

Task 11-3.3 — AFCS OPERATIONAL CHECK

INITIAL SETUP

Tools and Special Tools:

Electronic Tool Kit (Avionics)

Personnel Required:

Avionics Mechanic (2)

References:

TM 1-1520-272-23

TM 11-1520-272-20

TM 1-1520-272-10

NO. 1 AFCS AC CIRCUIT BREAKER WILL NOT STAY CLOSED

CLTV DRIVER ACTR AC CIRCUIT BREAKER WILL NOT STAY CLOSED

AFCS NO. 1 DC CIRCUIT BREAKER WILL NOT STAY CLOSED

CLTV DRIVER ACTR DC CIRCUIT BREAKER WILL NOT STAY CLOSED

CYCLIC TRIM MAN CIRCUIT BREAKER WILL NOT STAY CLOSED

CYCLIC TRIM FWD ACTR CIRCUIT BREAKER WILL NOT STAY CLOSED

THRUST BRAKE CIRCUIT BREAKER DOES NOT STAY CLOSED

CONTR CTR CIRCUIT BREAKER DOES NOT STAY CLOSED

SWIVEL LOCKS SYSTEM OPERATIONAL CHECK

NO. 1 HYD COOLING BLOWER CIRCUIT BREAKER DOES NOT STAY CLOSED

NO. 2 AFCS AC CIRCUIT BREAKER WILL NOT STAY CLOSED

AFCS NO. 2 DC CIRCUIT BREAKER WILL NOT STAY CLOSED

CYCLIC TRIM AFT ACTR CIRCUIT BREAKER WILL NOT STAY CLOSED

L PROX SW CIRCUIT BREAKER WILL NOT STAY CLOSED

R PROX SW CIRCUIT BREAKER WILL NOT STAY CLOSED

Equipment Condition:

Aircraft Parked on Level Area

Visual Check of AFCS Performed

Battery Connected

Electrical Power On

Hydraulic Power On

Aircraft Weight Supported By Its Own Wheels

Parking Brake On

Common Avionics Architecture (CAAS) System On (TM 1-1520-272-10)

NAV EGI 2 On and Aligned (TM 11-1520-272-20)

Flight Controls Closet Acoustic Blanket Removed

Electronic Compartment Acoustic Blanket Removed

CHECK CIRCUIT BREAKERS**NOTE**

The aircraft should be parked on an area as level as possible. If parked on a slope, it is possible to have a BITE failure on tests 4 and 20.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

- 1) Check that the following circuit breakers in NO. 1 PDP are closed:

AC

AFCS NO. 1 (1) B21
CLTV DRIVER ACTR (2) B22
NO. 1 VERT GYRO (3) B23

DC

AFCS NO. 1 (5) B20
CLTV DRIVER ACTR (6) B19
CYCLIC TRIM MAN (7) B18
CYCLIC TRIM FWD ACTR (8) B17
THRUST BRAKE (9) D6
CONTR CTR (10) D7
HYDRAULICS BRAKE STEER
(11) D14
NAV EGI 1 (38) C15
L PROX SW (39) E6

RESULT: If any circuit breaker (1 through 11, 38, or 39) is open, close it. If AC AFCS NO. 1 circuit breaker (1) opens again, go to Task 11-3.4.

RESULT: If CLTV DRIVER ACTR circuit breaker (2) opens again, go to Task 11-3.5.

RESULT: If NO. 1 VERT GYRO circuit breaker (3) opens again, refer to TM 11-1520-272-20.

RESULT: If DC AFCS NO. 1 circuit breaker (5) opens again, go to Task 11-3.6.

RESULT: If CLTV DRIVER ACTR circuit breaker (6) opens again, go to Task 11-3.7.

RESULT: If CYCLIC TRIM MAN circuit breaker (7) opens again, go to Task 11-3.8.

RESULT: If CYCLIC TRIM FWD ACTR circuit breaker (8) opens again, go to Task 11-3.9.

RESULT: If THRUST BRAKE circuit breaker (9) opens again, go to Task 11-2.4.

RESULT: If CONTR CTR circuit breaker (10) opens again, go to Task 11-2.5.

RESULT: If HYDRAULICS BRAKE STEER circuit breaker (11) opens again, go to Task 7-4.4.

RESULT: If NAV EGI 1 circuit breaker (38) opens again, refer to TM 11-1520-272-20.

RESULT: If L PROX SW circuit breaker (39) opens again, refer to Task 3-1.3.1.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

2) Check that the following circuit breakers in NO. 2 PDP are closed:

AC

AFCS NO. 2 (12) B21
NAV NO. 2 VERT GYRO (13) C21
NAV EGI 2 26 VAC (40) C22

DC

AFCS NO. 2 (14) B20
CYCLIC TRIM AFT ACTR (15) B11
HYDRAULICS FLT CONTR (16) D6
NAV RDR ALT (18) C13
NAV EGI 2 (41) C17
R PROX SW (42) E3

RESULT: If any circuit breaker (12 through 18, 41, or 42) is open, close it. If AC AFCS NO. 2 circuit breaker (12) opens again, go to Task 11-3.10.

