

ENGINE CONTROLS RIGGING - ADJUSTMENT/TEST (PT6A-140)

1. General

- A. This section gives the engine control rigging procedures for the PT6A-140 engine and the Crew Alerting System (CAS) annunciator. For more engine rigging data refer to, Pratt and Whitney Model PT6A-140 Maintenance Manual found in the List of Publications.

2. Power Lever Linkage Rigging

CAUTION: The propeller reversing linkage can be damaged if the power lever is moved aft of the idle position when the engine is not operating and the propeller is feathered.

- A. Do the Power Lever Linkage Rigging (Refer to Figure 501).

NOTE: When rigging the engine, do the rigging of the front linkage first.

- (1) Do the steps that follow to let the propeller reversing cam turn counterclockwise to its extreme aft position:
 - (a) Remove the pin, washer and cotter that attach the beta cable aft terminal to the propeller reversing cam.
 - 1 Disconnect the aft beta cable terminal from the propeller reversing cam.
 - 2 Discard the old cotter pin.
 - (b) Remove the cotter pin, bolt, nut, spacer and washers that attach the power cable terminal to the input power lever.
 - 1 Remove the power cable terminal from the input lever.
 - 2 Discard the old cotter pin.
 - (c) Remove the cotter pin, bolt, nut and washers that attach the Fuel Control Unit (FCU) interconnecting rod to the reversing cam box. Discard the cotter pin.
 - 1 Remove the Fuel Control Unit (FCU) interconnecting rod from the propeller reversing cam assembly.
 - 2 Discard the old cotter pin.
- (2) Turn the propeller reversing cam counterclockwise to its extreme aft position.
- (3) Loosen the bolt and nut that attach the input lever to the cam box assembly.
 - (a) Remove the input power lever from the cam box.
- (4) With the propeller reversing cam at its extreme aft position, install the input lever two serrations clockwise from the six o'clock position.
- (5) Put the power cable in its correct position on the input lever.
 - (a) Install the bolt, nut, washers, spacer, and a new cotter pin that attach the power cable to the input lever.
- (6) With light forward pressure on the propeller reversing cam, move the pedestal lever from the IDLE position to the MAX POWER position and then to the IDLE stop position.
 - (a) Make sure that the propeller reversing cam starts to move the reversing cam shaft aft.
- (7) If necessary, adjust the power control cable rod end terminal to make sure the tension on the cam is correct.
 - (a) Make sure you can see threads in the witness hole.
- (8) If the cable terminal cannot be adjusted sufficiently to get the correct tension or the cable threads are not visible in the rod end witness hole, do the applicable step that follows:
 - (a) Remove the input lever and then install in additional serrations clockwise from the six o'clock position.
 - (b) Adjust the cable position in the propeller control bracket.
- (9) Move the power lever to the IDLE position.
- (10) Put the FCU interconnecting rod the same lever position it was removed from.

NOTE: The FCU connecting rod is set at 8.25 inches and usually no adjustment is necessary.
- (11) Install the bolt, nut, and washers that attaches the interconnecting rod to the lever.
 - (a) Torque the bolt to between 20 inch-pounds to 30 inch-pounds.
 - 1 Install a new cotter pin on the nut.

3. Power Lever Deadband Adjustment

- A. Do the Power Lever Deadband Adjustment (Refer to Figure 501).
- (1) Install a piece of masking tape on the pedestal cover next to the power lever and do the steps that follow:
 - (a) Make a forward deadband limit mark 0.15 inches forward of the IDLE stop position.
 - (b) Make a reverse deadband limit mark 1 inch aft of the IDLE stop.
 - (2) Move the pedestal power lever forward so the edge of the lever is in line with the forward deadband mark.
 - (3) Put a piece of paper between the screw and the cam to check the position of the FCU deadband stop screw.
 - (4) Make sure that the paper fits between the screw and cam and slightly contacts the paper.
 - (a) If the screw does not contact the paper adjust the FCU at the nut.

