INSTALL PRIOR TO TAXI**

If unsafe indication persists:

9. **Perform landing with hung gear**

LANDING GEAR FAILS TO RETRACT

1. **Airspeed . . . . . .< 140 KCAS**
2. **Landing gear . . . . . DOWN**

If gear does not indicate down and locked:

3. **Landing Gear Fails to Extend Checklist . . . . . CONDUCT**

If gear indicates down and locked:

4. **Land as soon as practical**

LANDING WITH HUNG GEAR

With any unsafe gear indication, execute a vertical landing if possible. Proper selection of landing site and care during touchdown should permit a landing that minimizes danger to personnel and damage to the aircraft. Soft padding or shoring can be placed so the aircraft can hover over the area and land with malfunctioning gear on padding/shoring to minimize aircraft damage. After landing on padding or shoring, conduct shutdown without the rotor brake.

If all gear appear to be down but indicate unsafe, land with gear extended. Confirm locked gear and insert landing gear pins before subsequent aircraft movement. If nose gear indicates unsafe, but appears to be down, apply parking brake to prevent uncommanded retraction.

WARNING

Insertion of the ground lockpin in the NLG remote access ground lock handle is possible when the NLG actuator is NOT internally down and locked. Installation of the NLG lockpin when NLG actuator is not positively down and locked will NOT prevent inadvertent retraction of the NLG.

CONTINUED

If main landing gear are down and nose gear remains retracted, land in this configuration. For a hung gear condition in which the right and left main landing gear are extended and the nose landing gear remains retracted, place one landing pad perpendicular to the fuselage of the aircraft. The landing pad should be placed such that when the aircraft settles on the landing pad, the FLIR rests just forward, but not on top of the landing pad and the forward edge of the landing pad rests at STA 180.

If nosegear and only one main gear are down, retract the gear to provide a symmetrical configuration.

If all gear are retracted or partially extended, land on a level spot with no obstructions, preferably on padding or a soft surface such as sand or grass. For a hung gear condition in which all 3 landing gear are retracted, place 4 pads for the main landing gear perpendicular to the fuselage. The 2 pads for the left main landing gear shall be 40 inches apart from each other. The 2 pads for the right main landing gear shall be 40 inches apart from each other. There shall be 40 inches of space between the pads for the left and right landing gear. The landing pad for the nose landing gear shall be placed perpendicular to the fuselage and 15 ft (180 inches) in front of the main landing gear landing pads. The landing pads should be placed such that when the aircraft settles on the landing pads, the FLIR rests just forward, but not on top of the nose landing gear landing pad, the forward edge of the nose landing gear landing pad rests at STA 180 and the forward edge of the front main landing gear landing pads rests at STA 400.

CAUTION

If ground personnel are available and time permits, sand bags, mattresses or similar material can be used to reduce damage. Ensure materials are secure from effects of downwash.

Single Engine WAVEOFF

***1. TCL . . . . . FULL FORWARD**
***2. Airspeed . . . . . .INCREASE**

WARNING

Aircraft vertical velocity is extremely sensitive to nacelle beep rate. Ensure beep rate is slow enough to command an acceleration without inducing an uncommanded sink rate.

3. Single Engine Failure In-Flight Checklist . . . . . CONDUCT

AIRCRAFT FIRE ON GROUND (CREWCHIEF)

***1. Available fire extinguishers . . . . . EMPLOY**
***2. Passengers. . . . . EVACUATE**
***3. Cabin doors . . . . . CLOSED as required**

EMERGENCY LANDING (CREWCHIEF)

***1. Passengers . . . . . NOTIFIED/SET**
***2. Seatbelt . . . . . FASTENED**

After landing and proprotors have stopped:

***3. Passengers . . . . . EVACUATE**

EXTERNAL LOAD SUSPENSION SYSTEM FAILURES (CREWCHIEF)

CAUTION

Even with auto jettison system selected ON, there are sling failures that require crewchief load jettison. The crewchief must be prepared to jettison the load at any time there are abnormal/excessive angles, swing motion, or the security of the sling/pendant is in question to prevent aircraft damage.

***1. Load. . . . . JETTISON as required**

FUSELAGE FIRE IN-FLIGHT (CREWCHIEF)

***1. Oxygen mask . . . . . Don**
***2. Cockpit door . . . . . .Closed as required**
***3. Cabin doors . . . . . .Closed as required**

NOTE

Utility Isolation Override will be required to reposition the ramp/cargo door in-flight.

