AILERON AND SPOILER SYSTEM - ADJUSTMENT/TEST

1. General

A. This section has procedures for the 400B Autopilot, 400B Integrated Flight Control System, KAP-150 Autopilot, KFC-150 and KFC-225 Flight Control System. The following procedures give instructions for aileron rigging and for the aileron friction band check.

2. Aileron Rigging (Airplanes with 400B and 400B IFCS Autopilots Types AF-550A and IF-550A Installed)

NOTE: For the correct operation of the 400B Autopilot and 400B IFCS, the autopilot rigging must be examined in accordance with Chapter 5, Inspection Time Limits.

A. Rig the Ailerons (Refer to Figure 501).

(1) Set the control wheels so the ailerons are in a neutral position.

(2) Set a bar across the top of the control wheels and tape the bar to the control wheels. The bar connects them together and locks them in the neutral position.

(3) Remove the pilot and copilot seats. Refer to Chapter 25, Flight Compartment - Maintenance Practices.

(4) Remove the floor covering and access plates to get access to the roll actuator and cable assemblies. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

(5) Make sure the actuator support assembly is correctly riveted to the longeron at rib-line 19.00.

(6) Make sure the electrical connector is correctly attached.

(7) Make sure the actuator motor is attached to the actuator mount with four bolts and washers.

NOTE: The aileron actuator cable assembly is also utilized as the aileron interconnect cable (actuator/interconnect cable assembly).

(8) Make sure the actuator mount is correctly attached to the actuator support assembly with four bolts and washers.

(9) Make sure the aileron actuator/interconnect cable assembly is correctly adjusted by the following inspection procedures.

(a) Make sure the right hand clamp assembly is correctly set in position on the aileron cable assembly. It must be four inches outboard from the center of the actuator sprocket.

(b) Make sure the upper and lower right hand clamp halves are attached together with two bolts, washers, and nuts.

(c) Make sure the right hand aileron cable is routed through the small cable slot.

(d) Make sure the actuator/interconnect cable terminal is routed through the large cable slot and set in position with two roll pins.

(e) Make sure the chain portion of the actuator/interconnect cable assembly is closely centered on the actuator sprocket.

(f) Make sure the chain guard posts have safety wire attached and are correctly set in position next to the actuator sprocket.

NOTE: When the chain guard posts are loosened for removal, do not lose the lock washers.

NOTE: To replace the actuator/interconnect cable assembly, you must first remove the safety wire attached to the two chain guard posts and remove the chain guard posts.

(g) Make sure the chain part of the cable assembly is attached to the cable terminals with two chain link fasteners.

(h) Make sure the cable part of actuator/interconnect assembly is correctly routed through the pulley mount brackets and centered on the pulley.

(i) Make sure the two pins are installed correctly to the pulley mount brackets to safety the cable portion of the actuator/interconnect cable assembly.

(j) Make sure the two pulley mount brackets are correctly attached to the bulkhead at station 128.00.

(k) Make sure the pulley is correctly attacked to the pulley mount brackets with a bolt, washer and nut.

(l) Make sure the upper and lower left hand clamp halves are correctly attached together with two each bolts, washer and nut.

(m) Make sure the left hand aileron cable is routed through the large cable slot.

(n) Make sure the actuator interconnect cable is routed through the small cable slot.

(10) Do an inspection of the cable tension on the actuator/interconnect cable assembly.

(a) Make sure the aileron actuator/interconnect cable assembly is rigged correctly.

(b) Attach the cable tensiometer to the actuator/interconnect cable. The tensiometer must show a value of 10 to 15 pounds.

(c) If the cable tension is less than 10 pounds or more than 15 pounds, adjust the cables to the correct tension.

1 Loosen the bolts that attach the left hand clamp assembly.

2 To reduce the cable tension, move the left hand clamp inboard. To increase the cable tension, move the left hand clamp outboard.

3 When the correct tension is shown, tighten the bolts.

(d) Remove the tensiometer from the actuator/interconnect cable.

(e) Remove the bar attached to the control wheels.

(11) To remove the gyro roll and pitch signals made by a non-erect gyro, the 400B autopilot has a GYRO switch located on the rear of the control head. Set the GYRO switch to the OUT position. The 400B IFCS does not have a gyro out switch. It will be necessary to hook up an outside vacuum source or operate the engine to erect the gyro.

NOTE: If an outside vacuum source is used, it must be calibrated in inches of mercury. The desired suction range necessary to erect the gyro is 4.6 to 5.4 In.Hg.

NOTE: If the engine is operated to erect the gyro, the engine must be operated at 65 percent Ng to provide the amount of vacuum required and maintain the correct bus voltage.

(12) Turn the airplane battery switch and the 1 & 2 avionics power and autopilot (AP) switch to ON.

(13) Use the autopilot's PULL-TURN knob (pull out on 400B autopilot), and visually check the operation of the aileron travel in each direction.

NOTE: After several seconds, the ailerons will move slowly in the correct direction. The aileron travel does not need to have full travel in each direction. The typical control wheel travel will be full travel.

(14) Do a check of the autopilot so that it may be overpowered using the control wheels at any time. This procedure must be kept to a minimum since the extended manual operation will overheat the actuator, causing a thermostatic switch to remove power from the actuator.

(15) Turn OFF the autopilot (AP) switch, avionics power switches and the airplane battery switch.

(16) Install the access plates and carpeting. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

3. Aileron Friction Band (Airplanes with 400B and 400B IFCS Autopilots Types AF-550A and IF-550A Installed)

A. Do a check of the aileron friction band.

NOTE: The aileron friction band without an autopilot installed must be six pounds or less. With an autopilot installed, the aileron friction band must be eight pounds or less. The friction band must be measured and calculated each time the autopilot rigging is examined. Corrective action to decrease the aileron system friction band must be done if it is higher than the band range.

(1) All friction measurements must be made with a load scale so that the force exerted to move the aileron is applied to and in place of the control wheel assembly. The load scale must be attached to control wheel assembly at the longest possible moment arm (inside the grip). The friction band requirements apply over the complete travel of the ailerons.

(a) Turn the control wheel to approximately 30 degrees in a counter clockwise direction and attach the load scale.