RESULT: If NAV NO. 2 VERT GYRO (13) or NAV EGI 2 26VAC circuit breaker (40) opens again, refer to TM 11-1520-272-20.

RESULT: If DC AFCS NO. 2 circuit breaker (14) opens again, go to Task 11-3.11.

RESULT: If CYCLIC TRIM AFT ACTR circuit breaker (15) opens again, go to Task 11-3.12.

RESULT: If HYDRAULICS FLT CONTR circuit breaker (16) opens again, go to Task 7-1.9.

RESULT: If NAV RDR ALT circuit breaker (18) opens again, refer to TM 11-1520-272-20.

RESULT: If NAV EGI 2 circuit breaker (41) opens again, refer to TM 11-1520-272-20.

RESULT: If R PROX SW circuit breaker (42) opens again, refer to Task 3-1.3.2.

CHECK NO. 1 AFCS

3) Press and hold pilot's CD REL switch (19). Center pilot's pitch and roll control stick and directional pedals. Release CD REL switch.

RESULT: Control stick and directional pedals shall center easily, within 20 percent of center, and remain there after CD REL switch (19) is released. If not, go to Task 11-2.6.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

NOTE

Refer to TM 1-1520-272-10 for procedures to access the WCA, POWER TRAIN, FLIGHT DIRECTOR SELECT CONTROL LAYER, CDU FD SELECT, and INU2 Display screens.

- 4) Set SYSTEM SEL switch (20) to OFF.

RESULT: AFCS NO. 1 OFF and AFCS NO. 2 OFF shall be yellow. If AFCS NO. 1 remains green, go to Task 11-3.13. If AFCS NO. 2 remains green, go to Task 11-3.14.

- 5) Set SWIVEL switch (23) to LOCK.

RESULT: If not, refer to Chapter 7.

- 6) Check that ENG 1 and ENG 2 levers (24 and 25) are at STOP.

RESULT: Set them to STOP, if required.

- 7) Check that CYCLIC TRIM AUTO MANUAL switch (26) is at AUTO.

RESULT: Set switch to AUTO, if required.

- 8) Check FWD and AFT LCT positions on power train display.

RESULT: Both LCTs shall be in the GND position. If both are not in the GND position, go to Task 11-3.15. If FWD LCT is not at GND, go to Task 11-3.16. If AFT LCT is not at GND, go to Task 11-3.17.

- 9) Set SYSTEM SEL switch (20) to 1.

RESULT: NO. 1 AFCS OFF shall turn green. No large Integrated Lower Control Actuator (ILCA) engagement transients (hardovers) shall occur. If NO. 1 AFCS OFF remains yellow, go to Task 11-3.18. If large ILCA engagement transients (hardovers) occur, go to Task 11-3.19 for pitch transient, Task 11-3.20 for roll transient, or Task 11-3.21 for yaw transient.

- 10) Move pilot's directional pedals right, then left. Return pedals to center.

RESULT: No. 1 Yaw ILCA extensible link shall extend with pedal right and retract with pedal left. If No. 1 yaw ILCA extensible link does not extend or retract, go to Task 11-3.22.

- 11) Move pilot's pitch and roll control stick right, then left. Return grip to center.

RESULT: No. 1 roll ILCA extensible link shall extend with stick right and retract with stick left. If No. 1 roll ILCA extensible link does not extend or retract, go to Task 11-3.23.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

12) Momentarily set pilot's AFCS TRIM switch (29) right, then left. Release switch.

RESULT: No. 1 roll ILCA extensible link shall extend when switch (29) is right and retract when switch is left. If No. 1 roll ILCA extensible link does not extend or retract, go to Task 11-3.24.

13) Momentarily set copilot's AFCS TRIM switch (29) right then left. Release switch.

RESULT: No. 1 roll ILCA extensible link shall extend when switch (29) is right and retract when switch is left. If No. 1 roll ILCA extensible link does not extend or retract, go to Task 11-3.24.

14) Press and hold pilot's CD REL switch (19). Center pilot's pitch and roll control stick and directional pedals. Release CD REL switch.

RESULT: Control stick and directional pedals shall center easily, within 20 percent of center, and remain there after CD REL switch (19) is released. If not, go to Task 11-2.6.

15) Press HDG key on the flight director select control layer. Record the present REF HDG on the CDU. Use the CDU to add 30° to the right of REF HDG.

RESULT: HDG becomes white and asterisk is shown. If HDG cannot be selected, or if the REF HDG cannot be changed, refer to Chapter 18.

16) On INU 2 page, select key R4 to enter NAV MODE.

17) Press VSPD key on the flight director select control layer. On the CDU keyboard, type 1500 and press VSPEED key.

RESULT: VSPD becomes white and asterisk is shown. If VSPD cannot be selected or if the VSPEED cannot be set to 1500, refer to Chapter 18.