4. Portable fire extinguishers . . . . . Employ
***5. Emergency Landing Checklist . . . Conduct**

SMOKE AND FUME ELIMINATION (CREWCHIEF)

***1. Oxygen mask . . . . . DON**
***2. Cargo door . . . . . OPEN**

NOTE

Utility Isolation OPEN will be required to reposition the ramp/cargo door in-flight.

If smoke/fumes still present, and nacelles aft of 45°:

***3. Upper crew door . . . . . OPEN**

WHEEL BRAKE OVERHEAT/FIRE (CREWCHIEF)

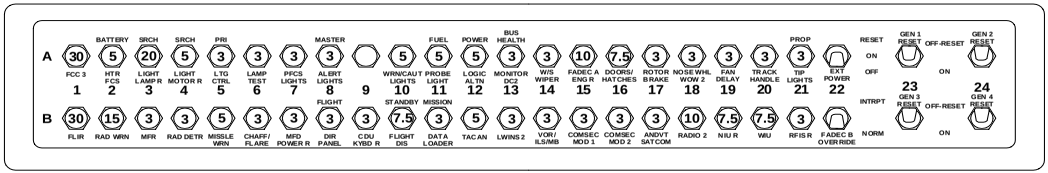
WARNING

Wheel brake overheating/fire may cause wheels to explode. DO NOT approach or discharge portable fire extinguisher on a wheel brake fire.

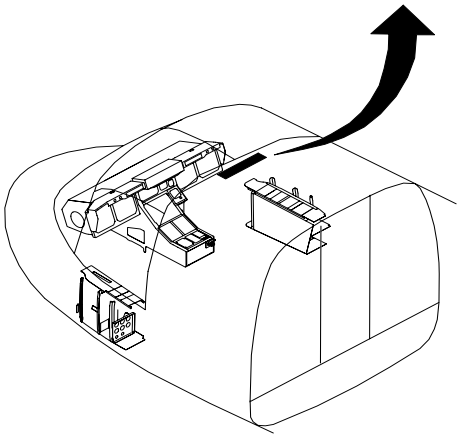
If excessive heat or fire are observed:

***1. Signal . . . . . HOT BRAKES**
***2. Crash, Fire, and Rescue personnel. . . . . ALERT**
***3. Nosewheel . . . . . CHOCK**