NOTE: Do not adjust the FCU lever at the stop screw.
 - (5) If you must position the FCU arm again for the correct forward deadband mark adjustment do the steps that follow:

NOTE: There are 24 serrations on the at 15 degree increments on the inner face of the serrated spacer. There are 25 serrations at 14.4 degree increments on the outer face of the serrated spacer. You can make adjustments in 0.6 degree increments.

 - (a) Mark the FCU arm and serrated spacer with a marker pen.
 - (b) Loosen the FCU arm extension bolt.
 - (c) Move the serrated spacer to adjust the FCU arm.
 - (d) Torque the FCU arm extension bolt to between 25 inches to 35 inches.
 - (6) Move the pedestal power lever forward of the deadband mark.
 - (a) Make sure that the deadband stop screw does not contact the cam.
 - (7) As you move the pedestal power lever aft of the forward deadband mark, insert a piece of paper between the cam and the screw.
 - (8) Move the power lever toward the reverse deadband mark.
 - (a) Make sure that the screw holds the paper until the lever is approximately at the reverse deadband mark.

NOTE: The exact point at which the deadband ends in the reverse direction is not critical in this procedure.

4. Fuel Condition Lever Adjustment

- A. Do the Fuel Condition Lever Adjustment (Refer to Figure 501).
- (1) Set the fuel condition lever to the NORMAL position.
 - (2) Insert the end of a 3/16 inch drill bit through the FCU rigging hole and in the condition lever rigging hole.

NOTE: A similar size pin can be used.
 - (3) Adjust the cable length at the rod end to reach the bottom hole of the FCU lever.
 - (4) If there is not sufficient adjustment at the cable end or the cable threads are not visible in the rod end witness hole, adjust the cable at the pedestal.
 - (5) Attach the condition cable to the FCU lever.
 - (a) Make sure that the condition lever does not compress the fuel cut-off plunger.
 - (6) Remove the drill bit or pin.
 - (7) Set the pedestal fuel condition lever to the CUTOFF position.
 - (a) Make sure that the FCU condition lever contacts the cut-off stop screw with light pressure.
 - (8) Set the pedestal fuel condition lever to the HIGH IDLE position.
 - (a) Make sure that the FCU condition lever setscrew contacts the high-idle stop screw.
 - (9) Set the pedestal fuel condition lever to the NORMAL position.

5. Emergency Power CAS Message Adjustment

- A. Adjust the Emergency Power Control CAS Light Switch (Refer to Control Quadrant Removal/Installation).
- (1) Make sure that the engine is powered OFF.
 - (2) Make sure that external electrical power is applied to airplane.

- (3) Move the emergency power control lever through full travel range, forward of NORM gate, then back to NORM gate.
 - (a) Make sure that the EMERGENCY POWER LEVER CAS message remains on when the power control lever is moved.

NOTE: IDLE stop position is forward of NORM gate.
- (4) Move the emergency power control lever aft of NORM gate.
 - (a) Make sure that EMERGENCY POWER LEVER CAS message goes off.

NOTE: Normal stowed position is aft of NORM gate.
- (5) If necessary, adjust the EMERGENCY POWER LEVER CAS switch as follows:
 - (a) Remove the pedestal cover. Refer to Control Quadrant Removal/Installation.
 - (b) Loosen the switch mounting screw.
 - (c) Adjust the switch position a small amount.
 - (d) Install the pedestal cover. Refer to Control Quadrant Removal/Installation.
 - (e) Move the emergency power control lever forward of the NORM gate and make sure the CAS message comes on.
 - (f) Move the emergency power control lever aft of the NORM gate and make sure the CAS message goes off.
 - (g) Do the switch adjustment procedure again until the switch operates correctly.
 - (h) Install the pedestal cover. Refer to Control Quadrant Removal/Installation.
- (6) Remove external electrical power from the airplane.