WARNING

Keep head, hands, and other body parts clear of flight controls, especially those in flight controls closet. AFCS BITE automatically causes actuator and controls motion. Severe injury can occur.

18) Set ENG 1 lever (24) to FLIGHT.

19) Press and release NO. 1 AFCS computer BITE switch (31).

RESULT: Computer digital test counter (32) shall remain blank. BITE switch (31) shall not flash. If counter does not remain blank or BITE switch flashes, go to Task 11-3.25.

20) Set ENG 1 lever (24) to STOP. Set ENG 2 lever (25) to FLIGHT. Repeat step 20, then go to step 22.

21) Set ENG 2 lever (25) to STOP.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)



Do not permit thrust control to drive full up. Damage to equipment may occur.

- 22) Press and release NO. 1 AFCS computer BITE switch (31).

RESULT: Computer counter (32) shall step and display from 1 through 3 and stop at 3. BITE switch (31) shall light and flash while display is stepping, and then glow steadily after display indicates 3. If display is blank and BITE switch does not light, go to Task 11-3.26. If counter steps to and stops at 3, but BITE switch does not light, replace NO. 1 AFCS computer. If BITE switches lights, but display stops at 1 or 2, repeat operational check Task 11-3.3. If same result occurs, replace NO. 1 AFCS computer.

- 23) Press the FLT DIR CPLR switch (30) on the AFCS Control Panel.

RESULT: The CPLR light shall remain lit. If the FLT DIR CPLR light does not light, go to Task 11-3.37.

- 24) Press and release NO. 1 AFCS computer BITE switch (31).

RESULT: Computer counter (32) shall step and display from 4 through 127 (end of test) and go blank. BITE switch shall flash while display is stepping. If BITE switch lights steadily, and counter stops at an intermediate number, record that number. Push BITE switch to continue test. Go to Table 11-3.1 to determine maintenance action. At end of test, counter shall go blank, and BITE switch light shall go out.

- 25) Press the FLT DIR CPLR switch (30) immediately after BITE test to terminate flight director coupling.

RESULT: The CPLR light shall be off. If not, go to Task 11-3.37.

- 26) Set SYSTEM SEL switch (20) to BOTH, pause for 10 seconds, then set it to OFF through position 2.

RESULT: AFCS NO. 1 OFF and AFCS NO. 2 OFF Cautions shall become yellow. If AFCS NO. 1 OFF remains green, go to Task 11-3.13. If NO. 2 AFCS remains green, go to Task 11-3.14.

- 27) Check that the STEER/LOCK switch (23) is set to LOCK.

- 28) Press HDG key on flight director select control layer to disengage heading mode.

RESULT: HDG should be green, with no asterisk. If HDG cannot be disengaged, refer to Chapter 18.

- 29) Press VSPD key on flight director select control layer to disengage vertical speed mode.

RESULT: VSPD should be green, with no asterisk. If VSPD cannot be disengaged, refer to Chapter 18.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

- 30) Check that ENG 1 and ENG 2 levers (24 and 25) are at STOP.

RESULT: Set them to STOP, if required.

- 31) Check that CYCLIC TRIM AUTO MANUAL switch (26) is at AUTO.

RESULT: Set switch to AUTO, if required.

- 32) Check FWD and AFT LCT positions on power train display.

RESULT: Both LCTs shall be in the GND position. If not, go to Task 11-3.15. If FWD LCT is not at GND, go to Task 11-3.16. If AFT LCT is not at GND, go to Task 11-3.17.

CHECK NO. 2 AFCS

- 33) Set SYSTEM SEL switch (20) to 2.

RESULT: AFCS NO. 2 OFF shall turn green. No large Integrated Lower Control Actuator (ILCA) engagement transients (hardovers) shall occur. If AFCS NO. 2 OFF remains yellow, go to Task 11-3.27. If large ILCA engagement transients (hardovers) occur, go to Task 11-3.28 for pitch transient, Task 11-3.29 for roll transient, or Task 11-3.30 for yaw transient.

- 34) Move pilot's directional pedals right, then left. Return pedals to center.

RESULT: No. 2 yaw ILCA extensible link shall retract with pedal right and extend with pedal left. If No. 2 yaw ILCA extensible link does not retract or extend, go to Task 11-3.31.

- 35) Move pilot's pitch and roll control stick right, then left. Return grip to center.

RESULT: No. 2 roll ILCA extensible link shall retract with stick right and extend with stick left. If No. 2 roll ILCA extensible link does not retract or extend, go to Task 11-3.32.

- 36) Momentarily set pilot's AFCS TRIM switch (29) right, then left. Release switch.

RESULT: No. 2 roll ILCA extensible link shall retract when switch (29) is right and extend when switch is left. If No. 2 roll ILCA extensible link does not retract or extend, go to Task 11-3.33.

- 37) Momentarily set copilot's AFCS TRIM switch (29) right, then left. Release switch.