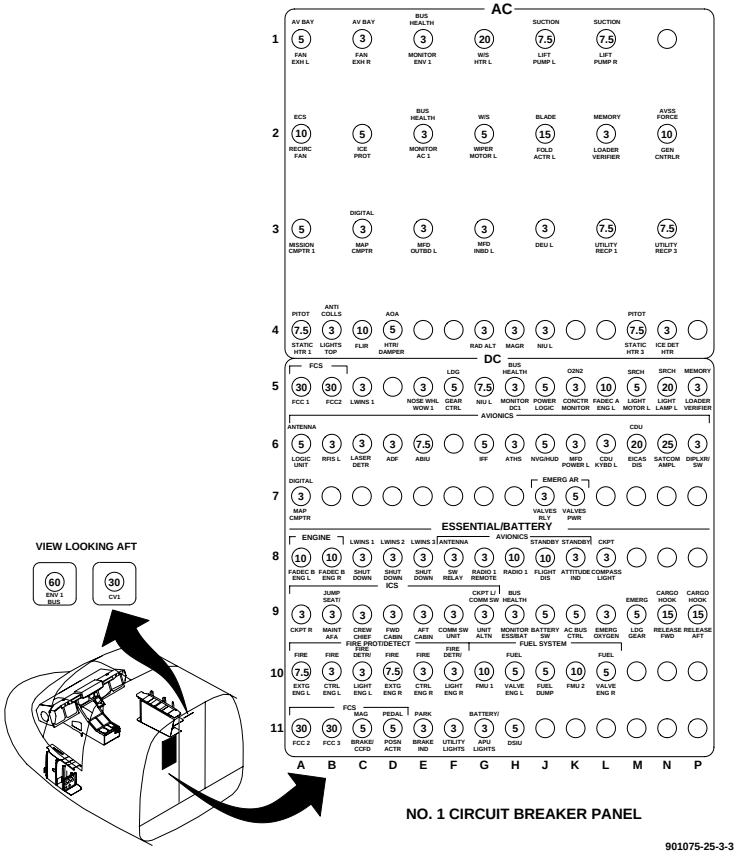
COCKPIT OVERHEAD CIRCUIT BREAKER PANEL



OVERHEAD CIRCUIT BREAKER PANEL



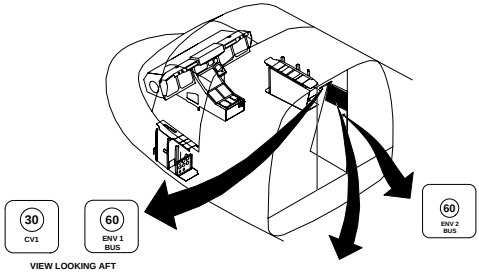
901075-25-8

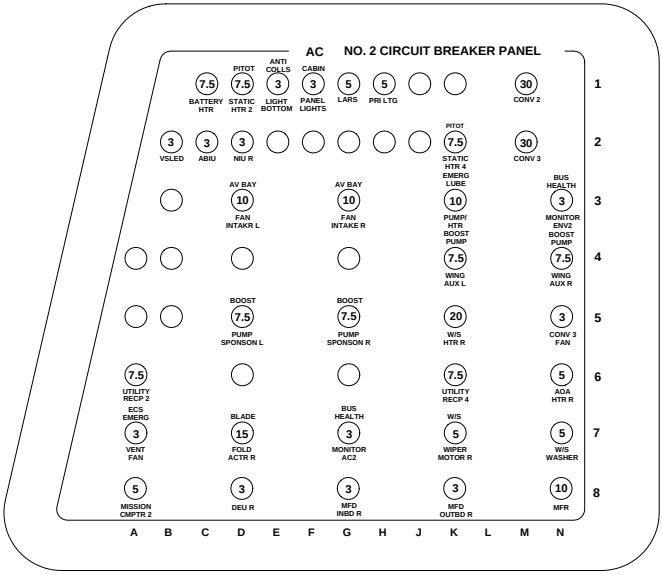


NO. 1 CIRCUIT BREAKER PANEL

901075-25-3-3

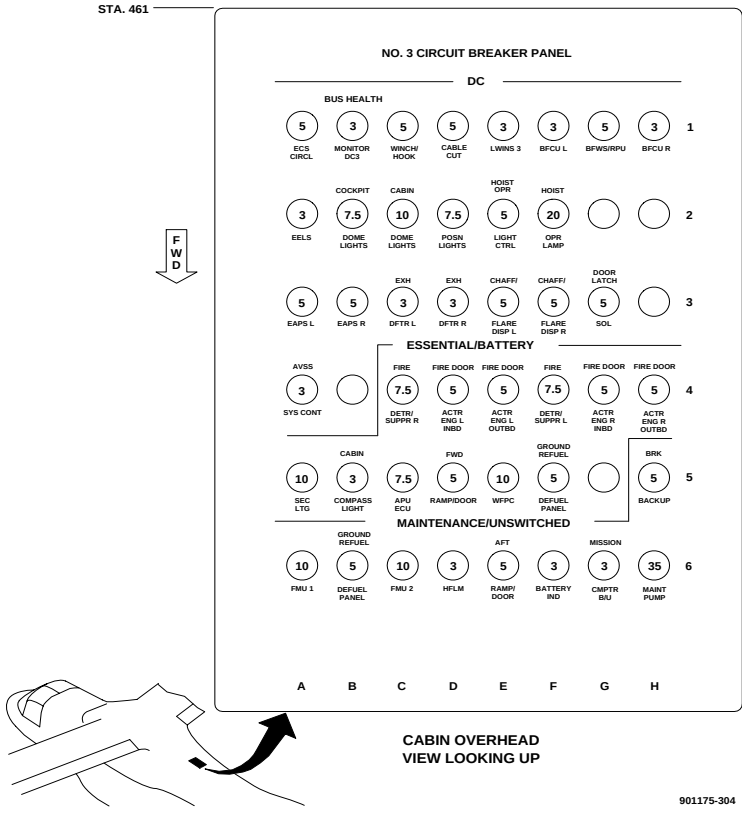
NO.1 CIRCUIT BREAKER PANEL





9010
J247

NO.2 CIRCUIT BREAKER PANEL



NO.3 CIRCUIT BREAKER PANEL

CIRCUIT BREAKER	PDP	GRID	BUS
ABIU	1	E6	DC 1
ABIU	2	C2	AC 2
AC BUS CTRL	1	K9	ESS/BATT
ADF	1	D6	DC 1
AFT RAMP/DOOR	3	E6	MAINT/UNSW
ANDVT SATCOM	OH	B17	DC 2
ANTENNA LOGIC UNIT	1	A6	DC 1
ANTENNA SW RELAY	1	F8	ESS/BATT
ANTI COLLS LIGHT BOTTOM	2	E1	AC 2
ANTI COLLS LIGHT TOP	1	B4	AC 1
AOA HTR R	2	N6	AC 2
AOA HTR/DAMPER	1	D4	ENV 1
APU ECU	3	C5	ESS/BATT
ATHS	1	H6	DC 1
AV BAY FAN DELAY	OH	A19	DC 2
AV BAY FAN EXH L	1	A1	ENV 1
AV BAY FAN EXH R	1	C1	ENV 1
AV BAY FAN INTAKE L	2	D3	ENV 2
AV BAY FAN INTAKE R	2	G3	ENV 2
AVSS FORCE/GEN CONTRLR	1	P2	AC 1
AVSS SYS CONTRLR	3	A4	DC 3
BATTERY HTR	2	C1	AC 2
BATTERY HTR FCS	OH	A2	DC 2
BATTERY IND	3	F6	MAINT/UNSW
BATTERY SW	1	J9	ESS/BATT
BATTERY/APU LIGHTS	1	G11	ESS/BATT
BFCU L	3	F1	DC 3
BFCU R	3	H1	DC 3
BFWS/RPU	3	G1	DC 3
BLADE FOLD ACTR L	1	J2	AC 1
BLADE FOLD ACTR R	2	D7	AC 2
BOOST PUMP SPONSON L	2	D5	ENV 2
BOOST PUMP SPONSON R	2	G5	ENV 2
BOOST PUMP WING AUX L	2	K4	ENV 2
BOOST PUMP WING AUX R	2	N4	ENV 2