6. Emergency Power Lever Adjustment

- A. Do the Emergency Power Lever Adjustment (Refer to Figure 501).
 - (1) Make sure that the pedestal fuel condition lever is set to the NORMAL position.
 - (2) Disconnect the emergency power control cable from the FCU emergency power control arm.
 - (3) Adjust the length of the connecting cable at the rod end until it can easily slip through the bottom hole of the FCU arm and in the rod end bearing.
 - (a) Turn the rod end one-half of a turn to shorten the cable.
 - (b) Install the control cable.
 - (4) Move the pedestal emergency power lever to the forward MAX limit.
 - (a) Make sure that the FCU lever is against the MAX stop.
 - (5) Make sure that when the emergency power lever is moved from the NORMAL to the MAX position, the FCU emergency power control arm turns from stop to stop.
 - (6) If you must position the FCU emergency power control arm again for the correct adjustment do the steps that follow:

NOTE: There are 24 serrations at 15 degree increments on the inner face of the serrated spacer. There are 25 serrations at 14.4 degree increments on the outer face of the serrated spacer. You can make adjustments in 0.6 degree increments.

 - (a) Mark the FCU arm and serrated spacer with a marker pen.
 - (b) Loosen the FCU arm extension bolt.
 - (c) Move the serrated spacer to adjust the FCU arm.
 - (d) Torque the FCU arm extension bolt to between 25 inches to 35 inches.

7. Beta Cable Adjustment (Aft)

- A. Do the Cable Adjustment (Aft) (Refer to Figure 502)
 - (1) Set the pedestal power lever to the IDLE position.
 - (2) Adjust the cable clevis until the clevis pin easily slips through the clevis and the center hole of the propeller reversing cam.
 - (3) To lengthen the cable turn the clevis one-half of a turn.
 - (4) Install the clevis pin.
 - (5) Disconnect the power control cable from the input lever.

- (a) Remove the cotter pin, bolt, nut, and washers that attach the power cable terminal end to the input lever.
- (b) Remove the terminal end from the input lever.
- (6) Turn the arm clockwise through the forward power range.
- (7) Make sure that too much drag is not felt between the following pin and the top of the track in the propeller reversing cam.
- (8) If too much drag is felt turn the clevis one-half turn to shorten the rear beta cable as follows:
 - (a) Remove the cotter pin, pin and washer.
 - (b) Discard cotter pin.
 - (c) Turn the beta terminal end one-half turn.
 - (d) Put the betas terminal end in its correct position on the cam.
 - (e) Install the pin, washer and new cotter pin that attach the terminal end to the cam.
- (9) Put the power control cable terminal end in its correct position on the input lever.
 - (a) Install the bolt, spacer, nut and washers that attach the power cable terminal end to the input lever.
 - (b) Make sure the input lever adjustment is correct. Refer to Power Lever Linkage Rigging
 - (c) When rigging is correct install a new cotter pin on the terminal end nut.

8. Beta Cable Adjustment (Forward)

CAUTION: The cable reversing linkage can be damaged if the power lever is moved aft of the idle position when the engine is not running and the propeller is feathered.

