United States Army Warfighting Center
Fort Rucker, Alabama
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STUDENT HANDOUT

TITLE: CH-47D ADVANCED FLIGHT CONTROL SYSTEM (AFCS)

FILE NUMBER: 011-2105-6

PROPONENT FOR THIS STUDENT HANDOUT IS:

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CH-47D ADVANCED FLIGHT CONTROL SYSTEM (AFCS)

STUDENT HANDOUT

TERMINAL LEARNING OBJECTIVE (TLO):

Action: Describe components, operational characteristics, limitations, operating procedures, and emergency procedures of the CH-47D Advanced Flight Control System (AFCS).

Conditions: In a classroom, given a CH-47D Advanced Flight Control System Trainer and a student handout.

Standards: Correctly answer in writing, without reference, fourteen of nineteen questions pertaining to components, operational characteristics, limitations, operation procedures, and emergency procedures of the CH-47D Advanced Flight Control System (AFCS), In Accordance With (IAW) TM 1−1520−240−10 and the student handout.

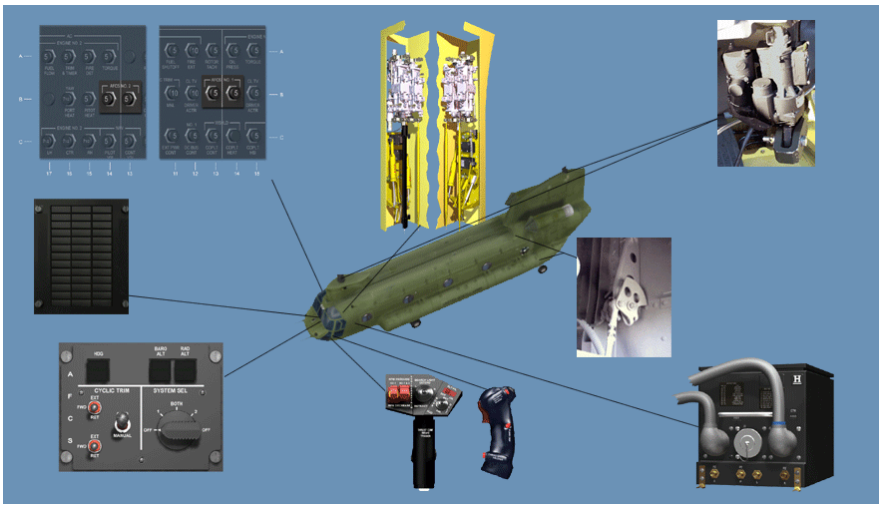
Safety Requirements: None.

Risk Assessment Level: Low.

Environmental Considerations: None.

Evaluation: Each student will be evaluated on this block of instruction during the first written examination. This will be a criterion type examination requiring a GO on each scored unit. You will have 90 minutes for the exam.

1. Learning Step/Activity 1−Provide instruction on the operational characteristics of the AFCS.



a. Advanced Flight Control System (AFCS) description.

(1) Dual systems, a No.1 and a No.2.

(2) AFCS provides the following:

(a) Stability about all axes.

(b) Bank angle hold.

(c) Heading hold.

(d) Airspeed hold.

(e) Pitch attitude hold.

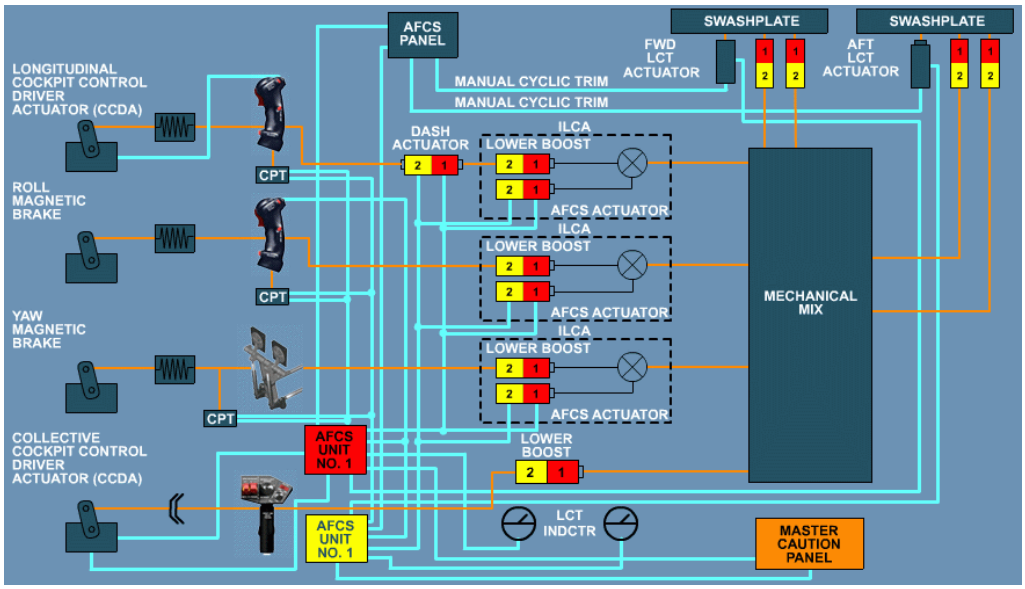
(f) Positive stick gradient.

(g) Altitude hold.

(h) AFCS trim.

(i) Heading select.

(j) Longitudinal Cyclic Trim (LCT).



(3) AFCS **must** have the following to operate:

(a) AC electrical power, − No. 1 and No.2 AC bus.

(b) DC electrical power, − No.1 and No.2 DC bus.

(c) Hydraulic pressure, − No.1 and No.2 flight control hydraulic systems.

(d) Two vertical gyros.

1) Copilot's for No.1 AFCS.

2) Pilot's for No.2 AFCS.

(4) With both AFCS systems ON, each system provides one half of the total required control input.

(5) With one AFCS ON, the single system provides the total required input.

b. AFCS control panel, switches and caution lights.

(1) SYSTEM SEL.

(a) A five position rotary switch.

(b) Purpose.

1) Selects a system ON, OFF, or BOTH on.

2) Controls a hydraulic valve.

(2) LCT.

(a) The mode select switch selects the mode of operation.

1) AUTO − The LCT actuators program automatically by the AFCS computers as airspeed is changed.

2) MAN − The LCT actuators must be manually controlled by the pilot.

(b) FWD and AFT EXT/RET switches are used by the pilot to control the LCT's when in the manual mode.

(3) Barometric altitude (BARO ALT).

(a) This switch engages barometric altitude hold.

(b) A press on, press off type switch.

(c) The switch legend ENGAGED will illuminate when pressed.

(4) Radar altitude (RAD ALT).

(a) Engages radar altitude hold.

(b) A press on, press off type switch.

(c) Switch legend ENGAGED illuminates when pressed.

NOTE: Both altitude hold systems cannot be engaged at the same time.

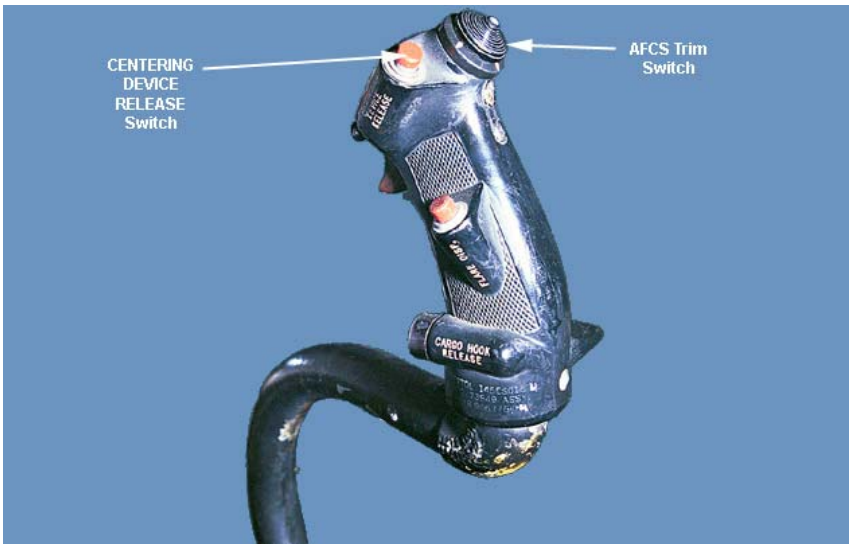
(5) Heading (HDG).

(a) Used to engage **HEADING SELECT**.

(b) Press on, press off type switch.

(c) The switch legend ENGAGED illuminates when pressed.

c. Cyclic stick switches.



(1) CENTERING DEVICE RELEASE.

(a) A red button located on the top of each cyclic.

(b) When pressed:

1) The magnetic brakes in the pitch, roll, and yaw axes are released.

2) Heading hold and bank angle hold are **momentarily** disengaged.

3) HDG select is disengaged.

4)

(2) AFCS trim.

(a) Conical shaped switch on the top of each cyclic.

(b) Forward or Aft movement.

1) Drives a trim motor in the longitudinal (pitch) Cockpit Controlled Driver Actuator (CCDA).

2) CCDA operation makes a control input causing a change in airspeed.

3) The cyclic stick **will** move.

4) Longitudinal AFCS trim will function even with AFCS off.

(c) Left or right movement.

1) Allows for bank angle trim.