(b) Apply a force to turn the control wheel in a clockwise direction. Write down the scale value as the control wheel passes the aileron neutral position. Identify this force as F1.

(c) Remove the load scale.

(d) Turn the control wheel approximately 30 degrees in the clockwise direction. Attach the load scale and exert a force to rotate the control wheel in a counter clockwise direction. Write down the scale value as the control wheel passes the aileron neutral position. Identify this force as F2.

(e) Remove the load scale.

(2) The aileron friction band is calculated by adding the values of F1 and F2. The friction band = F1 + F2.

(3) When the friction band is greater than the limits of 7 pounds, the following steps must be completed to reduce the system friction to an acceptable level.

(a) Do a check of the aileron direct, aileron return, interconnect, and rudder cables for clearance. Remove all interference.

(b) Decrease the tension on the aileron cable (minimum cabin loop tension is 15 pounds, minimum wing loop tension is 35 pounds) with ailerons in the neutral position.

(c) Decrease the aileron actuator/interconnect cable tension to 10 to 15 pounds with the ailerons in the neutral position.

(d) Do a check of the pulley alignment and adjust as necessary.

4. Slip Clutch Adjustment, Values and Capstan (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

A. Servo Slip Clutch Torque Settings (Refer to Figure 502).

NOTE: The servo slip clutch torque settings are adjustable and must be set before servo installation.

(1) Set the servo slip clutch torque to the appropriate value.

NOTE: The fixtures and tools required to complete the adjustments are supplied with the KTS 150 test set and the KTS 158 test set.

5. KM 275 and KM 277 Slip Clutch Torque Adjustment (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

A. Adjust the Slip Clutch Torque (Refer to Figure 502).

(1) Refer to Slip Clutch Adjustment, Values and Capstan, to determine the servo mount part number and setting required for each axis of the airplane.

(2) Remove the capstan guard from the KM 275 and KM 277 capstan plate.

(3) Attach the KM 275 or KM 277 servo mount and servo motor to the KTS 158 test stand (047-4238-01).

(a) When you adjust a KM 275, place the adapter tool over the KM 275 capstan and insert the positioning pin (from the straight-up position) to attach the adapter tool.

(b) When you adjust a KM 277, use the three sprocket pins (071-6065-00) to attach the adapter tool to the capstan.

NOTE: An alternative adjustment method for the KM 277 is to use the King gear adapter assembly (071-6018-06).

(4) Insert a torque wrench (Snap-On TEP-6FUA or equivalent).

(5) Connect the servo motor to the appropriate KTS 158 Test Set connector and apply power to the servo motor.

(6) Do a test of the torque value.

NOTE: The desired torque value is the average of the maximum and minimum indications from the clockwise and counterclockwise rotations. The test must be repeated three times in each direction and then the average of the six values is used to determine the true torque value.

(a) Use the appropriate switch on the KTS 158 Test Set and turn the servo motor in the clockwise direction. Write down the torque value shown on the wrench.

(b) Use the appropriate switch on the KTS 158 Test Set and turn the servo motor in the counter clockwise direction. Write down the torque value shown on the wrench.

(c) If the level measured is less than the desired value, rotate the clutch adjust nut clockwise.

(d) If the level measured is more than the desired value, rotate the clutch adjust nut counterclockwise.

(7) After an adjustment, repeat the torque test.

(8) After wiring has been completed and the servos installed, make sure the rotation direction of the servo capstans is correct.

6. Aileron Rigging (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

A. Adjust the Ailerons (Refer to Figure 503).

NOTE: To make sure of the correct operation of the KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System, the autopilot rigging must be checked in accordance with Chapter 5, Inspection Time Limits.

(1) Set the control wheels so the ailerons are in a neutral position.

(2) Set a bar across the top of the control wheels and tape the bar to the control wheels. The bar connects them together and locks them in the neutral position.

(3) Remove the pilot and copilot seats. Refer to Chapter 25, Flight Compartment - Maintenance Practices.

(4) Remove the floor covering and access plates to get access to the roll servo and cable assemblies. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

NOTE: The KS 271A Roll Servo and KM 275 Servo Mount are located under the cabin floor on the right side of the airplane at FS 148.0.

(5) Adjust the slip clutch of the KM 275 capstan. Refer to Slip Clutch Torque Adjustment.

(6) Make sure the KM 275 Servo Mount is correctly attached to the roll servo bracket.

(7) Make sure the servo mount and roll servo bracket are installed in the airplane under the right main aileron cable.

NOTE: The inboard servo bracket must be 1.88 inches aft of FS 143.0. The top of the KM 275 Capstan must be 0.25 to 0.50 inch below the right main aileron cable.

(8) Make sure the roll bracket support is installed against the inboard side of the existing triangle box brace located to the right and the KM 275 capstan. The flange of the roll bracket support containing the two slots must be aligned over two nut plates existing in the triangle box brace. The longest flange of the roll bracket support must be against the forward side of the roll servo bracket. Make sure the roll bracket support is attached to the triangle box brace with two bolts and two washers.

(9) Make sure the bridle cable is properly aligned in the bridle cable idler pulley at FS 131.0 and LBL 14.0 and the pulley correctly installed with one bolt, washer and nut.

(10) With the ailerons in the neutral position, locate the KM 275 capstan ball straight up.

(11) Make sure the roll bridle cable is wrapped around the KM 275 capstan.

NOTE: The short end of the roll bridle cable must be routed aft along the right main aileron cable. The long end of the roll bridle cable must be routed forward along the main aileron cable and around the idler pulley, then routed aft along the left main aileron cable.

(12) Make sure the ends of the roll bridle cable are correctly attached to the main aileron cables with four cable clamps, four bolts, eight washers and four nuts.

CAUTION: The roll bridle cable must not rub against any of the stringers and bulkheads.

(13) Do an inspection of the roll bridle cable to make sure it passes through all the stringers and bulkheads correctly. Do an inspection of the cable for corrosion and worn areas on the cable. If necessary, increase the cable openings in the stringers and bulkheads to allow the roll bridle cable to travel without touch.

(14) Install a tensiometer on the bridle cable.