- A. Do the Beta Cable Adjustment (Forward) (Refer to Figure 503).
 - (1) Disconnect the beta cable aft terminal from the propeller reversing cam.
 - (a) Remove the cotter pin, pin and washer that attach the beta cable aft terminal to the propeller reversing cam.
 - 1 Remove the aft beta cable terminal from the propeller reversing cam.
 - 2 Discard the old cotter pin.
 - (2) Disconnect the propeller governor interconnect rod from the reset lever.
 - (a) Remove the cotter pin, bolt, nut and washers that attach the propeller governor interconnect rod to the reset lever.
 - 1 Remove the propeller governor interconnect rod from the reset lever.
 - 2 Discard the old cotter pin.
 - (3) Disconnect the beta cable front terminal from the propeller reversing lever.
 - (a) Remove the cotter pin, bolt, nut and washers that attach the beta cable front terminal to the propeller reversing lever.
 - 1 Remove the beta cable front terminal from the propeller reversing lever.
 - 2 Discard the old cotter pin.
 - (4) Use your hand to check that cable travel is 1.10 to 1.20 inches.
 - (5) If adjustment is necessary, check that travel is not restricted by the low pitch stop adjuster.
 - (6) Adjust at the aft cable terminal to get additional travel as follows:
 - (a) Loosen the nut on the bolt passing through the terminal.
 - 1 Make sure that you do not turn the bolt.
 - (b) Turn the terminal until you get the necessary travel.
 - (7) To make sure that the wire rope is sufficiently engaged, attempt to pass a piece of lockwire through the inspection holes in the terminal.
 - (8) Connect the beta cable front terminal from the propeller reversing lever.
 - (a) Put the beta cable front terminal in its correct position on the propeller reversing lever.
 - (b) Install the cotter pin, bolt, nut and washers that attach the beta cable front terminal to the propeller reversing lever.
 - 1 Install a new cotter pin.

- (9) Pull hard forward on the propeller reversing lever so that the beta control terminal is against the internal stop in the low pitch stop adjuster.
 - (a) Make sure that you can see the collar through the low pitch stop adjuster holes.
- (10) Make sure that the rear of Beta valve clevis slot end is flush with front face of cap nut.
- (11) If adjustment is necessary, do the steps that follow:
 - (a) Turn the low pitch stop adjuster clockwise if clevis slot end is forward of the cap nut.
 - (b) Turn the low pitch stop adjuster counterclockwise if clevis slot end is aft of the cap nut.
 - (c) Tighten the locknut, and torque to between 150 and 250 inch-pounds and safety with wire. Refer to Chapter 20, Safetying - Maintenance Practices .
- (12) Pull firmly forward on the propeller reversing lever.
 - (a) Hold the fuel governor reset lever on the MAX forward stop.
 - (b) Remove the safety wire from the propeller governor interconnect rod locknut.
 - (c) Adjust the propeller governor interconnect rod until the rod end exactly aligns with the outer hole in the reset lever.
 - (d) Shorten by one-half turn.
 - (e) Connect the rod again.
 - (f) Torque the locknut between 32 to 36 inch-pounds and safety with wire. Refer to Chapter 20, Safetying - Maintenance Practices
- (13) Move the cambox input lever to the forward power range (on the radial portion of cam).
 - (a) Pull firmly aft on the propeller reversing cam.
 - (b) Put forward pressure on the aft beta terminal.
 - (c) Adjust the rear clevis to exactly align clevis hole with the middle hole in the propeller reversing cam.
 - (d) Lengthen clevis one-half turn:
 - 1 Install the pin.
 - 2 Do not install washer and cotter pin.
- (14) Operate the power lever from IDLE to MAX POWER; check for free movement.
 - (a) Make sure that the lever has free movement.

NOTE: The cable should be pre-loaded in compression and not prevent free movement.
- (15) Install the washer and a new cotter pin to the aft beta terminal.

9. Propeller Speed Control Lever Adjustment

- A. Do the Propeller Lever Adjustment (Refer to Figure 504).
 - (1) Set the pedestal propeller speed lever in the MAX PROP RPM (forward) position
 - (2) Hold the propeller governor speed adjusting lever against the MAX PROP RPM stop (lever forward).
 - (3) Adjust the propeller speed control cable rod end until it aligns with the speed adjusting lever.
 - (4) Connect the rod end to the lever again.
 - (5) Adjust the cable mounting bracket fitting, on the reduction gearbox flange, as necessary to get a 1/8 inch to 1/4 inch cushion at the pedestal MAX PROP RPM position.
 - (6) Move the pedestal lever through its full travel from FEATHER to MAX PROP RPM and back to the FEATHER position.
 - (a) Make sure that there is no binding, and that the propeller governor speed adjusting lever contacts the governor feather and MAX PROP RPM stops while maintaining the 1/8 inch to 1/4 inch cushion.
 - (7) If the governor lever does not contact either or both stops, do the steps that follow:
 - (a) Remove the safety wire from the retaining bolt.
 - (b) While the lower lever is in contact with the MAX PROP rpm feather stop, remove the governor lever.
 - (c) Install the governor speed adjusting lever on serrated shaft.