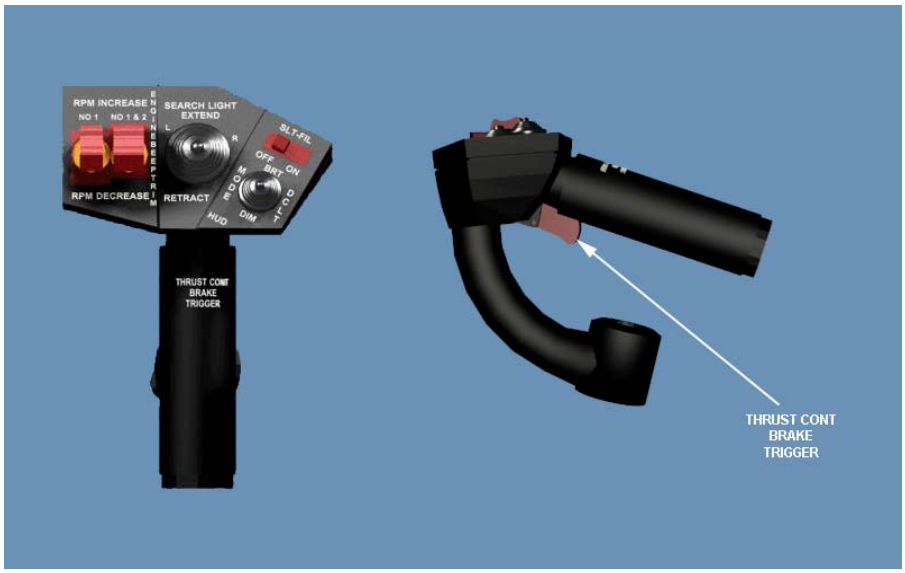
2) The control input is made to the roll Integrated Lower Control Actuator (ILCA).

3) The cyclic stick does **not** move.

4) AFCS trim is disengaged when HDG select is engaged.

5) Bank angle hold will be disengaged until the roll rate is less than 1.5º degrees per second.

6) When <u>lateral AFCS trim</u> is used, heading hold will be disengaged at airspeeds above 40 knots.



d. THRUST CONT BRAKE TRIGGER. The trigger is located under each thrust control grip. When the trigger is pressed, the thrust magnetic brake is released and altitude hold is momentarily disabled.

<u>OPERATOR'S MANUAL CAUTION</u>: To prevent engine over-torque, do not enter forecast **moderate or stronger turbulence** with the thrust brake (portion of the CCDA) inoperative, **Page 8-30.**

e. AFCS OFF caution lights.

(1) No.1 AFCS OFF and No.2 AFCS OFF caution lights are located on the master caution panel.

(2) The lights will come on when:

(a) AFCS is turned off by the SYSTEM SEL switch.

(b) A loss of:

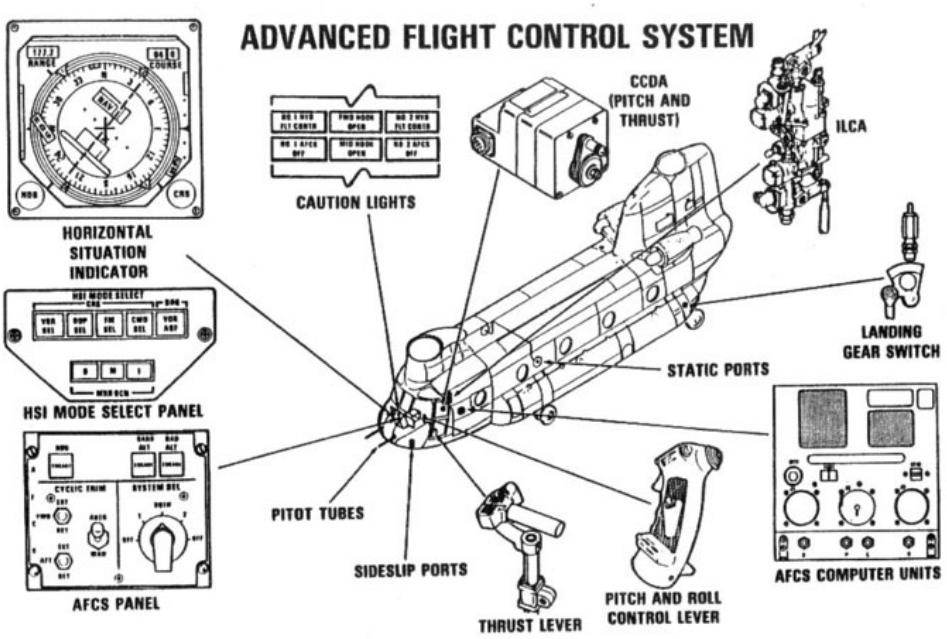
1) Hydraulic pressure.

2) Electrical power.

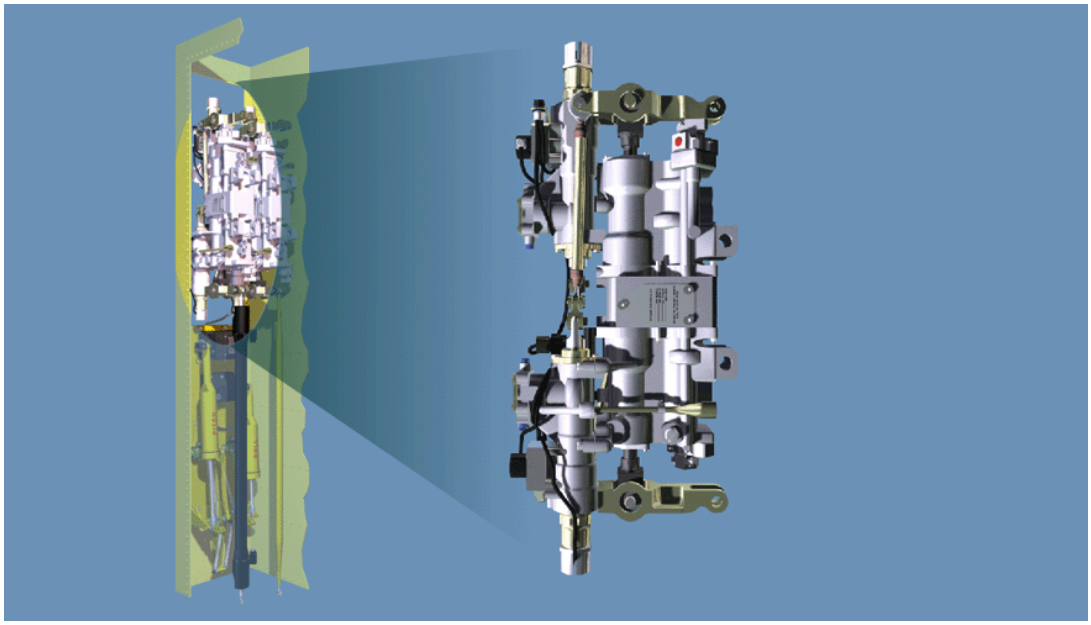
3) Vertical gyro.

(c) When AFCS is first selected ON, until the Differential Airspeed Hold actuators (DASH) reposition.

f. Components of the AFCS.



(1) ILCA's. Pitch, roll, and yaw extensible links provide AFCS control input for:



(a) Stability.

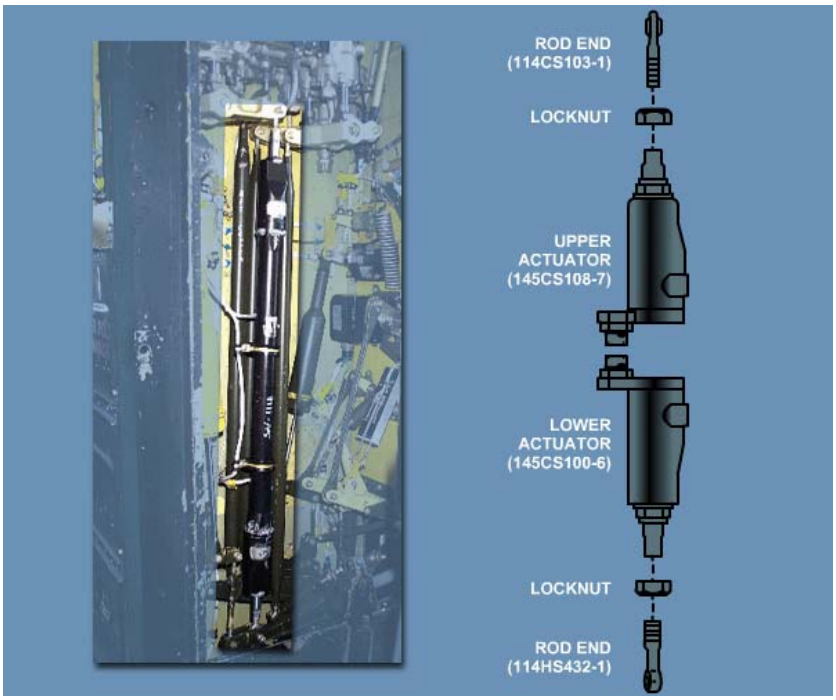
(b) Bank angle hold.

(c) Bank angle trim.

(d) Heading hold.

(e) Heading select.

(f) Coordinated turns.