RESULT: No. 2 roll ILCA extensible link shall retract when switch (29) is right and extend when switch is left. If No. 2 roll ILCA extensible link does not retract or extend, go to Task 11-3.33.

- 38) Press and hold pilot's CD REL switch (19). Center pilot's pitch and roll control stick and directional pedals. Release CD REL switch.

RESULT: Control stick and directional pedals shall center easily, within 20 percent of center, and remain there after CD REL switch (19) is released. If not, go to Task 11-2.6.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

- 39) Press HDG key on flight director select control layer. Record the present REF HDG on the CDU. Use the CDU to add 30° to the right of REF HDG.

RESULT: HDG becomes white and asterisk is shown. If HDG cannot be selected, or if the REF HDG cannot be changed, refer to Chapter 18.

- 40) Press VSPD key on flight director select control layer. On the CDU keyboard, type 1500 and press VSPEED key.

RESULT: VSPD becomes white and asterisk is shown. If VSPD cannot be selected, or if the VSPEED cannot be set to 1500, refer to Chapter 18.

WARNING

Keep head, hands, and other body parts clear of flight controls, especially those in flight controls closet. AFCS BITE automatically causes actuator and controls motion. Severe injury can occur.

- 41) Set ENG 1 lever (24) to FLIGHT.

- 42) Press and release NO. 2 AFCS computer BITE switch (33).

RESULT: Computer digital test counter (34) shall remain blank. BITE switch (33) shall not flash. If counter does not remain blank or BITE switch flashes, go to Task 11-3.25.

- 43) Set ENG 1 lever (24) to STOP. Set ENG 2 lever (25) to FLIGHT. Repeat step 45, then go to step 47.

- 44) Set ENG 2 lever (25) to STOP.

- 45) Press and release NO. 2 AFCS computer BITE switch (33).

RESULT: Computer counter (34) shall step and display from 1 through 3 and stop at 3. BITE switch (33) shall light and flash while display is stopping, and then glow steadily after display indicates 3. If display is blank and BITE switch does not light, go to Task 11-3.34. If counter steps to and stops at 3, but BITE switch does not light, replace NO. 2 AFCS computer. If BITE switch lights, but display stops at 1 or 2, replace NO. 2 AFCS computer.

- 46) Press the FLT DIR CPLR switch (30) on the AFCS Control Panel.

RESULT: If the FLT DIR CPLR light does not light, go to Task 11-3.37. Thrust lever shall not move. If it moves, depress FLT DIR CPLR switch (30) again (off), and go to Task 11-3.63.

- 47) Press and release NO. 2 AFCS computer BITE switch (33).

RESULT: Computer counter (34) shall step and display from 4 through 127 (end of test) and go blank. BITE switch shall flash while display is stepping. If BITE switch lights steadily, and counter stops at an intermediate number, record that number. Push BITE switch to continue test. Go to Table 11-3.1 to determine maintenance action. At end of test, counter shall go blank, and BITE switch light shall go out.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

- 48) Press the FLT DIR CPLR switch (30) immediately after BITE test to terminate flight director coupling.

RESULT: The CPLR light shall be off. If not, go to Task 11-3.37.

- 49) Press BARO ALT key on flight director select control layer. Note reference altitude on CDU FD select display. Press HOVER UP switch (37) on pilot's thrust lever. Reference altitude shall increase **3 feet** on CDU. Press HOVER DWN switch (37). Reference altitude shall decrease **3 feet** on CDU. Repeat for copilot's HOVER UP/DWN switch.

RESULT: If reference altitude does not change, go to Task 11-3.64.

CHECK LONGITUDINAL CYCLIC TRIM ACTUATOR CONTROL

- 50) Set CYCLIC TRIM AUTO/MANUAL switch (26) to MANUAL.

- 51) Set and hold FWD switch (35) to EXT.

RESULT: FWD LCT pointer on the power train control layer shall move smoothly from GND to EXT position. If it does not, go to Task 11-3.35.

- 52) Set and hold FWD switch (35) to RET. With stopwatch, time actuator travel.

RESULT: FWD LCT pointer shall move smoothly from EXT to RET position within **25 seconds**. If it does not move, go to Task 11-3.35. If it moves erratically or takes longer than **25 seconds**, replace forward actuator.

- 53) Set and hold FWD switch (35) to EXT. With stopwatch, time actuator travel.

RESULT: FWD LCT pointer shall move smoothly from RET to EXT within **25 seconds**. If it does not, replace forward LCT actuator.

- 54) Set and hold AFT switch (36) to EXT.

RESULT: AFT LCT pointer shall move smoothly from GND to EXT position. If it does not move, go to Task 11-3.36.

- 55) Set and hold AFT switch (36) to RET. With stopwatch, time actuator travel.

RESULT: AFT LCT pointer shall move smoothly from EXT to RET position within **25 seconds**. If it does not move, go to Task 11-3.36. If it moves erratically or takes longer than **25 seconds**, replace aft LCT actuator.