BRK BACKUP	3	H5	MAINT/UNSW
BUS HEALTH MONITOR AC 1	1	E2	AC 1
BUS HEALTH MONITOR AC 2	2	G7	AC 2
BUS HEALTH MONITOR DC 1	1	H5	DC 1
BUS HEALTH MONITOR DC 2	OH	A13	DC 2
BUS HEALTH MONITOR DC 3	3	B1	DC 3

CIRCUIT BREAKER INDEX
(Sheet 1 of 6)

BUS HEALTH MONITOR ENV 1	1	E1	ENV 1
BUS HEALTH MONITOR ENV 2	2	N3	ENV 2
BUS HEALTH MONITOR ESS/BAT	1	H9	ESS/BATT
CABIN COMPASS LIGHT	3	B5	ESS/BATT
CABIN DOME LIGHTS	3	C2	DC 3
CABIN PANEL LIGHTS	2	F1	AC 2
CABLE CUT	3	D1	DC 3
CARGO HOOK RELEASE AFT	1	P9	ESS/BATT
CARGO HOOK RELEASE FWD	1	N9	ESS/BATT
CDU EICAS DIS	1	M6	DC 1
CDU KYBD L	1	L6	DC 1
CDU KYBD R	OH	B9	DC 3
CHAFF/FLARE	OH	B6	DC 3
CHAFF/FLARE DISP L	3	E3	DC 3
CHAFF/FLARE DISP R	3	F3	DC 3
CKPT COMPASS LIGHT	1	L8	ESS/BATT
COCKPIT DOME LIGHTS	3	B2	DC 3
COMSEC MOD 1	OH	B15	DC 2
COMSEC MOD 2	OH	B16	DC 2
CONV 1 (CV 1)	STA315 OH	LH SIDE	AC 1
CONV 2	2	M1	AC 2
CONV 3	2	M2	ENV 2
CONV 3 FAN	2	N5	ENV 2
DEU L	1	J3	AC 1
DEU R	2	D8	AC 2
DIGITAL MAP CMPTR	1	A7	DC 1
DIGITAL MAP CMPTR	1	C3	AC 1
DIPLXR/SW	1	P6	DC 1
DOOR LATCH SOL	3	G3	DC 3
DOORS/HATCHES	OH	A16	DC 2
DSIU	1	H11	ESS/BATT
EAPS L	3	A3	DC 3
EAPS R	3	B3	DC 3
ECS CIRCL	3	A1	DC 3
ECS EMERG VENT FAN	2	A7	AC 2
ECS RECIRC FAN	1	A2	AC 1
EELS	3	A2	DC 3
EMERG LDG GEAR	1	M9	ESS/BATT
EMERG LUBE PUMP/HTR	2	K3	ENV 2
EMERG OXYGEN	1	L9	ESS/BATT
ENV 1 BUS	STA315 OH	RH SIDE	ENV 1
ENV 2 BUS	2	BELOW PDP	ENV 2
EXH DFTR L	3	C3	DC 3