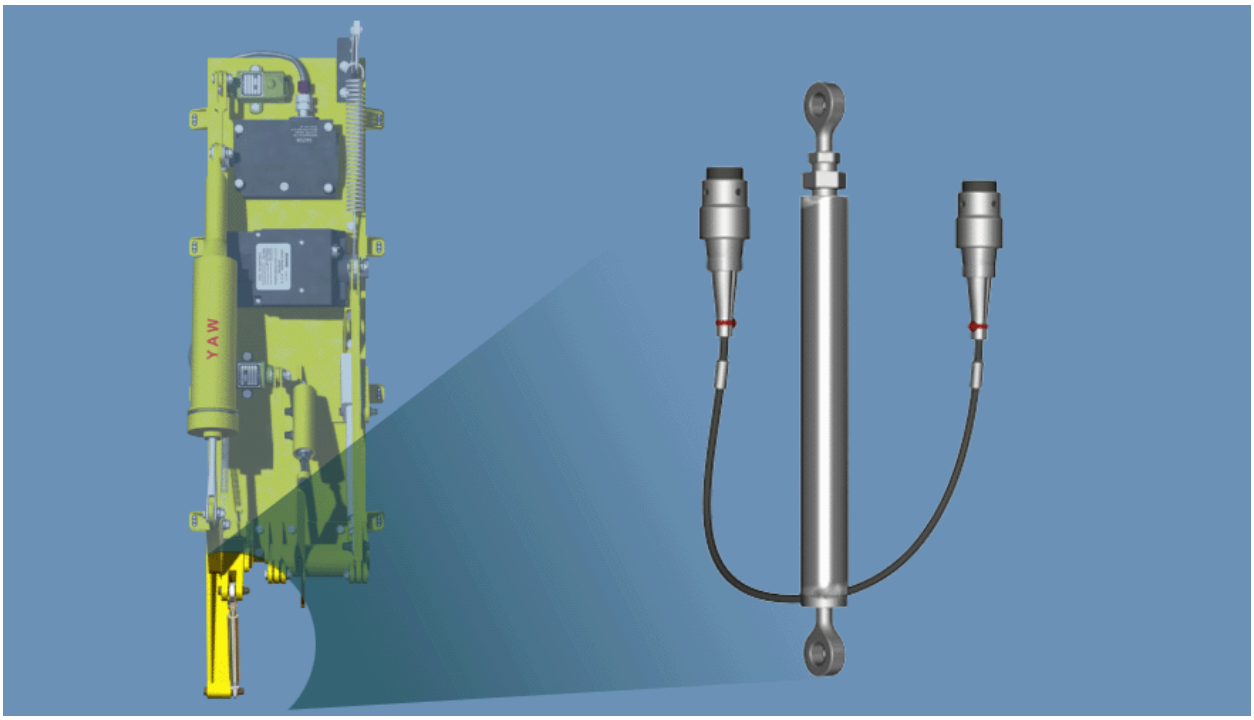
(3) DASH actuators (electromechanical).

(a) A pitch axes component located in the flight controls closet.

1) The upper actuator is controlled by the No.1 AFCS.

2) The lower actuator is controlled by the No.2 AFCS.

(b) The **DASH** makes the control inputs for: **AIRSPEED HOLD, PITCH ATTITUDE HOLD, and POSITIVE STICK GRADIENT.**



(4) Control Position Transducers (CPT).

(a) Three CPT's located in the lower portion of the flight controls closet.

(b) The CPT's provide control position information to the AFCS computers.

(c) They are dual sending units for the pitch, roll, and yaw axes.

(5) Landing gear proximity switches.

(a) Two proximity switches are installed, one on each aft landing gear.

(b) Each switch is activated when its associated shock strut is compressed during landing.

1) The left switch:

a) Reduces the No.1 AFCS pitch stabilization signal by 50%.

b) Cancels the longitudinal CPT input to the No.1 AFCS computer.

2) The right switch performs the same functions for No.2 AFCS.

3) Both switches:

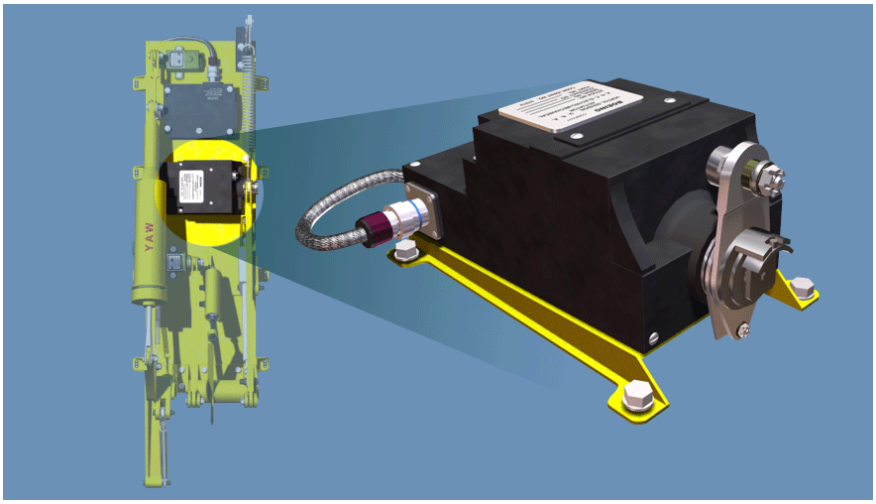
a) Must be closed (both aft gear on the ground) to position the LCT actuators to the GND position.

b) Are inoperative during water landings.

NOTE: The ground proximity switches perform other functions, but are not AFCS related. They also disable the flare system (accidental firing), and holds the transponder mode 4 code, which would be otherwise be cleared when the set is turned off.

(6) Ground contact indicating lights on the MAINTENANCE PANEL indicate proximity switch position.

(7) Thrust CCDA. The thrust CCDA is located in the flight controls closet and makes a control input when using the altitude hold features of AFCS. The **thrust rod will move** while the control input is being made.

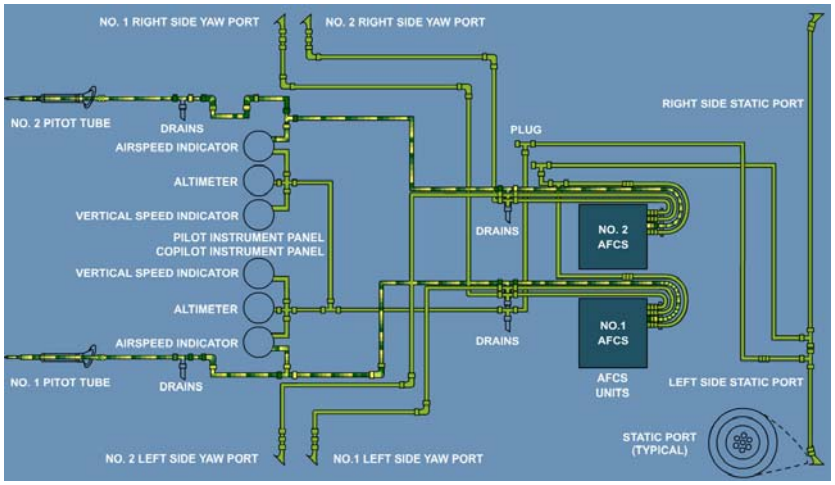


(8) AFCS computers.

(a) The No.1 and No.2 AFCS computers are located in the avionics compartment.

(b) The computers receive and process related sensor signals from:

1) Pitot tubes (airspeed).



a) No.1 AFCS, − Left tube.

b) No.2 AFCS, − Right tube.

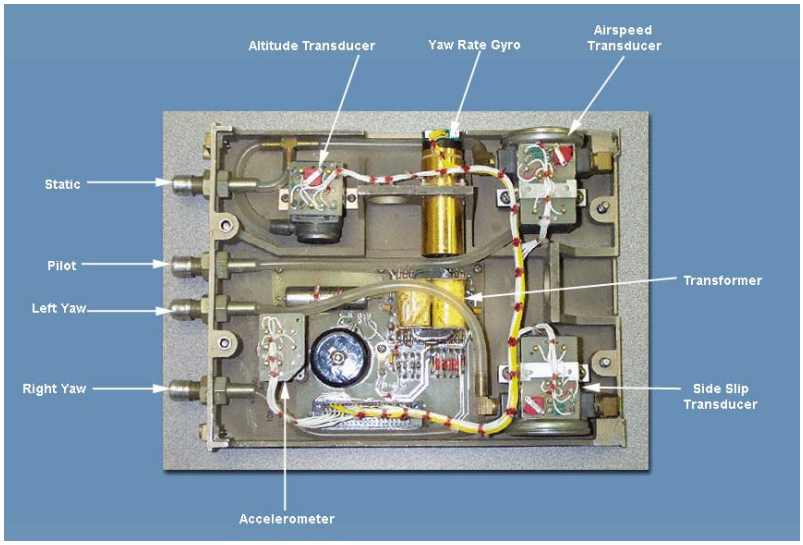
2) Static ports (barometric altitude).

3) Sideslip ports (sideslip stability).

a) The ports are located on the left and right side of the nose.

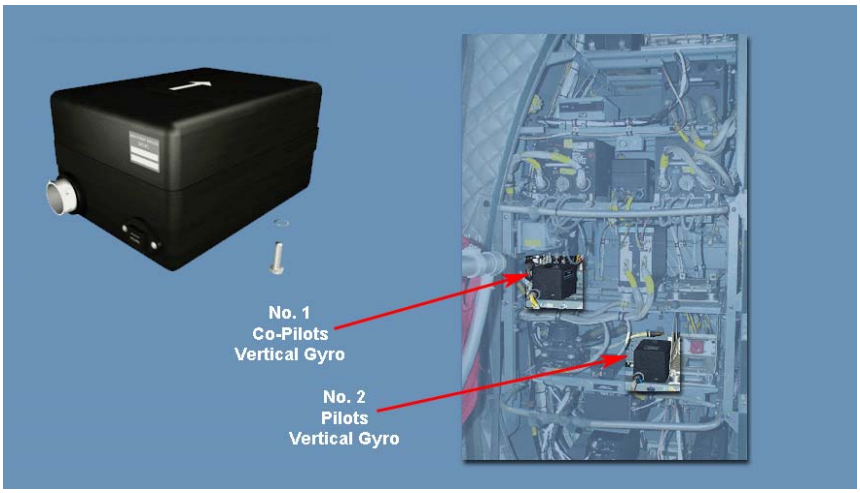
b) No.1 AFCS, − Upper.

c) No.2 AFCS, − Lower.