- 56) Set and hold AFT switch (36) to EXT. With stopwatch, time actuator travel.

RESULT: AFT LCT pointer shall move smoothly from RET to EXT within **25 seconds**. If it does not, replace aft LCT actuator.

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

57) Set CYCLIC TRIM AUTO/ MANUAL switch (26) to AUTO.

RESULT: FWD and AFT LCT pointers shall move to GND positions. If it does not, go to Task 11-3.15 for both, Task 11-3.16 for forward, or Task 11-3.17 for aft.

CHECK LONGITUDINAL COCKPIT CONTROL DRIVER ACTUATOR

NOTE

EGI does not require realignment.

58) Set and hold pilot's AFCS TRIM switch (29) forward.

RESULT: Pitch and roll control sticks shall move forward. If not, go to Task 11-3.39.

59) Set and hold pilot's AFCS TRIM switch (29) aft.

RESULT: Pitch and roll control sticks shall move aft. If not, go to Task 11-3.39.

60) Repeat steps 61 and 62 using copilot's AFCS TRIM switch (29).

NORMAL SHUTDOWN PROCEDURE

NOTE

If a problem with the AFCS occurred during flight and could not be verified by the AFCS operational check, refer to Table 11-3.2 to locate trouble symptom task number.

Perform AFCS Interface Test using AFCS Line Test Set to verify trouble symptoms.

61) Press FLT DIR CPLR switch (30) to verify light is out.

62) Press HDG key for asterisk removed.

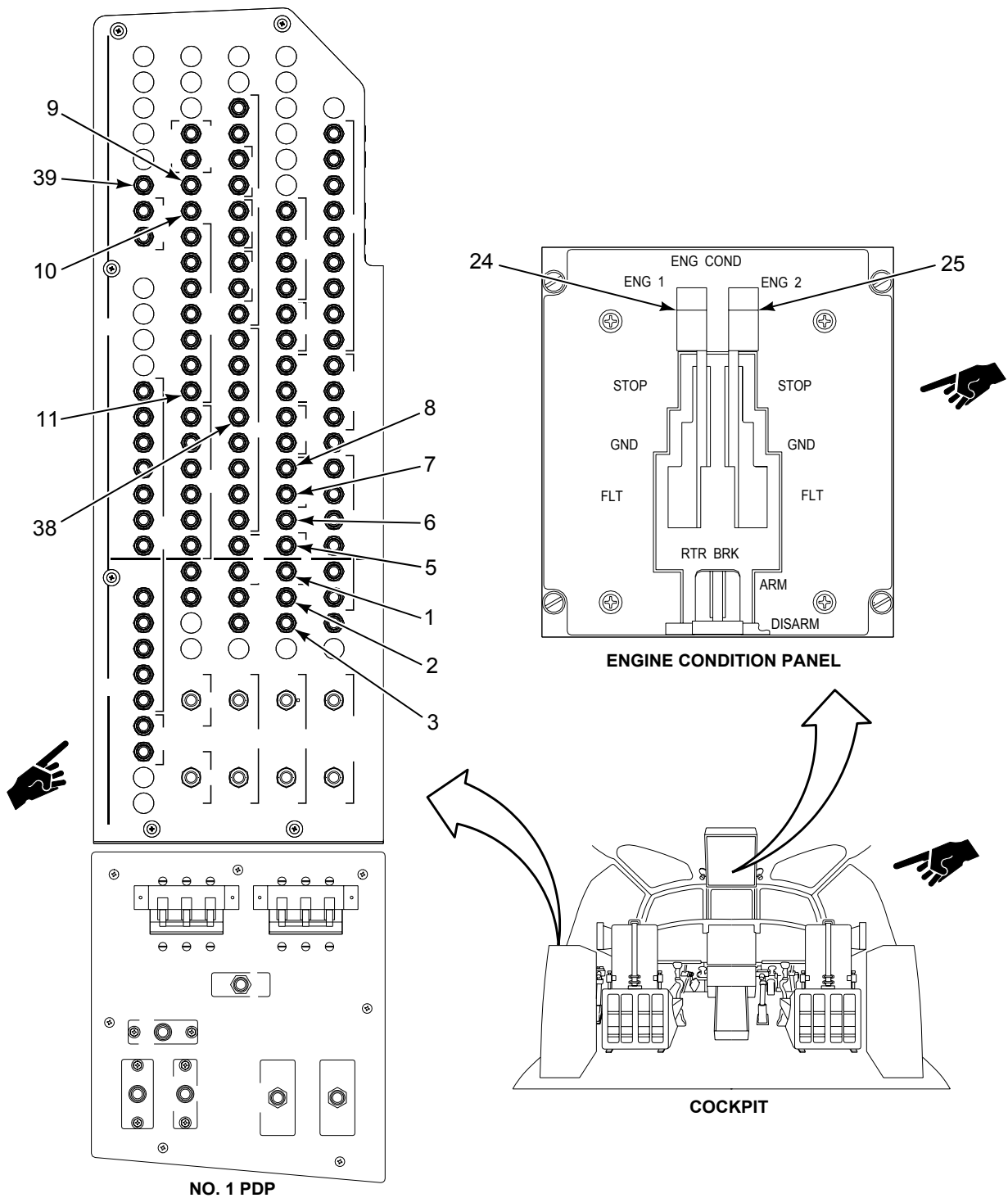
63) Press VSPD key for asterisk removed.