(a) Make sure the tensiometer on the cable shows 12.00 pounds (53.38 N), +2.00 or -2.00 pounds (+8.90 or -8.90 N).

(b) Make sure the torque on the four cable clamp nuts is 50 inch-pounds, +5 or -5 inch-pounds.

(15) Do a check of the roll bridle cable route around the idler pulley at FS 131.0. Make sure the two cable guard pins for the main aileron cables give protection to the roll bridle cable idler pulley.

(16) Remove the tensiometer.

(17) Remove the tape and the bar attached to the control wheels.

(18) Install the pilot and copilot seats. Refer to Chapter 25, Flight Compartment - Maintenance Practices.

(19) Install the floor cover and access plates. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

7. Friction Band (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

A. Do a check on the aileron friction band.

NOTE: The aileron friction band without an autopilot installed must be six pounds or less. With an autopilot installed, the aileron friction band must be eight pounds or less. The friction band must be measured and calculated each time the autopilot rigging is examined. Corrective action to decrease the aileron system friction band must be done if it is higher than the band range.

(1) All friction measurements must be made with a load scale so that the force exerted to move the aileron is applied to and in place of the control wheel assembly. The load scale must be attached to the control wheel assembly at the longest possible moment arm (inside the grip). The friction band requirements apply over the complete travel of the ailerons.

(a) With control wheel rotated to approximately 30 degrees in the counter clockwise direction, attach a load scale and exert a force to turn the wheel in a clockwise direction. Take the scale value as the control wheel passes the aileron neutral position. Identify this value as F1.

(b) With the control wheel rotated to approximately 30 degrees in the clockwise direction, attach load scale and exert a force to turn the wheel in a counter clockwise direction. Take the scale value as the control wheel passes the aileron neutral position. Identify this value as F2.

(2) The aileron friction band is calculated by adding the measured values F1 and F2. Friction Band = F1 + F2.

(3) When the friction band is more than the limitations of six pounds or less without an autopilot, or eight pounds or less with an autopilot, do the steps below to decrease the system friction to an satisfactory level.

(a) Do a check of the aileron direct cable, aileron return cable, interconnect cable, and rudder cable for clearance and remove any interference.

(b) Decrease the tension on the aileron cable with the ailerons in the neutral position. The tension of the minimum cabin loop to 15 pounds. The tension of the minimum wing loop to 35 pounds.

(c) Decrease the tension on the aileron actuator/interconnect cable with the ailerons in the neutral position. The acceptable range is 10 to 15 pounds.

(d) Do a check and adjust pulley alignment as necessary.

Figure 501 : Sheet 1 : Aileron Rigging (Airplanes with 400B and 400B IFCS Autopilots Types AF-550A and IF-550A Installed)

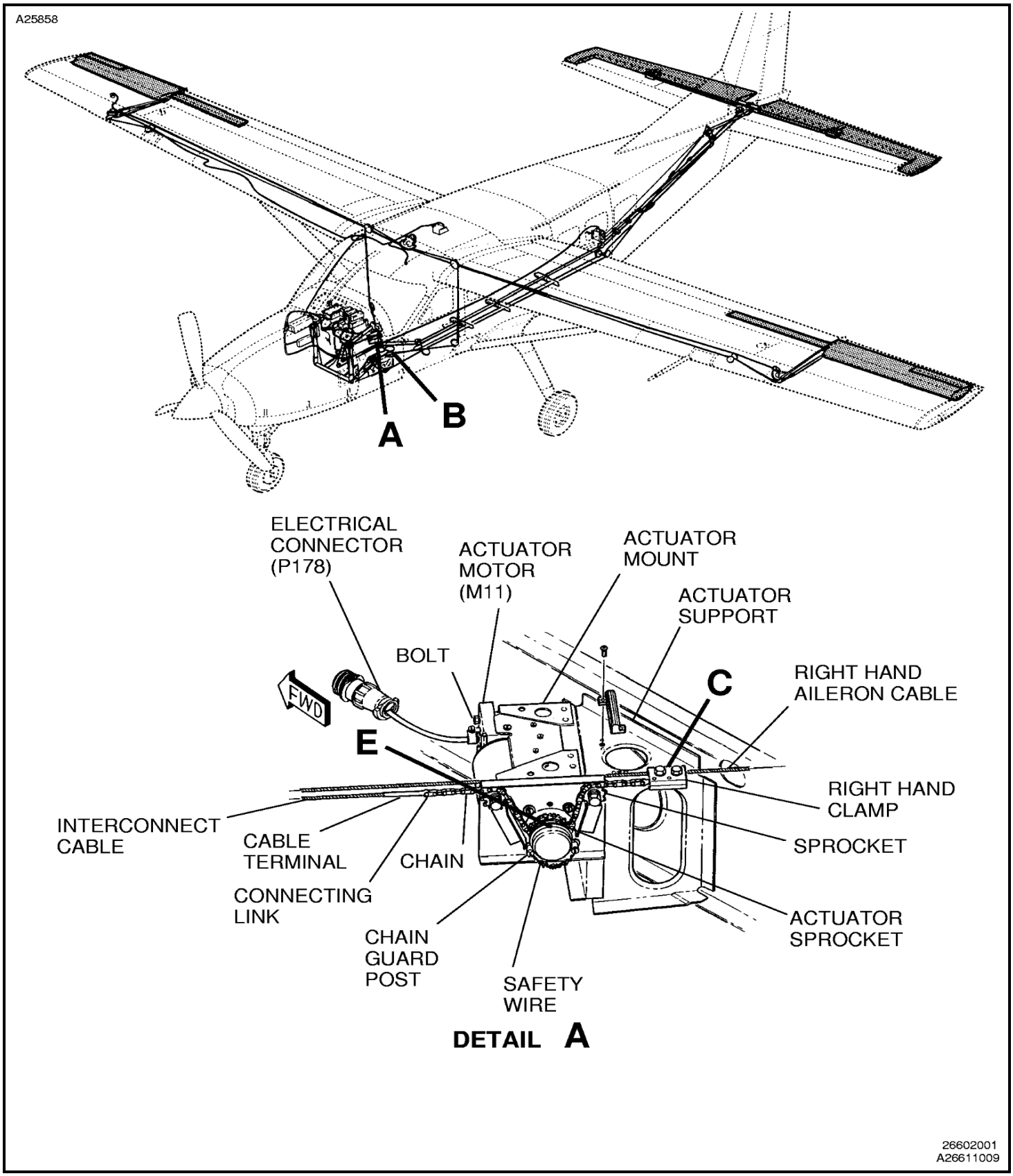

Figure 501 : Sheet 2 : Aileron Rigging (Airplanes with 400B and 400B IFCS Autopilots Types AF-550A and IF-550A Installed)