4) Yaw rate gyros. One yaw rate gyro is located in the base of each AFCS computer and provides a **rate of motion** signal for motion dampening.

5) Vertical gyros.

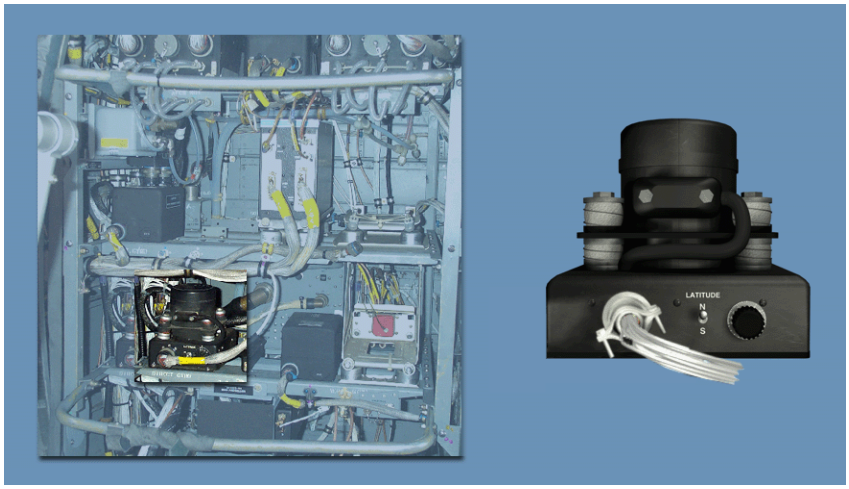


a) Co-pilots vertical gyro signal goes to the No.1 AFCS.

b) Pilots vertical gyro signal goes to the No.2 AFCS.

c) The gyros produce pitch and roll **attitude signals** and a rate of motion signal for motion dampening and turns is derived by the AFCS computers.

6) The directional gyro provides the signals for heading hold and the Horizontal Situation Indicator (HSI). The controls for the Gyro-magnetic compass are on the overhead panel.



OPERATOR'S MANUAL NOTE: If synchronizing becomes necessary in flight with the AFCS on, position the SWIVEL switch to UNLOCK. After synchronization is complete, position the SWIVEL switch to LOCK. This prevents unwanted yaw axis inputs, **Page 3-39.**

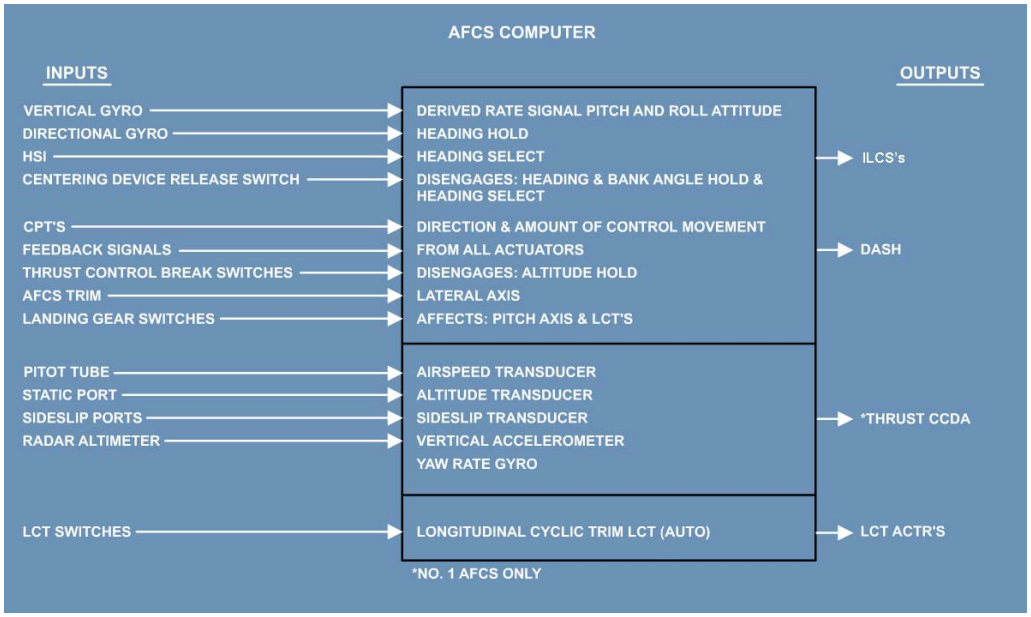
7) HSI.

a) Pilot or Copilots.

b) Heading select.

8) **Pilots** radar altimeter provides the signal for radar altitude hold.

9) CPT's (discussed earlier).



10) Feedback signals from the actuators.

(c) The AFCS computers develop command signal and send them to the actuators which make the control input.

1) ILCA's in the pitch, roll, and yaw axes (extensible links).

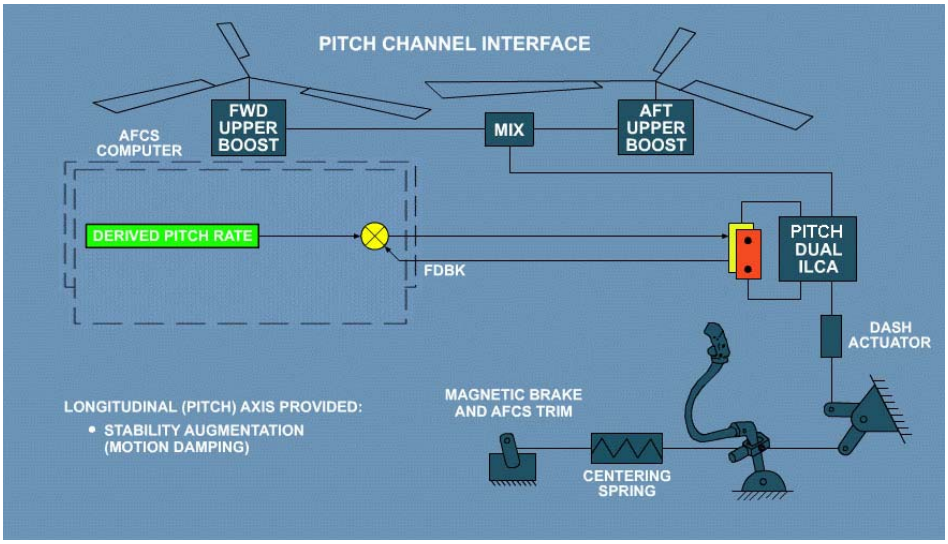
2) Thrust CCDA (100% travel authority).

3) DASH.

4) LCT.

(d) Built-In Test Equipment (BITE). The BITE is used for **ground** troubleshooting only! The engine condition levers must be in the STOP position for the BITE to function.

f. Subsystem operation.



(1) Pitch axis.

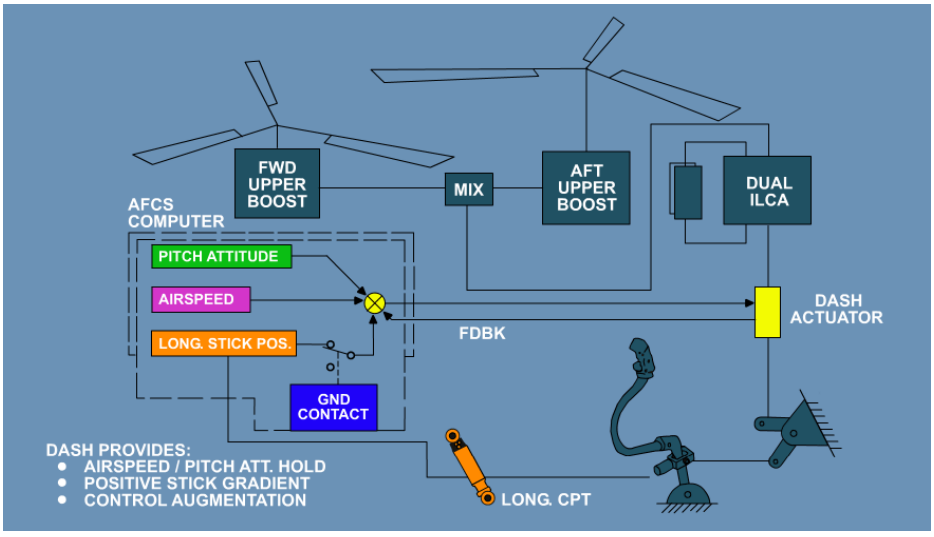
(a) Stability augmentation (motion dampening).

1) A rate of motion signal is derived from the vertical gyro

2) The rate signal goes to the extensible link portion of the pitch ILCA which makes the control input.

3) Proximity switches on the aft landing gear reduce the signal by 50% during ground operations.

(b) AFCS trim, forward or aft movement (discussed earlier).



(c) DASH.

1) The DASH actuator movement is controlled in response to airspeed, pitch attitude, and stick position so that a constant airspeed is maintained for a given stick position.

2) Positive stick gradient.

a) CPT's send stick position signal to the AFCS computers.

b) The airspeed signal from the pitot system to AFCS at airspeeds above 40 knots.

c) DASH actuator makes the control input.