64) Set SYSTEM SEL switch (19) to OFF.

65) Set SWIVEL switch (20) to UNLOCK.

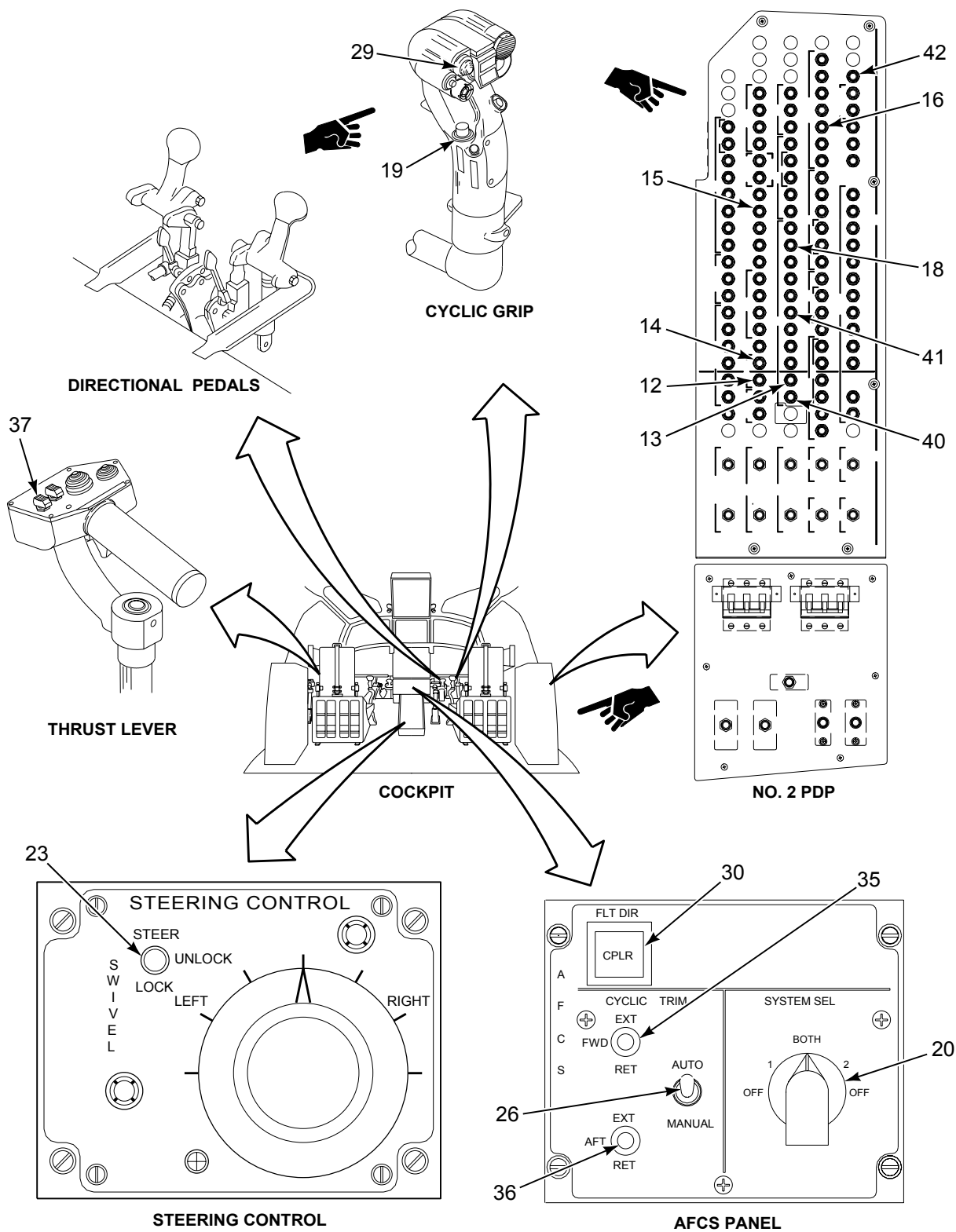
66) Perform orderly shutdown of EGI NO. 2 (TM 1-1520-272-10).