NOTE: Serrations can locate the lever position in increments of 5°.

1. Make sure that the lever is aligned with the feather stop boss on top of governor body.
- (8) Move the pedestal lever through its full travel from FEATHER to MAX PROP RPM and back to the FEATHER position.
 - (a) Make sure that there is no binding, and that the propeller governor speed adjusting lever contacts the governor feather and MAX rpm stops while maintaining the 1/8 inch to 1/4 inch cushion.
 - (b) If necessary, move the governor speed adjusting lever on serrated shaft, and check movement again.
- (9) Install the bolt that attaches the governor lever and safety with wire. Refer to Chapter 20, Inertial Air Separator - Maintenance Practices

10. Inertial Air Separator Control Linkage Rigging

- A. For the inertial air separator control linkage maintenance and rigging procedures, refer to Chapter 71, Inertial Air Separator - Maintenance Practices.

11. Propeller Torque Limiter Adjustment/Test

CAUTION: DO NOT EXCEED ENGINE OPERATING AND TRANSIENT LIMITS OF SPEED, TORQUE OR TEMPERATURE. DO NOT EXCEED 2500 FT-LBS (3389 N-m) FOR MORE THAN 20 SECONDS OR MAINTAIN MAX TORQUE CONDITION (TORQUE LIMITER ENGAGED) FOR MORE THAN FIVE SECONDS. DO NOT ALLOW INDICATED TORQUE TO EXCEED 2600 FT-LBS (3525 N-m).

- A. Do the Propeller Torque Limiter Adjustment/Test. (Refer to Figure 505).
 - (1) Start engine, observing all operating limitations. Refer to Pilot's Operating Handbook and Approved Flight Manual.
 - (a) Operate engine at idle for five minutes, allowing temperatures to stabilize.
 - (2) With the propeller control lever set at MAX rpm, advance the power control lever to takeoff power.
 - (3) Retard the propeller control lever until the torque indication ceases to increase.
 - (4) Record the maximum indicated torque. Torque should be between 2585 ft-lbs (3505 N-m) and 2515 ft-lbs (3410 N-m).
 - (5) If the maximum indicated torque does not fall between 2585 ft-lbs (3505 N-m) and 2515 ft-lbs (3410 N-m) while conducting the Torque Limiter Test, shut down the engine and adjust the torque limiter as follows:
 - (a) Remove the safety wire and loosen the locknut on torque limiter adjustment screw.
 - (b) Use a hex key to turn adjusting screw clockwise to increase torque and counterclockwise to decrease torque. One turn of the screw changes torque limit by about 152 ft-lbs (206 N-m).
 - (c) Torque the locknut to 55-60 in-lbs (6.21-6.78 N-m) while making sure the adjusting screw position is unchanged.
 - (d) Repeat the Torque Limiter Test.
 - (e) Make sure that the indicated Torque is between 2585 ft-lbs (3505 N-m) and 2515 ft-lbs (3410 N-m).
 - (f) Safety the adjustment screw and locknut with lock wire. Refer to Chapter 20, Safetying - Maintenance Practices.

12. Engine Operating Limits

- A. Engine operating limits are given for the PT6A-140 engine. Refer to Chapter 71, Power Plant - Adjustment/Test (PT6A-140).