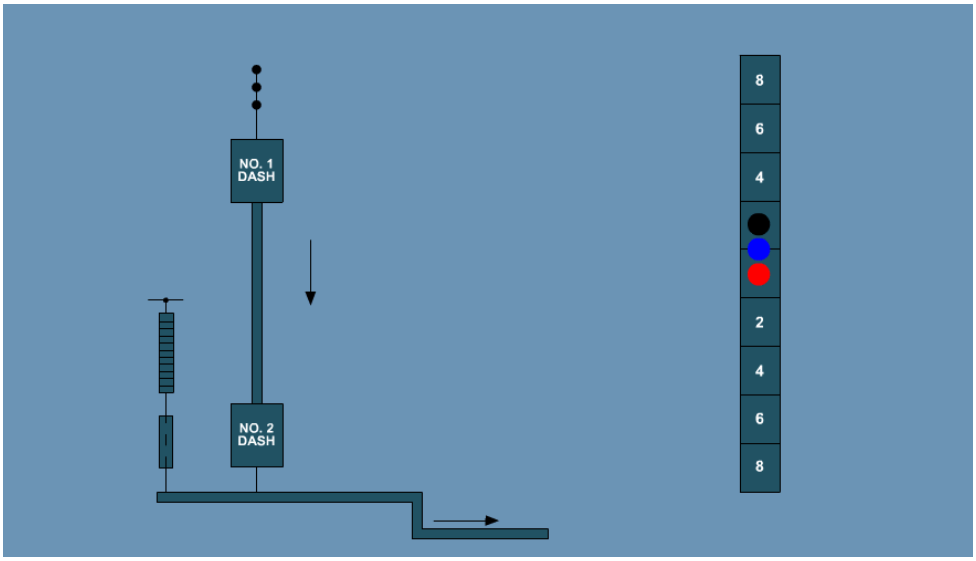
d) Provides stick position in proportion to airspeed from hover to V-max.

3) Pitch attitude hold.

a) Pitch attitude change is sensed by the vertical gyros.

b) The DASH actuators make the control input.

4) Airspeed hold. The DASH actuators extend or retract to maintain a constant airspeed for any given stick position at airspeeds above 40 knots.



5) When the AFCS is turned OFF:

a) The DASH actuators remain at **that airspeed** position.

b) The stick gradient will now be negative.

6) When AFCS is turned ON at a different airspeed:

a) The cyclic will be at an incorrect position.

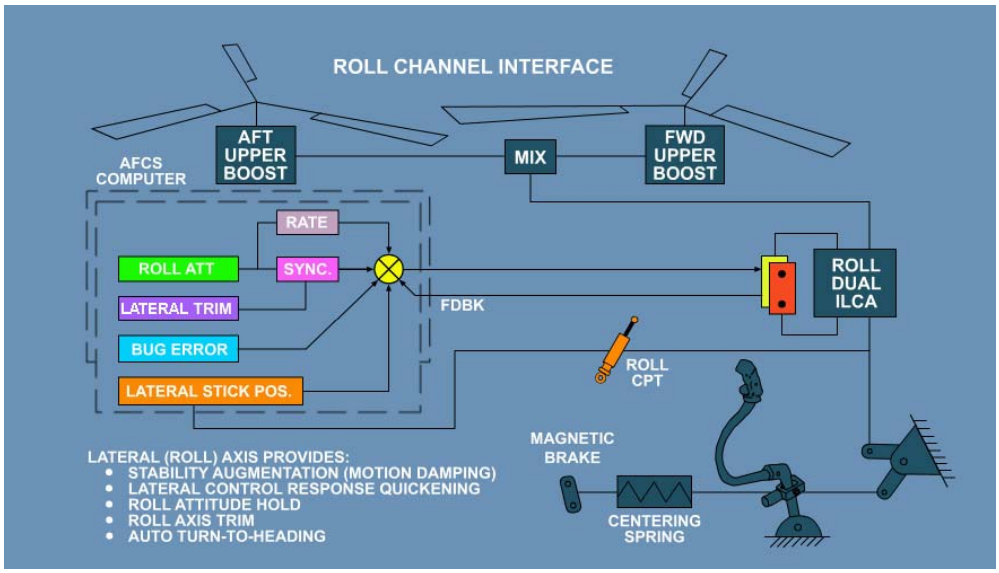
b) The DASH actuator will extend or retract at a reduced rate to the position where it should be for the new stick position and airspeed.

c) The AFCS OFF caution light will be on until DASH corresponds to the airspeed and stick position.

d) Low rate pitch transients will occur if in flight.

7) The longitudinal CPT input to the AFCS is canceled when the aft landing gear is on the ground.

8) The vertical gyro signal **is not** canceled.



(2) Roll axis.

(a) Stability augmentation (motion dampening).

1) A rate of motion signal is derived from the vertical gyros.

2) The rate signal goes to the extensible link portion of the roll ILCA.

(b) Bank angle hold (roll attitude).

1) Vertical gyros supply the attitude signal to the AFCS.

2) The extensible link of the roll ILCA makes the input.

3) Bank angle hold **is** disengaged anytime:

a) The centering device release button is pressed.

b) The cyclic is moved laterally.

c) **HDG select** is engaged.

d) **Lateral** AFCS trim is used.

4) Bank angle hold will not resume until the roll rate is less than 1.5º degrees per second.

(c) Lateral AFCS trim (discussed earlier).

(d) Heading select.

1) HDG select automatically produces a standard rate turn.

2) Operation.

a) AFCS must be on.

b) Airspeed must be above 40 knots.

c) Be sure the gyrosyn compass is synchronized!

d) Rotate the heading bug on the HSI that is to be used for the referenced heading until the cursor bug is aligned with the chosen heading on the compass card.

e) Trim the aircraft for straight and level flight (a centered ball).

f) Trim forces, press the centering device release switch and release.

g) Press CMD SEL switch on HSI.

h) Press the AFCS HDG switch.

i) The aircraft will now turn to the heading selected.

j) The heading can be changed by rotating the bug to a new heading.

3) Explanation of HDG select.

a) The AFCS computer directs the bug error signal (difference between the present heading and the HSI bug heading) to the roll ILCA extensible link.

b) The roll rate signal is then applied to the yaw ILCA extensible link.

4) HDG select will **disengage** when:

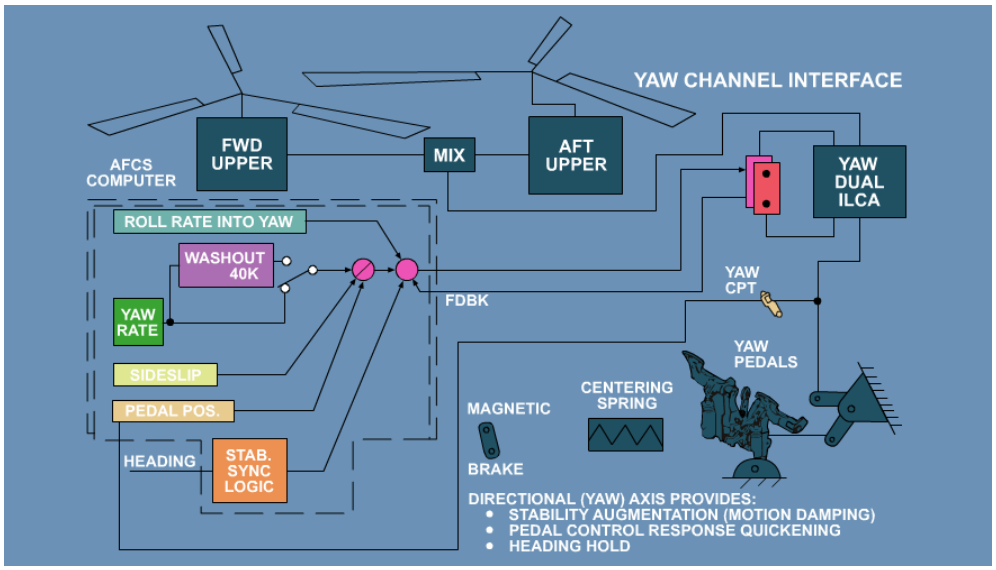
a) Airspeed drops below 40 knots.

b) The centering device release switch is pressed.

c) The other CMD SEL switch is pressed.

5) To re-engage HDG select, push the HDG switch on the AFCS control panel.

6) These features of AFCS will be **disengaged** while HDG is engaged: **Bank angle hold, heading hold, and lateral AFCS trim**.



(3) Yaw axis.

(a) Stability augmentation (motion dampening).

1) The rate gyro in the AFCS computer supplies the rate of motion signal.

2) The rate signal goes to the extensible link of the yaw ILCA.

(b) Sideslip stability.

1) AFCS ports (yaw) are connected to the sideslip transducer in the base of the AFCS computer.

2) The transducer senses differential pressure caused by sideslip conditions.

3) AFCS supplies the sideslip signal to the extensible link portion of the yaw ILCA to keep the aircraft in trim.

(c) Heading hold.

1) Maintains aircraft heading within 5º. The directional gyro supplies the heading signal to the AFCS computers. Then, AFCS provides that signal to the extensible link of the yaw ILCA.

2) Heading hold **is OFF** when:

a) The SWIVEL switch is set at STEER or UNLOCK (must be at LOCK position to engage).

b) Centering device release switch is pressed.

c) The pedals are moved.

d) Lateral AFCS trim is used above 40 knots.

e) Cyclic is moved laterally above 40 knots.

f) HDG select is engaged.

3) Heading hold **will not** resume until:

a) The yaw rate is less than 1.5º per second.

b) The bank angle is less than 1.5º at airspeeds above 40 knots.

(d) Coordinated turns.

1) With AFCS ON, AFCS automatically makes a coordinated roll and yaw input.

2) With AFCS ON at airspeeds **above 40 knots**:

a) Pilot moves the cyclic laterally (or lateral AFCS trim) causing the aircraft to roll.

b) A derived roll rate signal from the vertical gyro is supplied by AFCS to the yaw extensible link.

c) The extensible link makes the correct amount of yaw input.

d) The yaw rate signal is washed out during this period.