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)



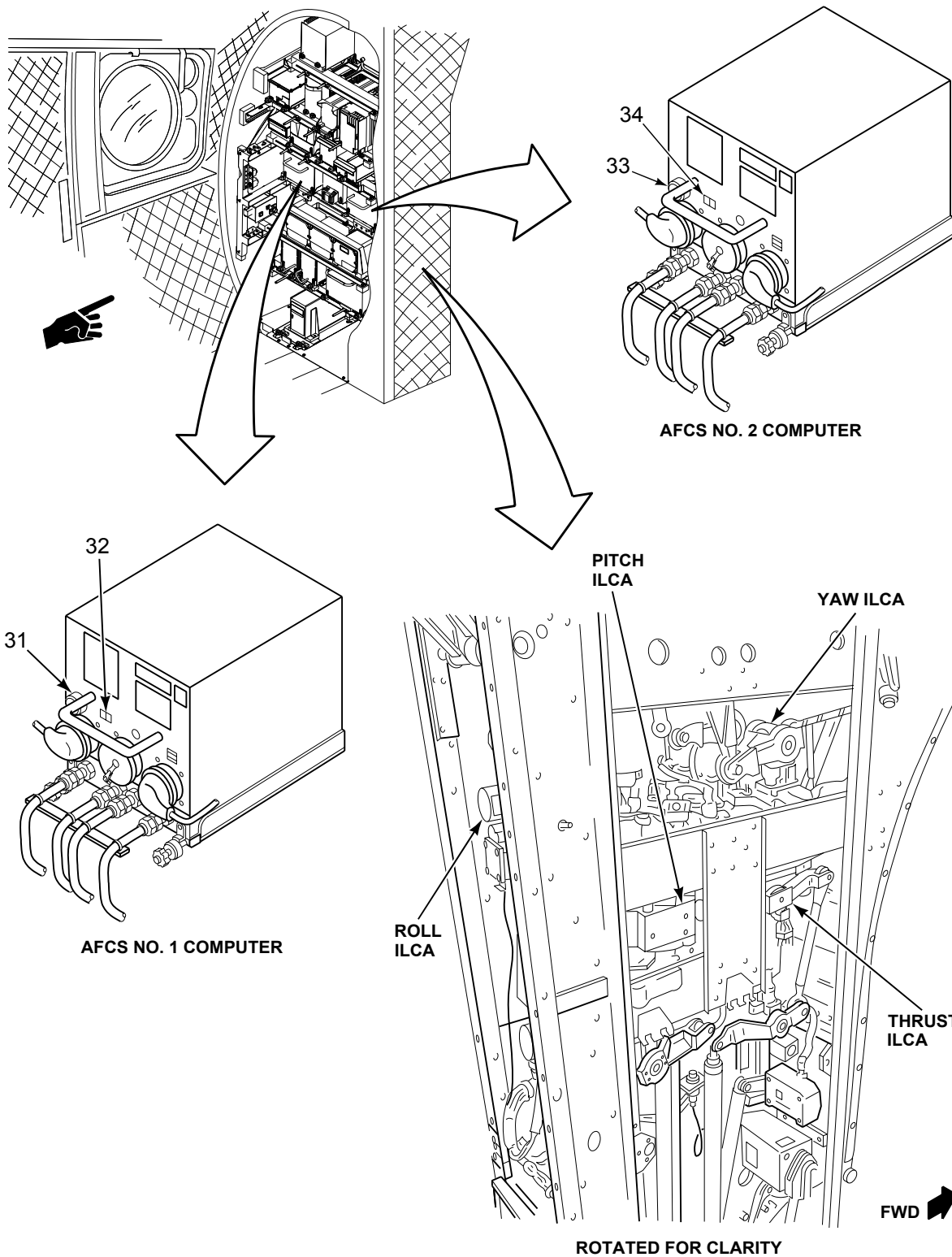
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Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)