CIRCUIT BREAKER INDEX
(Sheet 2 of 6)

EXH DFTR R	3	D3	DC 3
FADEC A ENG L	1	L5	DC 1
FADEC A ENG R	OH	A15	DC 2
FADEC B ENG L	1	A8	ESS/BATT
FADEC B ENG R	1	B8	ESS/BATT
FCC 1	1	A5	DC 1
FCC 2	1	A11	ESS/BATT
FCC 2	1	B5	DC 1
FCC 3	OH	A1	DC 2
FCC 3	1	B11	ESS/BATT
FIRE CTRL ENG L	1	B10	ESS/BATT
FIRE CTRL ENG R	1	E10	ESS/BATT
FIRE DETR/LIGHT ENG L	1	C10	ESS/BATT
FIRE DETR/LIGHT ENG R	1	F10	ESS/BATT
FIRE DETR/SUPPR L	3	F4	ESS/BATT
FIRE DETR/SUPPR R	3	C4	ESS/BATT
FIRE DOOR ACTR ENG L INBD	3	D4	ESS/BATT
FIRE DOOR ACTR ENG L OUTBD	3	E4	ESS/BATT
FIRE DOOR ACTR ENG R INBD	3	G4	ESS/BATT
FIRE DOOR ACTR ENG R OUTBD	3	H4	ESS/BATT
FIRE EXTG ENG L	1	A10	ESS/BATT
FIRE EXTG ENG R	1	D10	ESS/BATT
FLIGHT DIR PANEL	OH	B8	DC 2
FLIR	OH	B1	DC 2
FLIR	1	C4	AC 1
FM HOMING	1	F6	DC 1
FMU 1	1	G10	ESS/BATT
FMU 1	3	A6	MAINT/UNSW
FMU 2	1	K10	ESS/BATT
FMU 2	3	C6	MAINT/UNSW
FUEL DUMP	1	J10	ESS/BATT
FUEL PROBE LIGHT	OH	A11	DC 2
FUEL VALVE ENG L	1	H10	ESS/BATT
FUEL VALVE ENG R	1	L10	ESS/BATT
FWD RAMP/DOOR	3	D5	ESS/BATT
GROUND REFUEL DEFUEL PANEL	3	B6	MAINT/UNSW
HFLM	3	D6	MAINT/UNSW
HOIST OPR LAMP	3	F2	DC 3
HOIST OPR LIGHT CTRL	3	E2	DC 3
ICE DET HTR	1	N4	AC 1
ICE PROT	1	C2	AC 1
ICS AFT CABIN	1	E9	ESS/BATT
ICS CKPT L/COMM SW UNIT ALTN	1	G9	ESS/BATT