3) With AFCS OFF or airspeed is **below 40 knots**, the pilot must make the input.

a) A lateral cyclic input in the direction of turn.

b) A pedal input in the direction of turn.

(4) BARO ALT holds. Normally used for forward flight over terrain.

(a) Accuracy.

1) ± 25 feet in stabilized flight.

2) Transients up to ± 50 feet may occur during turns up to 20º bank angle or airspeed changes up to 20 knots.

(b) Thrust CCDA makes the control input and the thrust rod will move.

OPERATOR'S MANUAL CAUTION: To prevent engine over-torque, **do not enter forecast moderate or stronger turbulence** with BARO ALT engaged. **Page 8-30.**

(c) Limit bank angles to a maximum of 45º. Excessive bank angles could result in altitude loss, altitude hold will attempt to correct for the altitude loss and an over-torque condition may occur.

OPERATOR'S MANUAL CAUTION: Large pitch inputs will result in rapid gain or loss of altitude. If altitude hold is on, an over-torque condition can occur during large pitch-down inputs. Monitor thrust control movement and torque meter during airspeed changes, **Page 8-20.**

(d) To engage BARO ALT hold, when aircraft is at the desired altitude and airspeed, press the BARO ALT switch.

(e) To make altitude changes:

1) Press BARO ALT switch - check ENGAGED legend out.

2) Fly to desired altitude and press BARO ALT switch.

3) As an alternate method, press the thrust brake trigger and fly to new altitude, then release the thrust brake trigger.

(5) RAD ALT hold. Radar altitude hold maintains a more precise altitude in hover or over water than barometric altitude hold. This feature is normally used for extended hover operations.

(a) Accuracy is ± 5 feet.

(b) Maximum altitude is **1,500** feet agl.

(c) The altitude signal is supplied by the pilot's radar altimeter.

(d) Thrust CCDA makes the control input.

(e) To engage:

1) Radar altimeter must be ON.

2) Fly to the desired hover altitude.

3) Press the RAD ALT switch.

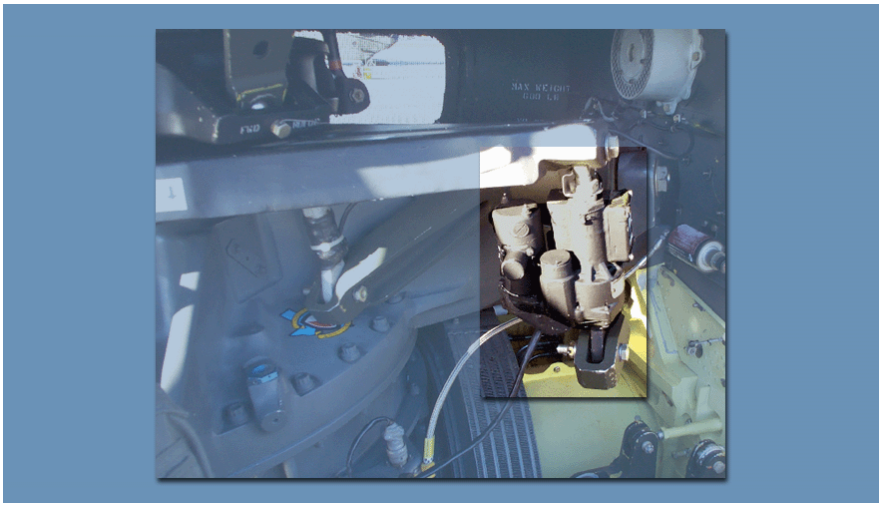
(f) To change altitude, press the thrust brake trigger switch and fly to new altitude.

(g) **Never** move the thrust rod without pressing the thrust brake trigger switch with altitude hold engaged.

OPERATOR'S MANUAL CAUTIONS: Radar altitude (RAD ALT) hold can only be used in forward flight over water; **it cannot be used in forward flight over terrain, Page8-20.**

OPERATOR'S MANUAL CAUTIONS: Failure of the No.1 vertical gyro with altitude hold engaged may result in an altitude runaway. If this occurs, disengage **ALT HOLD, Page 9-30.**

(6) Longitudinal cyclic trim (LCT).



(a) The LCT's provide longitudinal cyclic tilt of both rotor discs.

1) This reduces the angle of attack of the fuselage.

2) Helps to reduce fuselage drag.

3) Reduces blade flapping.

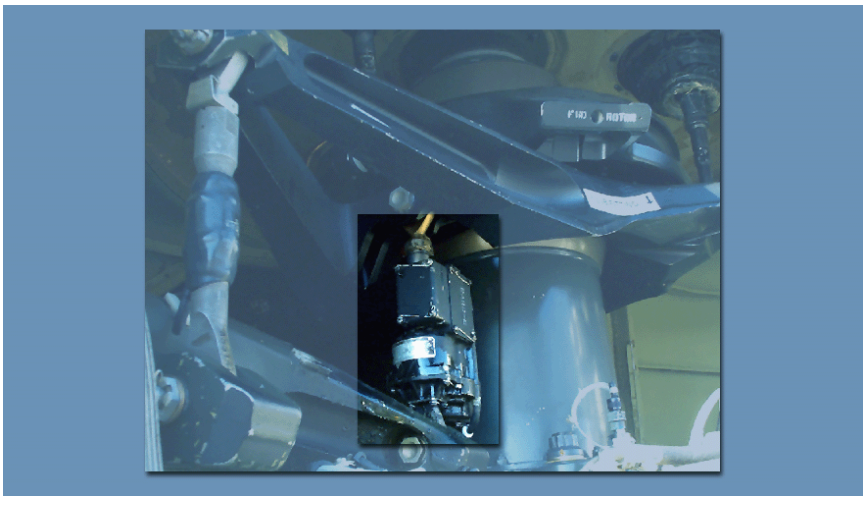
4) Reduce stress on the aft vertical shaft.

5) A more level fuselage at a hover.

6) An increase of forward airspeed.

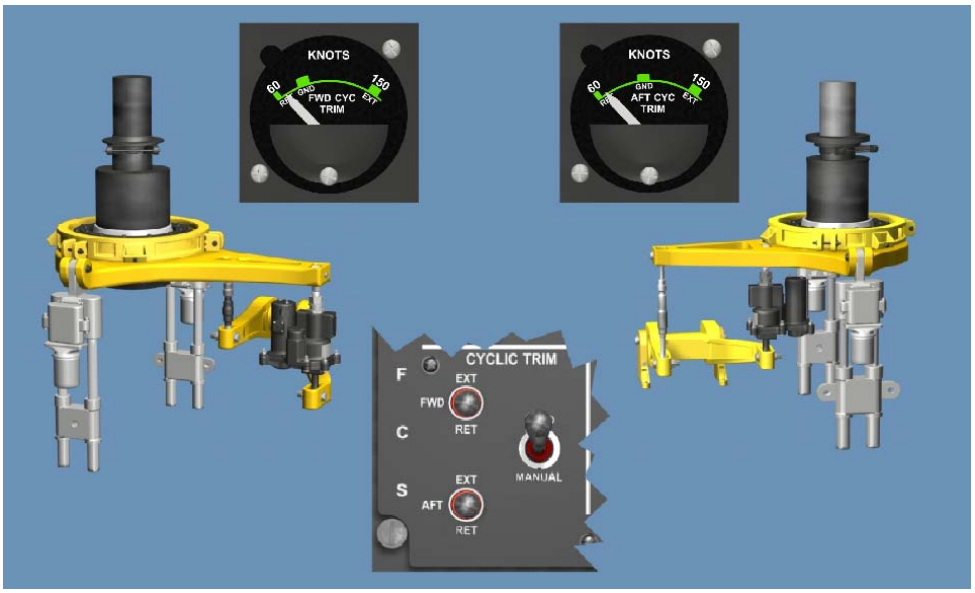
(b) LCT actuators tilt both swashplates.

1) The forward actuator is controlled by the No.1 AFCS.



2) Aft actuator is controlled by the No.2 AFCS.

3) LCT's will function with both AFCS off as long as electrical power is supplied to the computers.



(c) LCT switches on the AFCS control panel.

1) Mode select is used to select either AUTO or MANUAL operation.

a) AUTO − the actuators automatically program (extend or retract) as airspeed is increased or decreased.

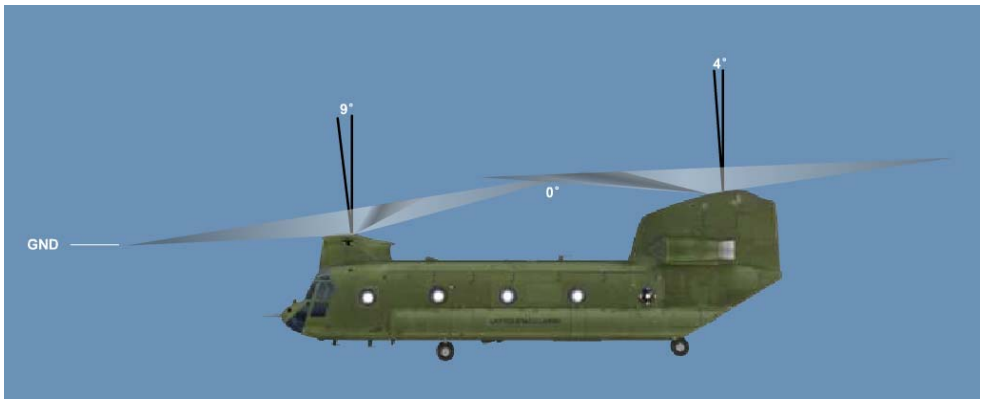
b) MANUAL − the actuators must be manually programmed by the pilot.

2) Manual EXT or RET switches for manual operation.