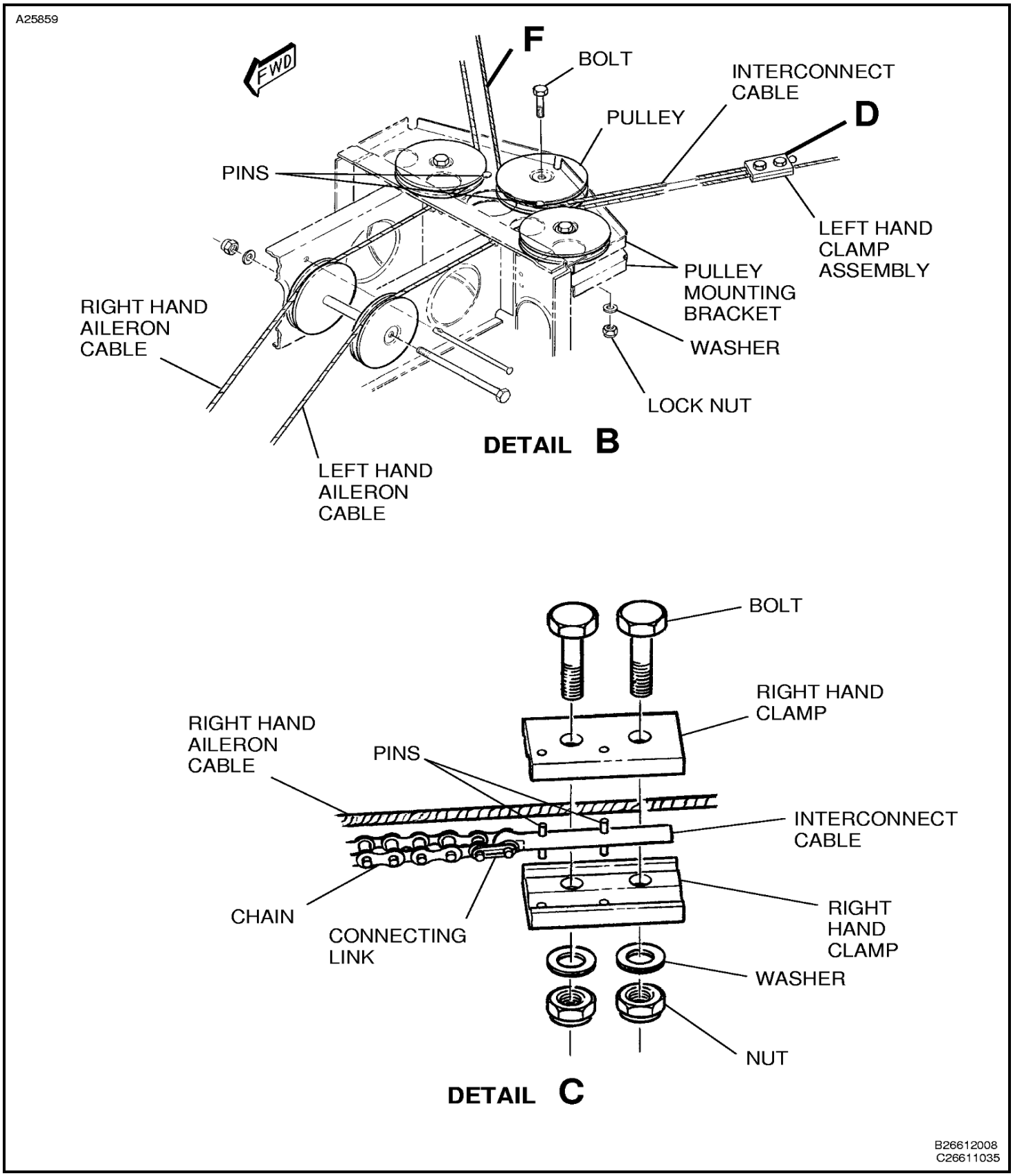

Figure 501 : Sheet 3 : Aileron Rigging (Airplanes with 400B and 400B IFCS Autopilots Types AF-550A and IF-550A Installed)