ICS CKPT R	1	A9	ESS/BATT
ICS COMM SW UNIT	1	F9	ESS/BATT
ICS CREW CHIEF	1	C9	ESS/BATT
ICS FWD CABIN	1	D9	ESS/BATT
ICS JUMP SEAT/MAINT AFA	1	B9	ESS/BATT
IFF	1	G6	DC 1
LAMP TEST	OH	A6	DC 2
LASER DETR	1	C6	DC 1
LARS	2	G1	AC 2
LDG GEAR CTRL	1	F5	DC 1
LWINS 1	1	C5	DC 1
LWINS 1 SHUT DOWN	1	C8	ESS/BATT
LWINS 2	OH	B13	DC 2
LWINS 2 SHUT DOWN	1	D8	ESS/BATT
LWINS 3	3	E1	DC 3
LWINS 3 SHUT DOWN	1	E8	ESS/BATT
MAG BRAKE/CCFD	1	C11	ESS/BATT
MAGR	1	H4	ESS/BATT
MAINT PUMP	3	H6	MAINT/UNSW
MASTER ALERT LIGHTS	OH	A8	DC 2
MEMORY LOADER VERIFIER	1	L2	AC 1
MEMORY LOADER VERIFIER	1	P5	DC 1
MFD L INBD	1	G3	AC 1
MFD L OUTBD	1	E3	AC 1
MFD R INBD	2	G8	AC 2
MFD R OUTBD	2	K8	AC 2
MFD POWER L	1	K6	DC 1
MFD POWER R	OH	B7	DC 2
MFR	OH	B3	DC 2
MFR	2	N8	AC 2
MISSILE WRN	OH	B5	DC 2
MISSION CMPTR 1	1	A3	AC 1
MISSION CMPTR 2	2	A8	AC 2
MISSION CMPTR B/U	3	G6	MAINT/UNSW
MISSION DATA LOADER	OH	B11	DC 2
NIU L	1	G5	DC 1
NIU L	1	J4	AC 1
NIU R	OH	B19	DC 2
NIU R	2	D2	AC 2
NOSE WHL WOW 1	1	E5	DC 1
NOSE WHL WOW 2	OH	A18	DC 2
NVG/HUD	1	J6	DC 1
O2N2 CONCTR MONITOR	1	K5	DC 1

CIRCUIT BREAKER INDEX
(Sheet 4 of 6)

PARK BRAKE IND	1	E11	ESS/BATT
PEDAL POSN ACTR	1	D11	ESS/BATT
PFCS LIGHTS	OH	A7	DC 2
PITOT STATIC HTR 1	1	A4	AC 1
PITOT STATIC HTR 2	2	D1	AC 2
PITOT STATIC HTR 3	1	M4	AC 1
PITOT STATIC HTR 4	2	K2	AC 2
POSN LIGHTS	3	D2	DC 3
POWER LOGIC	1	J5	DC 1
POWER LOGIC ALTN	OH	A12	DC 2
PRI LTG	2	H1	AC 2
PRI LTG CTRL	OH	A5	DC 2
PROP TIP LIGHTS	OH	A21	DC 2
RAD ALT	1	G4	AC 1
RAD DETR	OH	B4	DC 2
RAD WRN	OH	B2	DC 2
RADIO 1	1	H8	ESS/BATT
RADIO 1 REMOTE	1	G8	ESS/BATT
RADIO 2	OH	B18	DC 2
RFIS L	1	B6	DC 1
RFIS R	OH	B21	DC 2
ROTOR BRAKE	OH	A17	DC 2
SATCOM AMPL	1	N6	DC 1
SEC LTG	3	A5	ESS/BATT
SRCH LIGHT LAMP L	1	N5	DC 1
SRCH LIGHT LAMP R	OH	A3	DC 2
SRCH LIGHT MOTOR L	1	M5	DC 1
SRCH LIGHT MOTOR R	OH	A4	DC 2
STANDBY ATTITUDE IND	1	K8	ESS/BATT
STANDBY FLIGHT DIS	OH	B10	DC 2
STANDBY FLIGHT DIS	1	J8	ESS/BATT
SUCTION LIFT PUMP L	1	J1	ENV 1
SUCTION LIFT PUMP R	1	L1	ENV 1
TACAN	OH	B12	DC 2
TRACK HANDLE	OH	A20	DC 2
UTILITY LIGHTS	1	F11	ESS/BATT
UTILITY RECP 1	1	L3	AC 1
UTILITY RECP 2	2	A6	AC 2
UTILITY RECP 3	1	N3	AC 1
UTILITY RECP 4	2	K6	AC 2
VALVES PWR	1	K7	EMERG AR
VALVES RLY	1	J7	EMERG AR
VOR/ILS/MB	OH	B14	DC 2

CIRCUIT BREAKER INDEX
(Sheet 5 of 6)

VSLED	2	B2	AC 2
W/S HTR L	1	G1	ENV 1
W/S HTR R	2	K5	ENV 2
W/S WASHER	2	N7	AC 2
W/S WIPER	OH	A14	DC 2
W/S WIPER MOTOR L	1	K7	AC1
W/S WIPER MOTOR R	2	G2	AC 2
WFPC	3	E5	ESS/BATT
WINCH/HOOK	3	C1	DC 3
WIU	OH	B20	DC 2
WRN/CAUT LIGHTS	OH	A10	DC 2

CIRCUIT BREAKER INDEX
(Sheet 6 of 6)