(d) Cyclic trim indicators. The indicators are located on the center instrument panel and indicate the position of the LCT actuators.

1) Calibrated in airspeed.

2) Will indicate actuator failure.



(e) The range of programming at sea level pressure altitude is 60 to 150 knots.

1) GND.

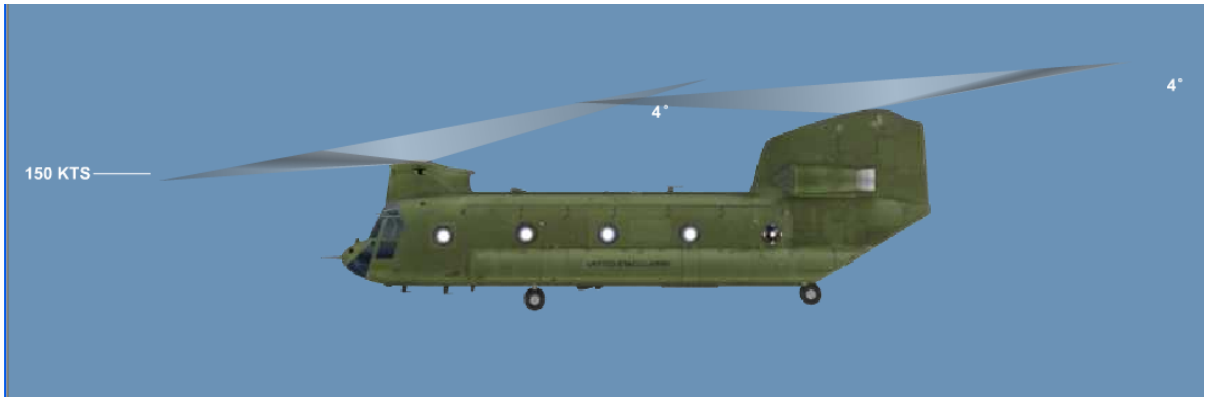
a) Both rotor discs are positioned perpendicular to the rotor mast.

b) This reduces blade flapping during ground operations.

c) Activated to GND by switches on the aft landing gear.

d) Some operations will require manually positioning the actuators to GND.

2) RET (60). Allows a level fuselage at a hover. Both rotor discs tilt aft of perpendicular to the rotor mast.



3) EXT (150). Both actuators are fully extended.

(f) Both actuators are altitude compensated up to 15,000 feet PA to provide more forward tilt of the rotor systems at lower airspeeds.

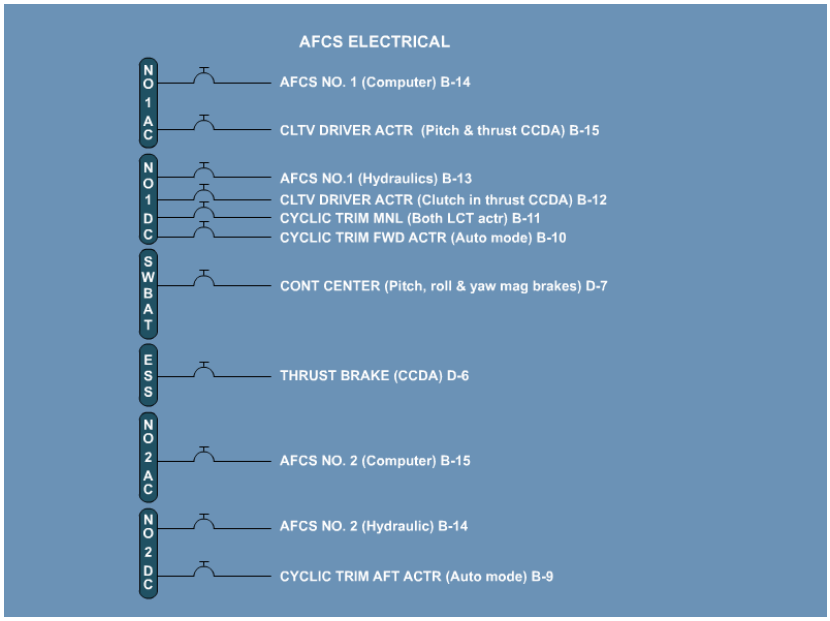
1) Three knots per 1,000 feet.

2) Actuators will not begin to program below 40 knots.

OPERATOR'S MANUAL: Prior to entering moderate or stronger turbulent air, the following should be accomplished: Longitudinal cyclic trim − Select MAN, then adjust both actuators for the airspeed to be flown. This is accomplished to prevent the cyclic trim actuators from cycling. **Pg: 8−4−3.**

(5) AFCS electrical.

(a) The No.1 AFCS receives AC and DC electrical power from the No.1 AC and DC buses respectively through the AFCS NO.1 circuit breakers on the No.1 PDP (same for the No. 2 side).



(b) Power is supplied to the HDG ENGAGED, BARO ALT and RAD ALT ENGAGED lights from the DC essential bus through the CAUTION PNL circuit breaker on the No.1 PDP.

2. Learning Step/Activity 2−Describe AFCS Limitations.

NOTE: Refer to a current operator's manual for these limits.

a. **Single** AFCS airspeed limit, **Page 9-29.**

b. Airspeed limit with **both** AFCS off, **Page 9-30.**

OPERATOR'S MANUAL: **Do not** manually extend the LCT beyond the GND position on the cyclic trim indicators at indicated airspeeds below 60 knots. Use of extended cyclic trim at low airspeeds will result in high aft **rotor blade stresses, Page 5-14.**

3. Learning Step/Activity 3−Describe AFCS Normal Operating Procedures.

NOTE: Refer to a current operator's manual for these procedures.

a. Hover check, **Page 8-19.**

1. AFCS — Check as follows: (First flight of day).

a. SYSTEM SEL switch — NO.1 Check helicopter stable with no abrupt engagement error. Check NO.2 AFCS OFF caution on.

b. SYSTEM SEL switch — NO.2 Check helicopter stable with no abrupt engagement error. Check NO.1 AFCS OFF caution on.

c. SYSTEM SEL switch — Both. Check helicopter stable with no abrupt engagement error. Check both AFCS OFF caution capsules extinguished.

b. Engine shutdown, **Page 8-22.**

1. AFCS SYSTEM SEL switch − OFF

4. Learning Step/Activity 4−Describe Emergency Procedures for AFCS.

NOTE: The instructor will explain the current −10 procedures.

c. **Single** AFCS failure, **Page 9-29.**

OPERATORS MANUAL: A malfunction of the AFCS can usually be detected by an abrupt attitude change (hardover) or unusual oscillations in one or more of the flight control axes or by lighting of the NO.1 or NO.2 AFCS OFF caution. If flight is conducted at low altitude such as contour or NOE, a climb to higher altitude must be initiated before the pilot attempts isolation of the defective system.

1. **Airspeed — Reduce** to 100 KIAS or Vne, whichever is slower.

2. **Altitude — Adjus**t as required.

NOTE: A hard-over in the opposite direction may occur when the malfunctioning AFCS is turned off and the functioning AFCS reacts on the flight controls.

3. AFCS SYSTEM SEL switch — Isolate defective system. Turn NO. 1 ON, if not isolated, turn NO. 2 ON.

If system is not isolated:

AFCS SYSTEM SEL switch **— OFF.**

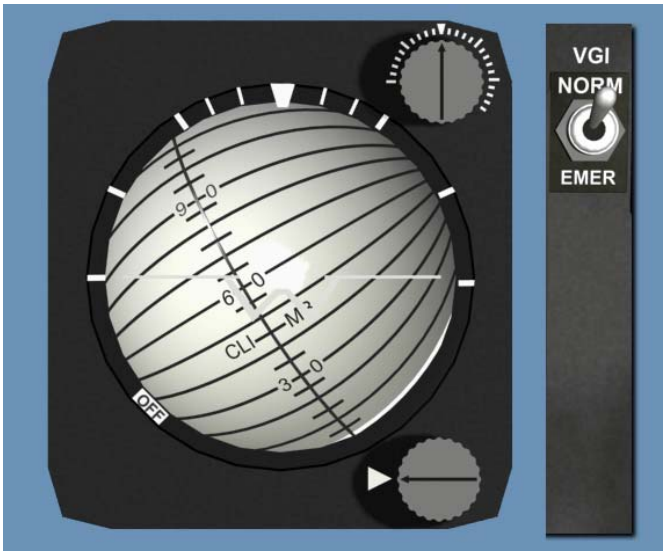
d. **Dua**l AFCS failure, **Page 9-30.**

1. **AFCS SYSTEM SEL switch — OFF.**

If IMC;

2. Land as soon as practicable.

e. Vertical gyro malfunction, **Page 9-30.**



OPERATORS MANUAL: A vertical gyro malfunction will be indicated by an attitude indicator failure, an AFCS OFF caution, and attitude transients. If a vertical gyro failure occurs, proceed as follows:

CAUTION: Failure of the No.1 vertical gyro with altitude hold engaged may result in an altitude runaway. If this occurs, disengage ALT HOLD**.**

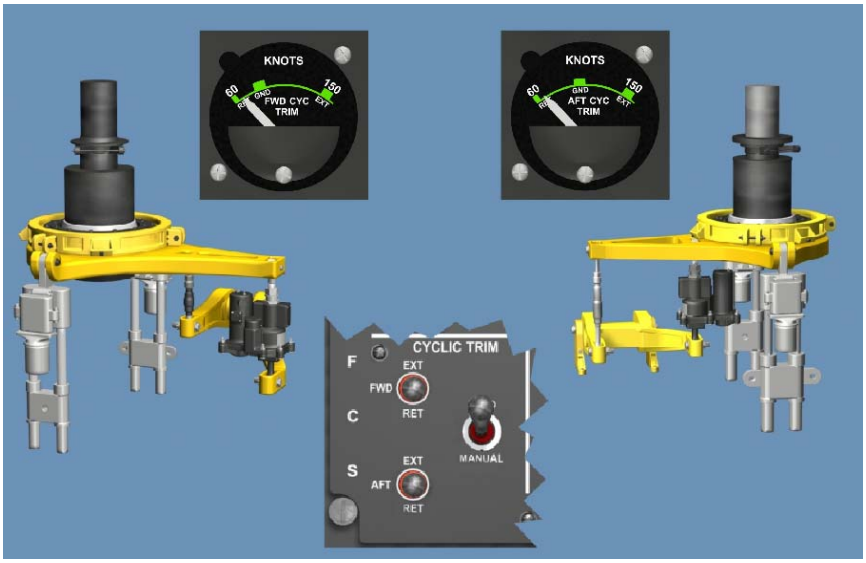
NOTE: Failure of a vertical gyro results in loss of its associated AFCS and should be treated as a single AFCS failure.