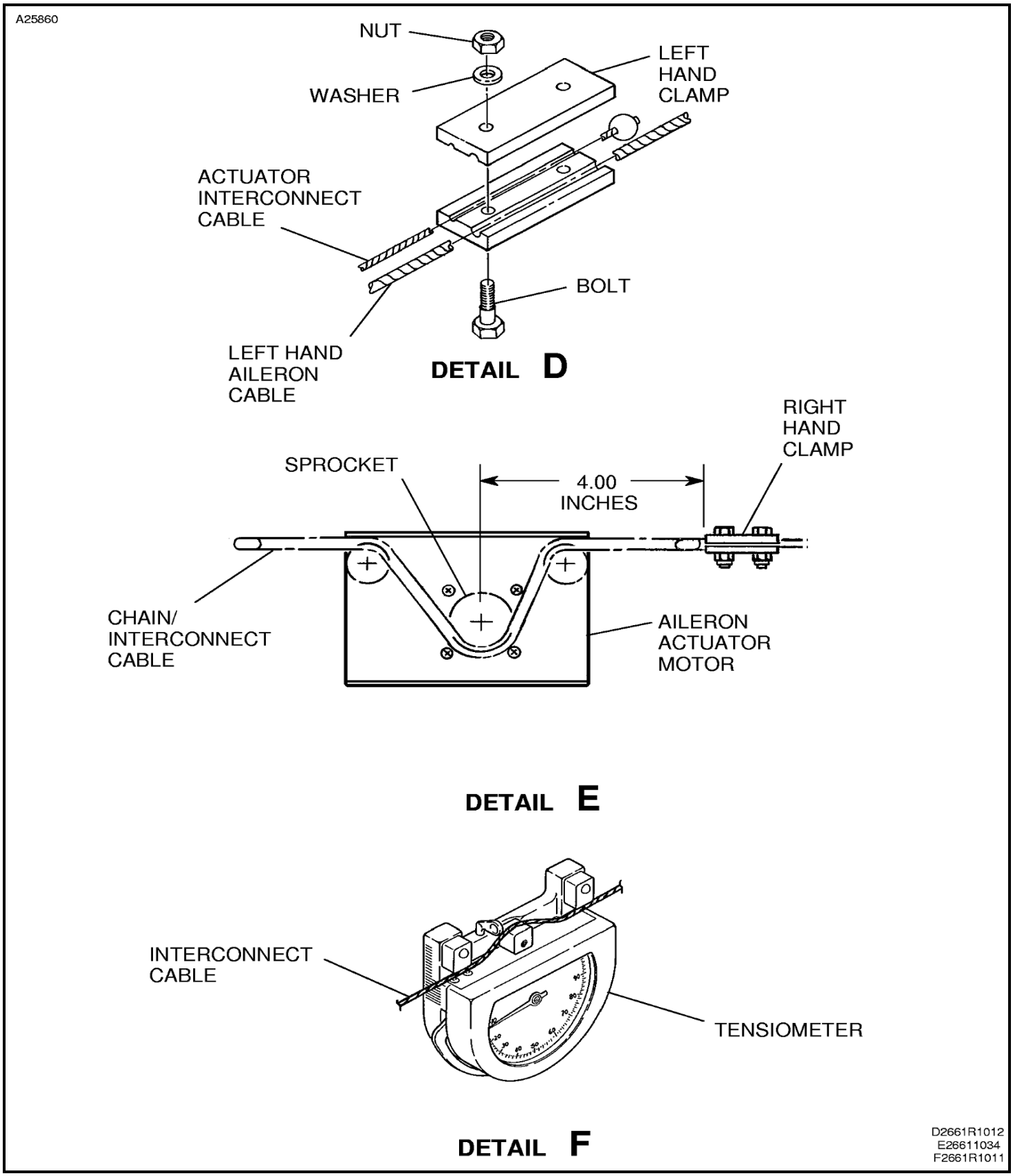

Figure 502 : Sheet 1 : Clutch Adjustment

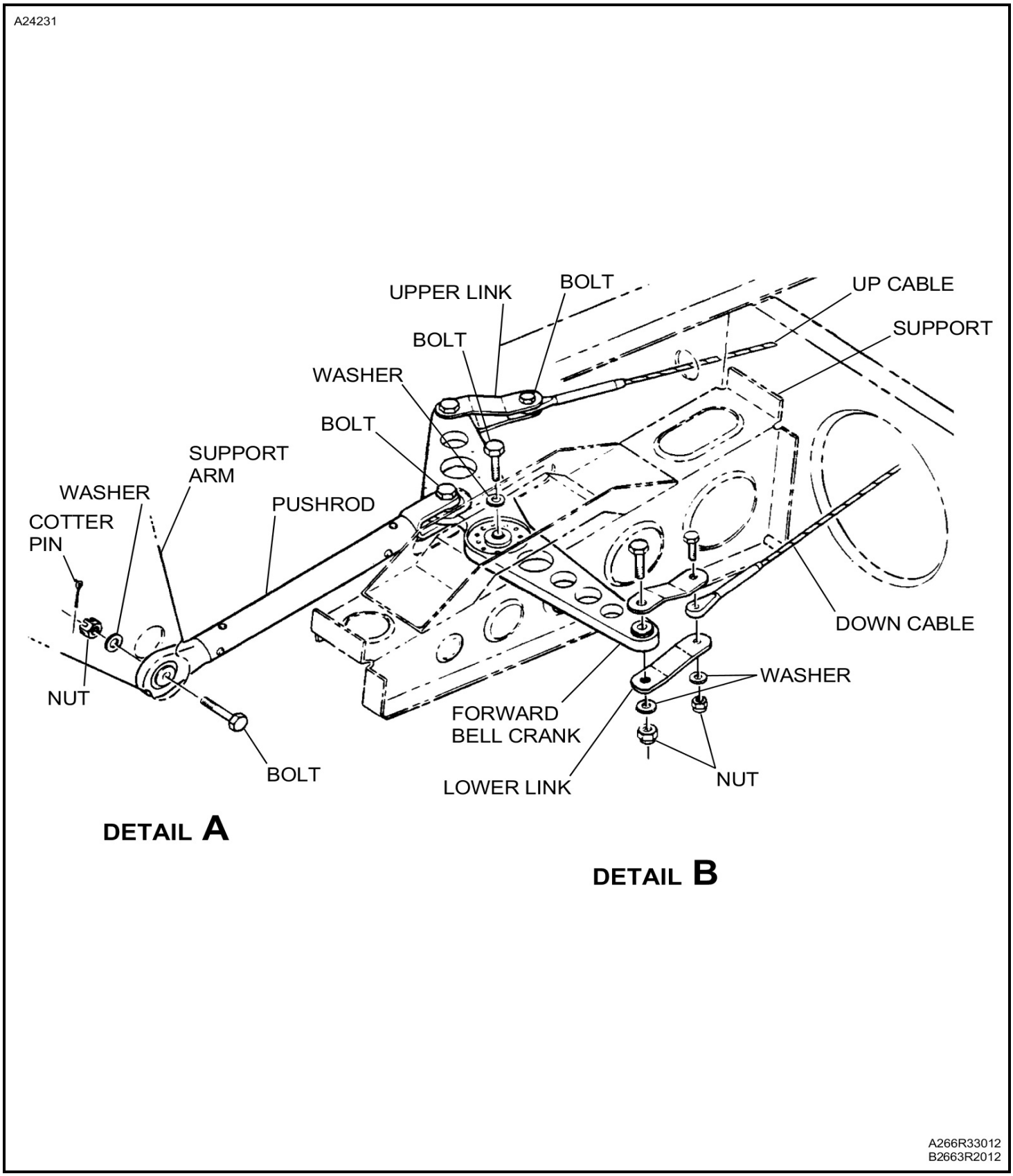

Figure 502 : Sheet 2 : Clutch Adjustment