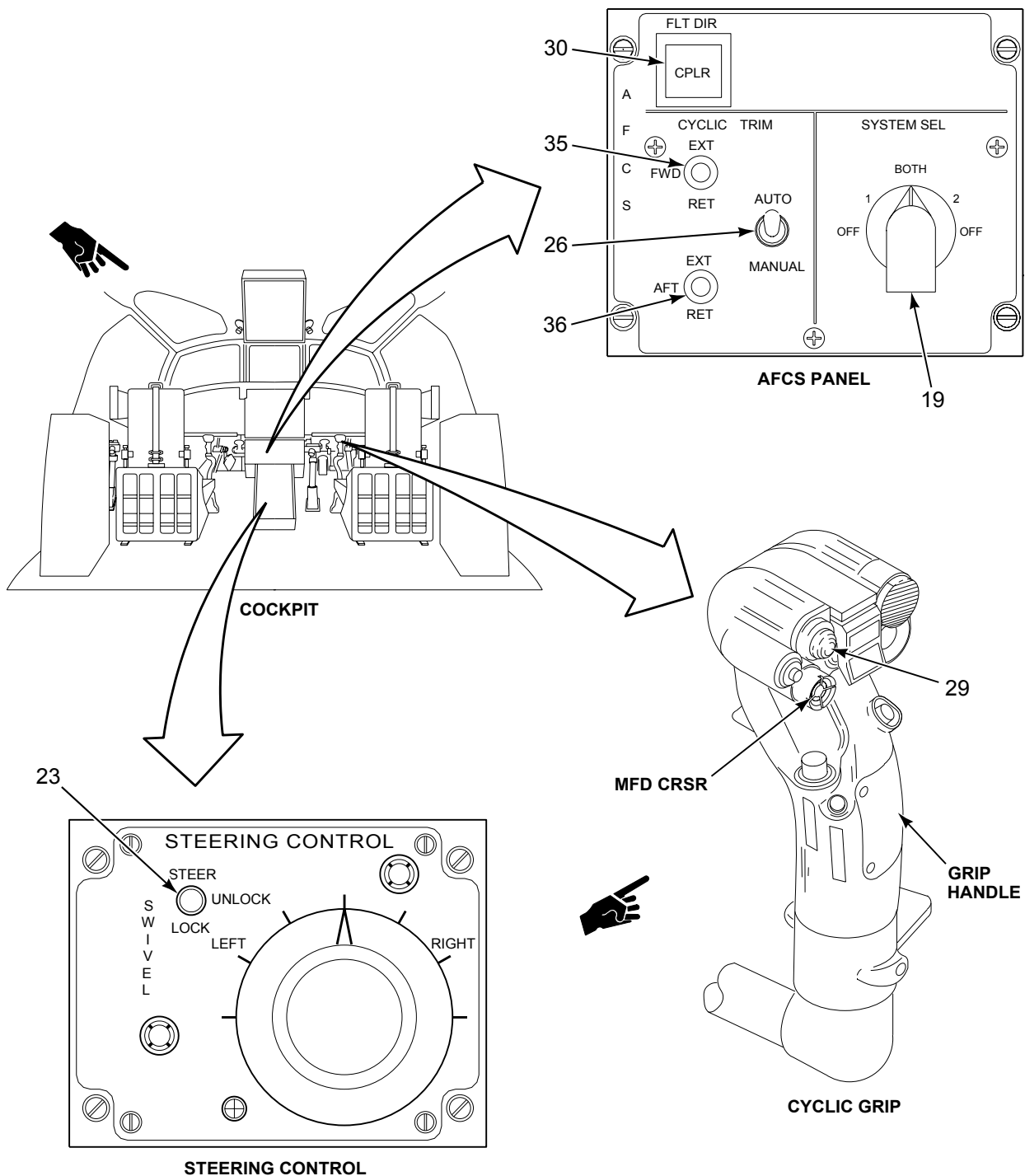
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Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)



T0000712

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)



T0000713

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

FOLLOW-ON MAINTENANCE:

- Hydraulic power off.
- Electrical power off.
- Battery disconnected.
- Flight controls closet acoustic blanket installed.
- Electronic compartment acoustic blanket installed.
- Pylon left work platform closed.
- Forward left work platform closed.

BITE TEST NUMBER	TASK NO. OR MAINTENANCE ACTION
4-8, 10-17, 19-47, 49-69, 74, 79, 84, 88, 90, 92, 94-127	Replace computer
9, 18	11-3.40
48	11-3.41
70-73	11-3.42
75-78	11-3.43
80-83	11-3.44
85, 86	11-3.45 or 11-3.46
87	11-3.47
89	11-3.48 or 11-3.49
91	11-3.50
93	11-3.51

TROUBLE SYMPTOM	Task Number	
	NO. 1 AFCS	NO. 2 AFCS
Longitudinal Axis:		
AFCS Pitch Attitude/Airspeed Hold Weak or Inoperative	11-3.55	11-3.56
AFCS Longitudinal Control Position Out of Trim	11-3.57	11-3.57
Lateral Axis:		
AFCS Roll Attitude Hold Weak or Inoperative	11-3.58	11-3.58
Lateral Flight Director Modes Erratic/Oscillatory or Will Not Couple	11-3.58	11-3.38
Directional Axis:		
AFCS Heading Hold Weak or Inoperative	11-3.61	11-3.61
AFCS Lateral Stick Only Turns Not Coordinated	11-3.62	11-3.62
Heading Hold Inop in Approach and Hover Hold Mode	11-3.54	11-3.54
YAW Stability Erratic/Oscillatory	11-3.59	11-3.60

Task 11-3.3 — AFCS OPERATIONAL CHECK (Continued)

TROUBLE SYMPTOM	Task Number	
	NO. 1 AFCS	NO. 2 AFCS
Longitudinal Axis:		
Collective Axis:		
BARO ALT Select Flight Director Mode Erratic or Oscillatory	11-3.53	11-3.53
Reference Altitude Does Not Change Using Hover Up/Down switches	11-3.64	11-3.64
Thrust Lever Moves While No. 2 AFCS in BITE	11-3.63	11-3.63
Vertical Flight Director Modes Erratic/Oscillatory or Will Not Couple	11-3.52	11-3.52

END OF WORK PACKAGE