1. **Airspeed — 100 KIAS or Vne , whichever is slower.**

2. Affected VGI switch — EMER.

3. AFCS — Select remaining system.

f. LCT system failure, **Page 9-29.**



OPERATORS MANUAL: Should the system fail during cruise, with the cyclic trim system programmed for maximum forward tilt of the rotors, an abnormal nose-up attitude will result with decreasing airspeed. Should one or both cyclic actuators fail in full retract position, airspeed must be limited according to Vne for retracted longitudinal cyclic trim. With both LCT's partially or fully retracted, maintain below Vne and if failure occurs extended, maintain airspeed at or above **60 KIAS** or until the approach to landing. Should the longitudinal cyclic trim system fail, perform the following:

CYCLIC TRIM circuit breakers — In. If cyclic trim operation is not restored, proceed with the procedures below for AUTO or MANUAL modes of operation.

If in AUTO mode:

1. **Airspeed — Adjust.**

2. CYCLIC TRIM switch — MANUAL.

3. FWD and AFT CYCLIC TRIM switches — Adjust for airspeed.

If LCT operation is not indicated:

FWD and AFT CYCLIC TRIM switches — RET for 30 seconds, before landing.

If in MANUAL mode:

1. **Airspeed — Adjust.**

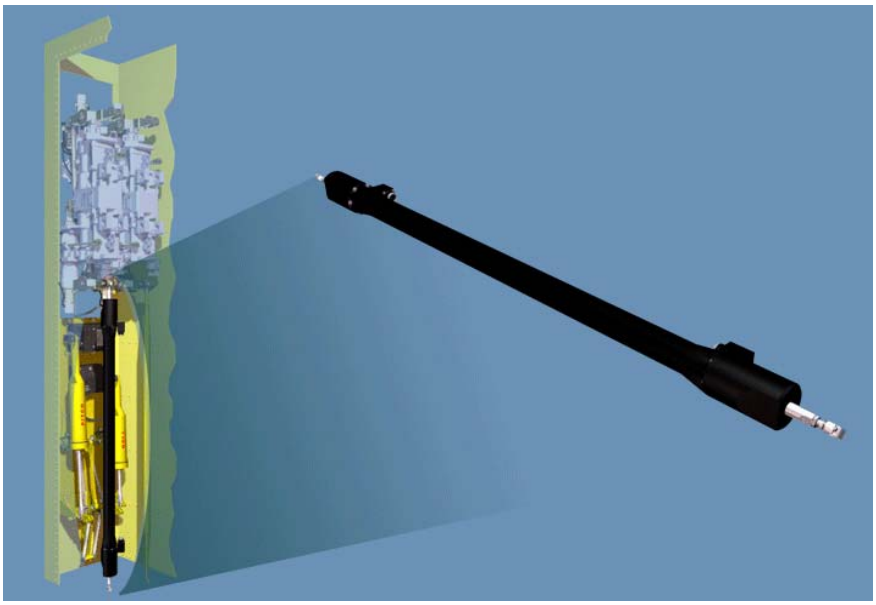
2. CYCLIC TRIM switch — AUTO.

If normal LCT operation is not indicated:

1. CYCLIC TRIM switch — MANUAL.

2. FWD and AFT CYCLIC TRIM switches — RET both LCTS for 30 seconds, before landing.

g. DASH failure, **Page 9-30.**



OPERATORS MANUAL: Differential airspeed hold failure will be recognized by pitch attitude deviations. If DASH failure occurs, avoid nose high attitudes.

h. CCDA failure, **Page 9-30.**

1. THRUST CONT lever — Slip as required.

2. RAD/ALT/BARO ALT switch—DISENGAGED.

Appendix C - Practical Exercises and Solutions

CH-47D ADVANCED FLIGHT CONTROL SYSTEM (AFCS)

PRATICAL EXERCISE

NOTE: This practical exercise covers the instruction you received in this handout. Completion is optional, but strongly encouraged!

1. Can both altitude hold modes be engaged at the same time?

2. What happens to heading select when the centering device release switch is pressed?

3. The AFCS stabilizes the helicopter about all axes and enhances control response; name five features provided by the AFCS.

4. How should you momentarily disengage the altitude hold when changing altitude?

5. Should you allow the cyclic to move when the AFCS trim switch is moved forward or aft?

6. Will the cyclic move when lateral AFCS trim is used?

7. When HDG Select is engaged how can the pilot change the aircraft heading, without touching the controls.

8. Which actuator makes the control input for positive stick gradient, pitch attitude, and airspeed hold purposes?

9. What is the status of the heading hold when HDG is engaged?

10. Will the LCT's function with the AFCS off?

11. When are you allowed to use radar altitude hold?

12. What should you do prior to entering moderate turbulence if BARO ALT is engaged?

13. Which switches must you press to engage heading select?

14. Radar and Barometric altitude hold are controlled by which AFCS Computer?

15. What causes the LCT actuator to position to GND when operating at AUTO?

16. What should you do if the LCT actuators fail to position to GND during taxi, water, or slope operations?

17. What are 3 of 4 methods of disengaging heading (HDG) select?

18. Where must the swivel switch be positioned in order for heading hold to operate?

19. How will a vertical gyro failure affect AFCS?

20. What features of AFCS are disengaged while the centering device release switch is pressed?

21. When operating at or above 40 KIAS does the AFCS automatically provide coordinated turns?

22. Which radar altimeter provides the altitude signals to AFCS?

23. What is the maximum bank angle with altitude hold engaged?

24. What is the maximum allowable airspeed when operating with Both AFCS OFF?

25. What is the maximum allowable airspeed when operating with a single AFCS ON?

26. What must you monitor to prevent transmission damage when changing airspeed or heading with altitude hold engaged?

27. What are the 3 AFCS functions are provided by the DASH actuator?

28. How is HDG select re-engaged if the other CMD SEL switch is pressed while heading select is engaged?

29. What action should you take if altitude hold fails?

30. Should you cause the thrust brake to slip during the controls check?

31. What is the emergency procedure for a single AFCS failure with both systems on?

32. If you have a hardover with both AFCS on, how will you know when you have the good system selected on?

33. What action is required to release the Thrust Magnetic brake?

34. How will the aircraft react if AFCS is turned off at one airspeed and back on at a different airspeed?

35. What will indicate that the DASH actuators are re-centering when AFCS is first turned on?

36. Do not manually extend the LCT actuators beyond the GND position on the cyclic trim indicators at airspeeds below_____ KIAS.

37. How can you change the aircraft bank angle without moving the cyclic?

38. What is the minimum airspeed for engaging heading select?

39. When are you **prohibited** from using radar altitude hold?

40. How will an LCT actuator failure be indicated?

41. What are three possible indications of a vertical gyro failure?

42. Which mode of LCT operation should you select during flight in turbulence?

43. The acronym CPT stands for?

CH-47D ADVANCED FLIGHT CONTROL SYSTEM (AFCS)

PRATICAL EXERCISE SOLUTIONS

1. No.

2. It goes off.

3. Heading Hold
   Barometric Hold
   Radar Altitude Hold
   Pitch Attitude Hold
   Altitude Hold
   Positive Stick Gradient
   Bank Angle Hold
   Coordinated Turns
   Heading Select
   Airspeed Hold
   LCT Programming

4. Press the thrust brake trigger switch.

5. Yes.

6. No.

7. By rotating the Heading Bug on the HSI

8. DASH.

9. Off.

10. Yes

11. Hover up to 1,500 feet agl, forward flight over water.

12. Disengage it.

13. CMD SEL and HDG

14. #1

15. Both aft landing gear proximity switches.

16. Select MAN and manually position them.

17. Press CMD Select
    Turn it off
    CDR (Centering Device Release) Switch
    Decrease airspeed below 40 knots

18. LOCK.

19. AFCS may go off or pitch and roll transients.

20. Heading hold, heading select, bank angle hold.

21. Yes
22. Pilots.
23. 45º degrees.
24. 160 Knots or VNE, whichever is slower
25. 100 Knots or VNE, whichever is slower
26. Thrust and torque.
27. Airspeed Hold, Pitch attitude Hold, Positive Stick Gradient
28. Press HDG switch.
29. Turn it off.
30. NO.
31. Refer to the current –10.
32. A reverse hardover will occur.
33. Press the thrust control trigger.
34. Pitch attitude transients.
35. AFCS off caution lights on.
36. 60 Knots.
37. Lateral AFCS trim switch.
38. 40 Knots.
39. In Forward Flight over Terrain.
40. LCT indicator pointers fail to move.
41. OFF Flag on VGI. AFCS OFF Light and PITCH / ROLL Transients.
42. MAN.
43. Control Position Transducer.