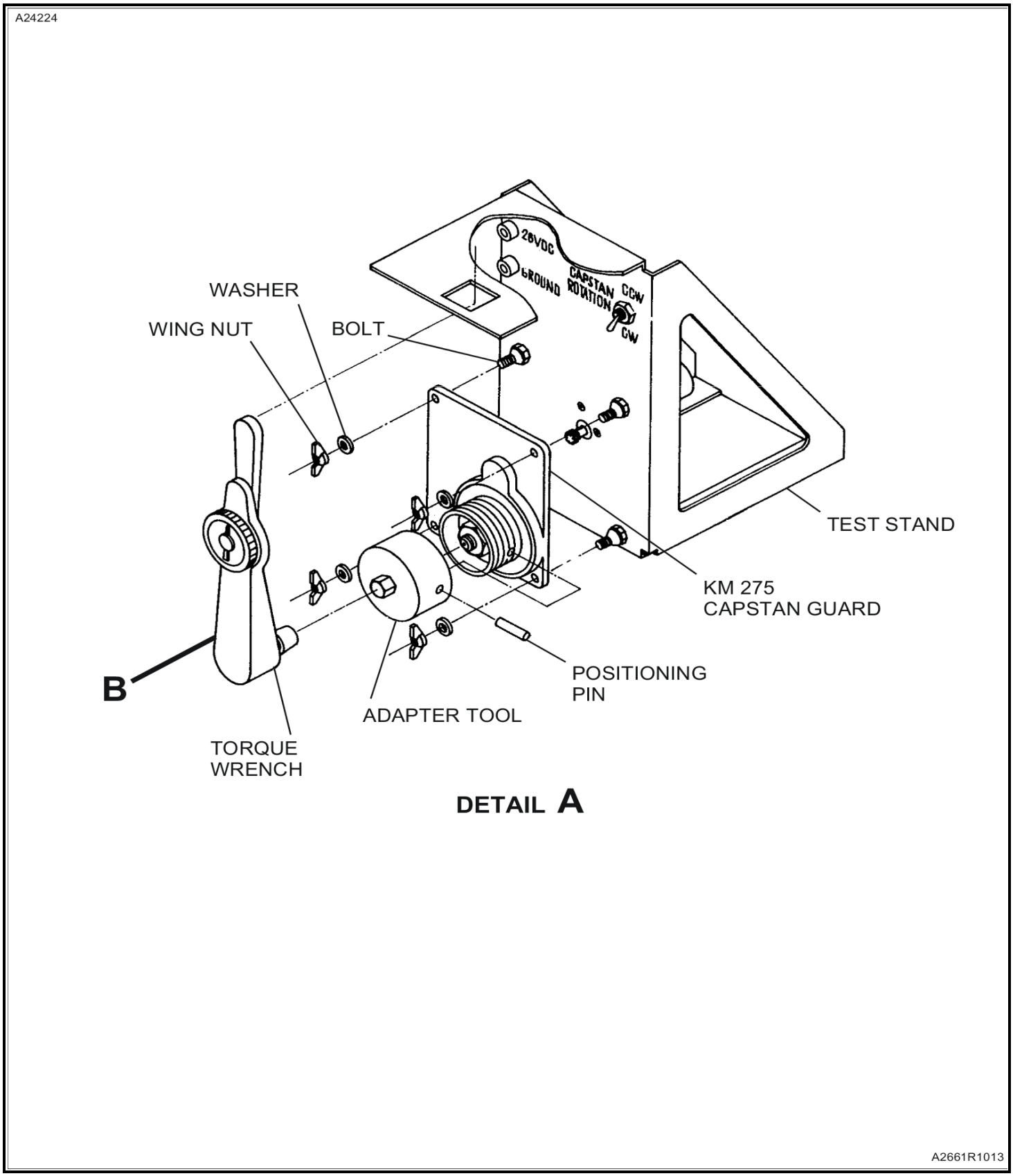

Figure 502 : Sheet 3 : Clutch Adjustment

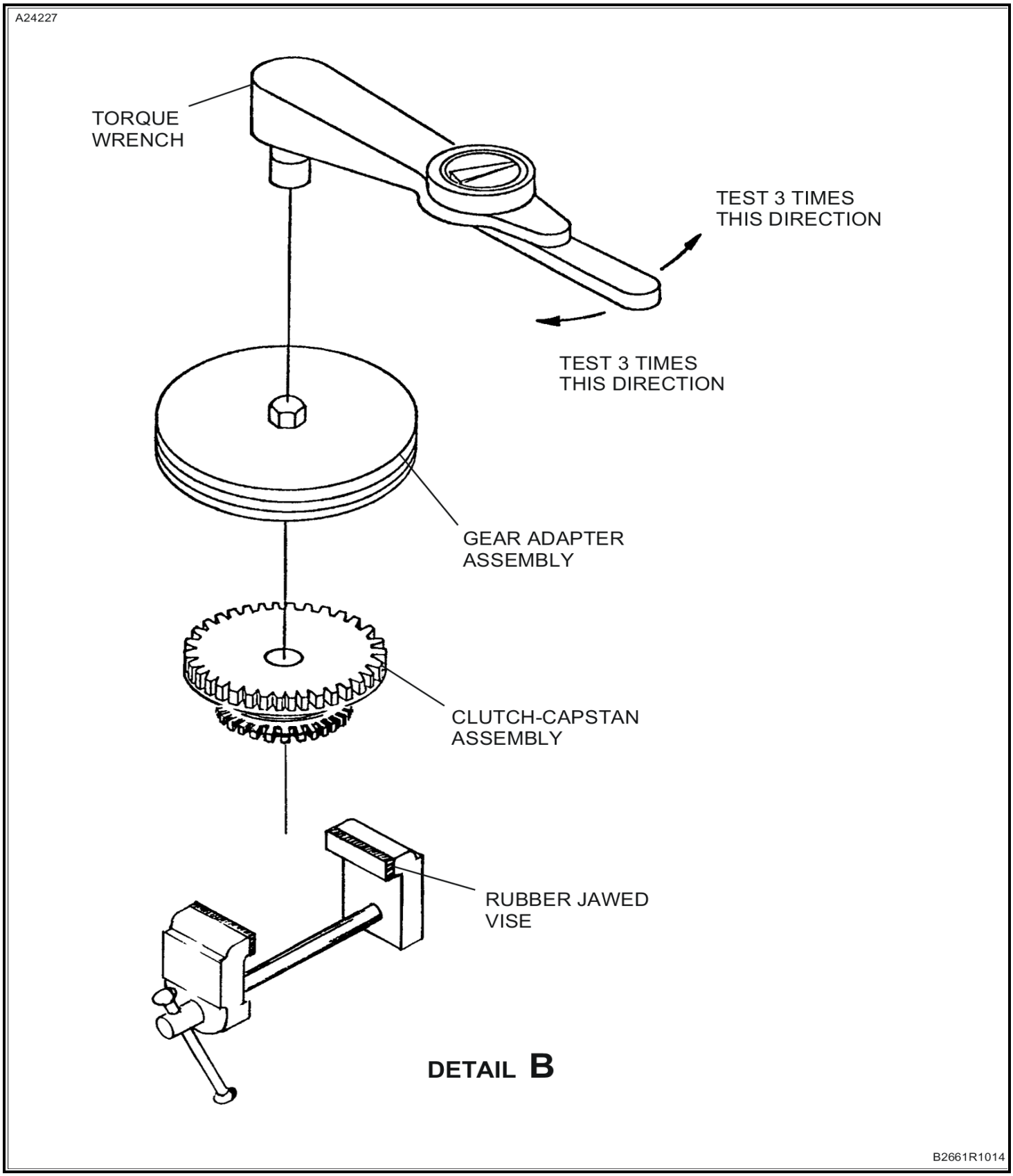

Figure 503 : Sheet 1 : Aileron Rigging (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

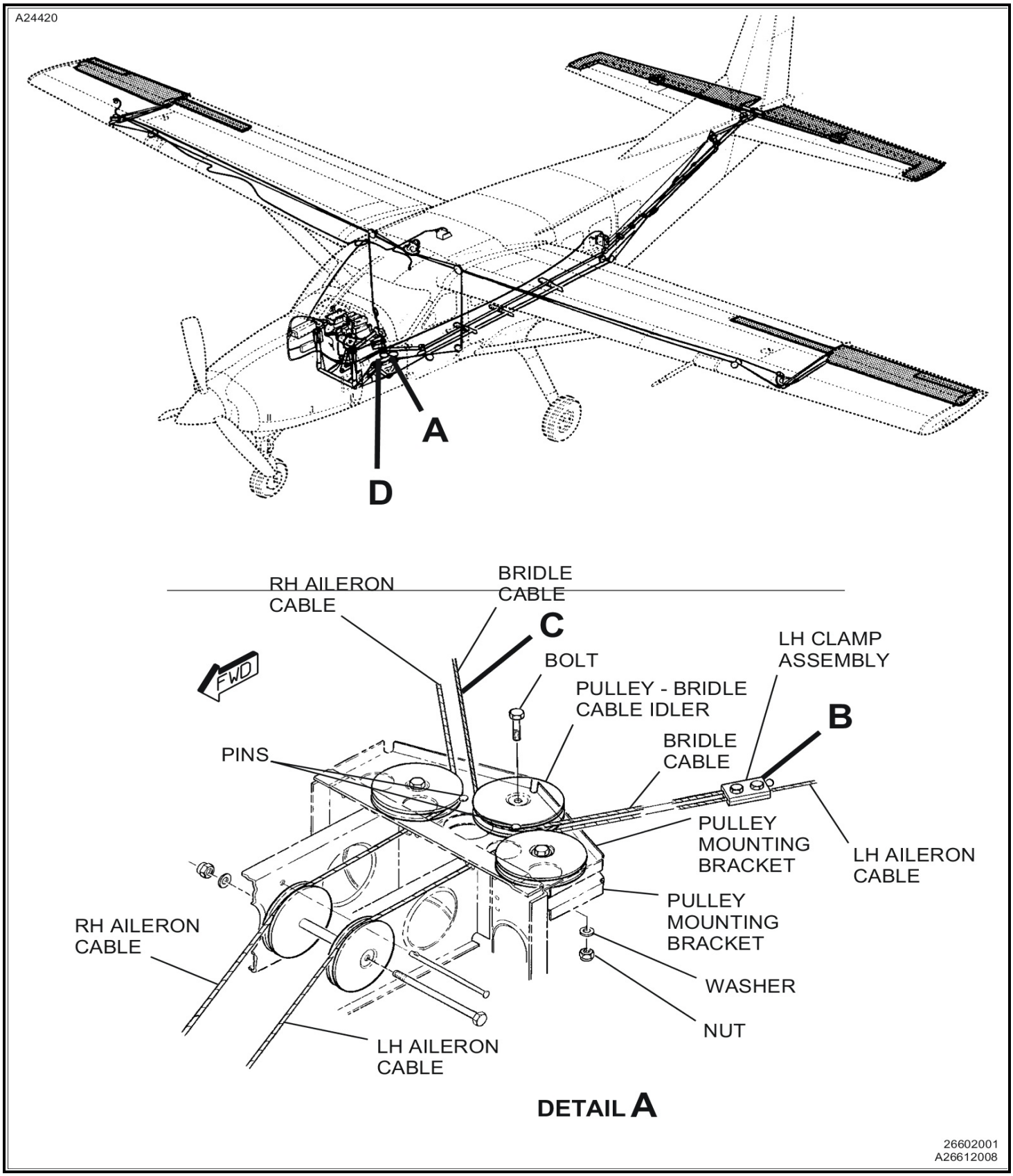

Figure 503 : Sheet 2 : Aileron Rigging (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

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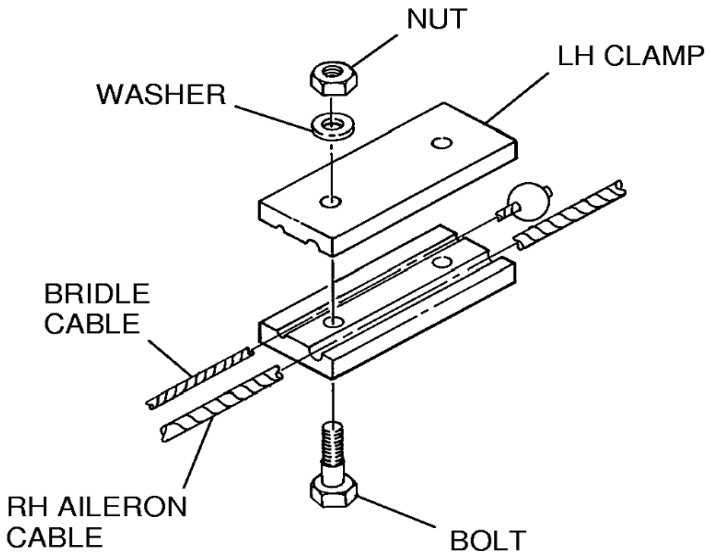
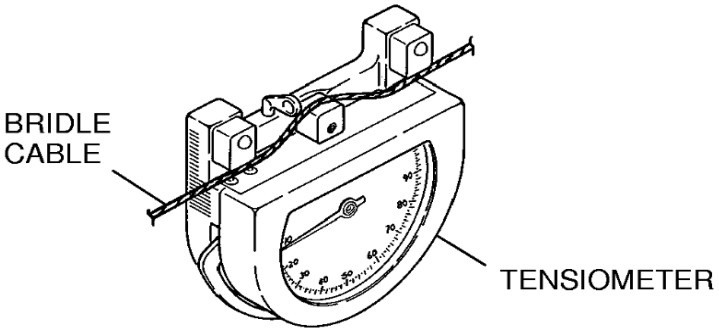


DETAIL B



DETAIL C

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Figure 503 : Sheet 3 : Aileron Rigging (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)

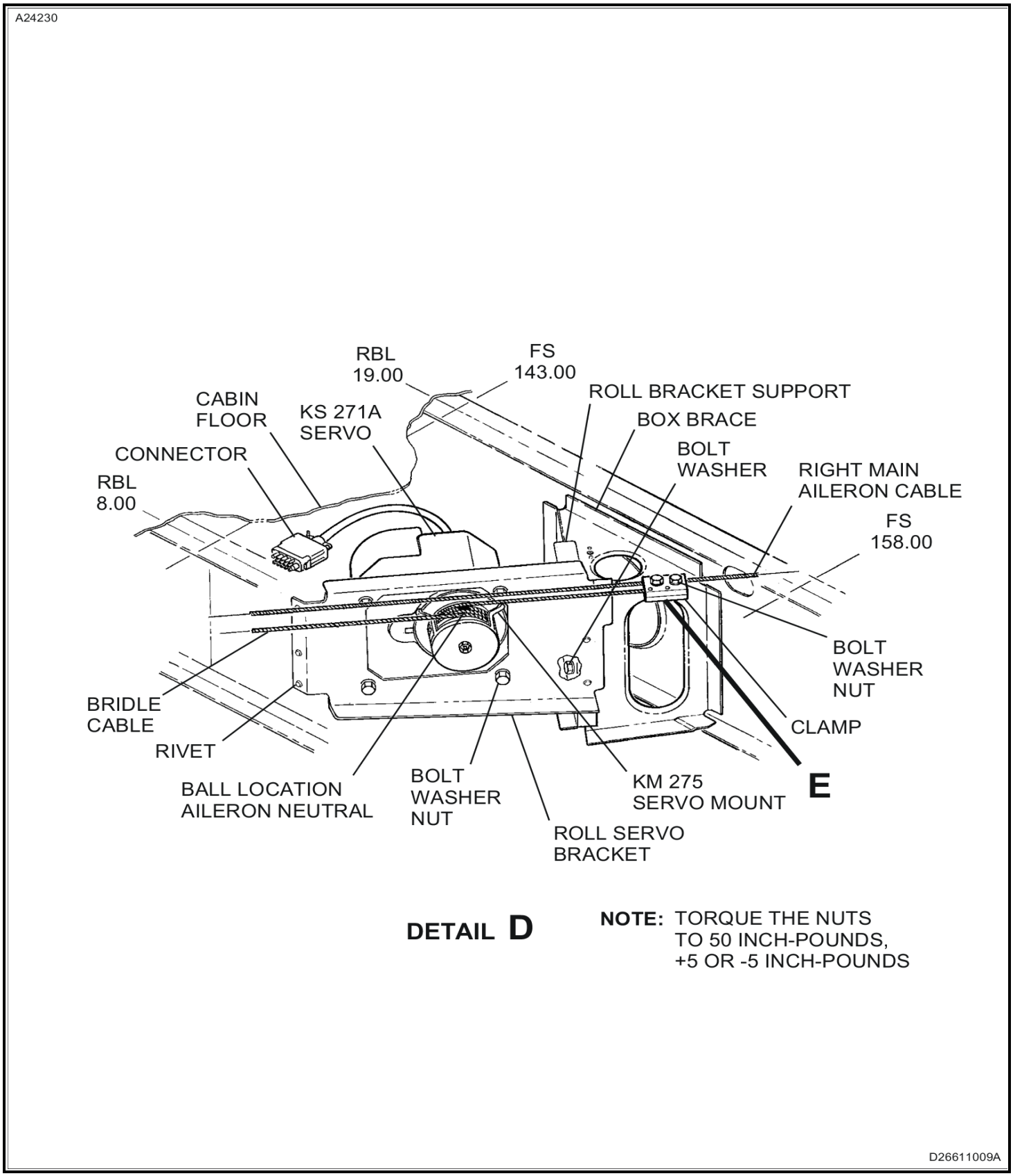

Figure 503 : Sheet 4 : Aileron Rigging (Airplanes with KAP-150 Autopilot and KFC-150, KFC-225 Flight Control System Installed)