Figure 501 : Sheet 1 : Power Lever Adjustment

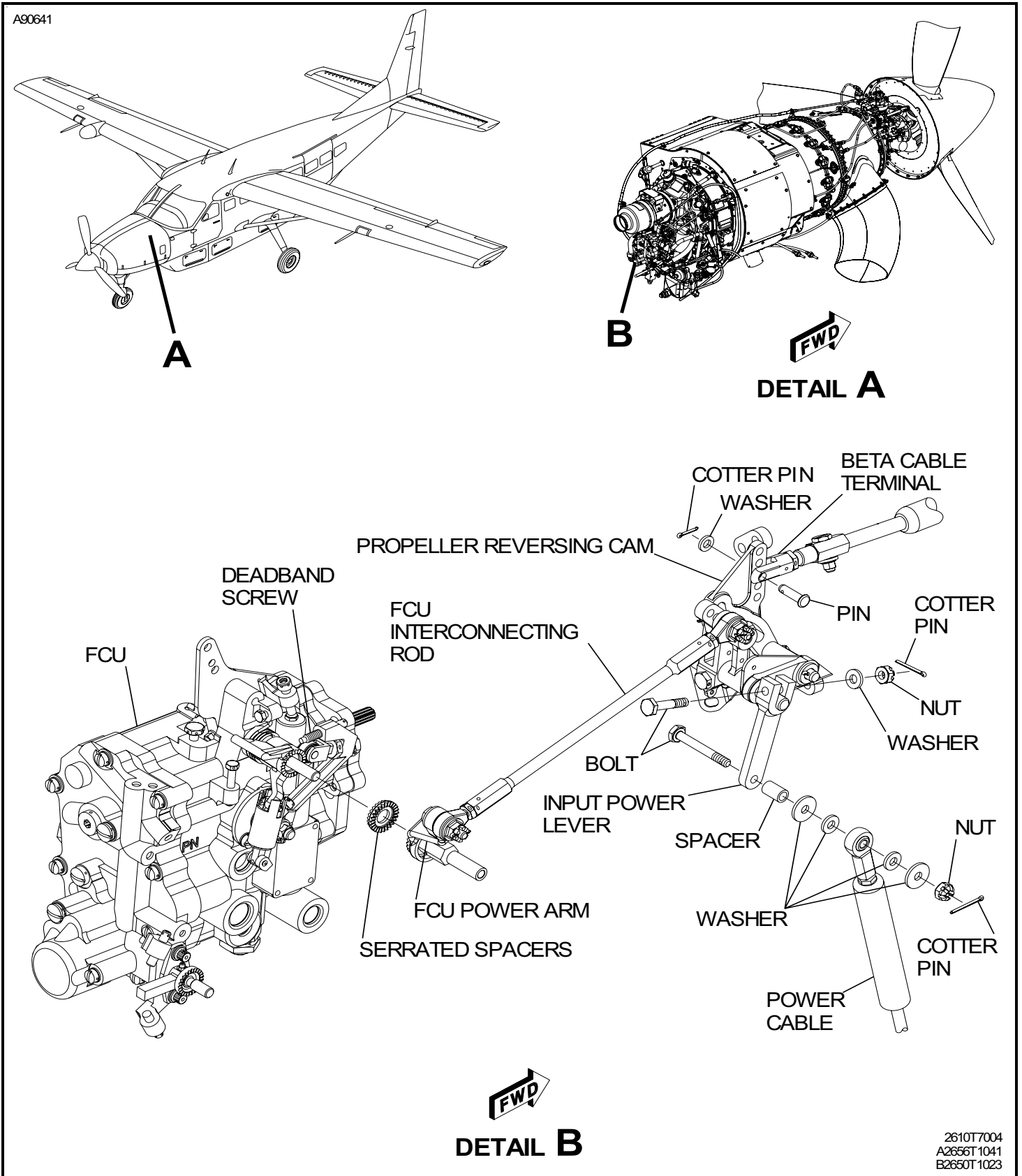


Figure 502 : Sheet 1 : Fuel Condition Lever Adjustment

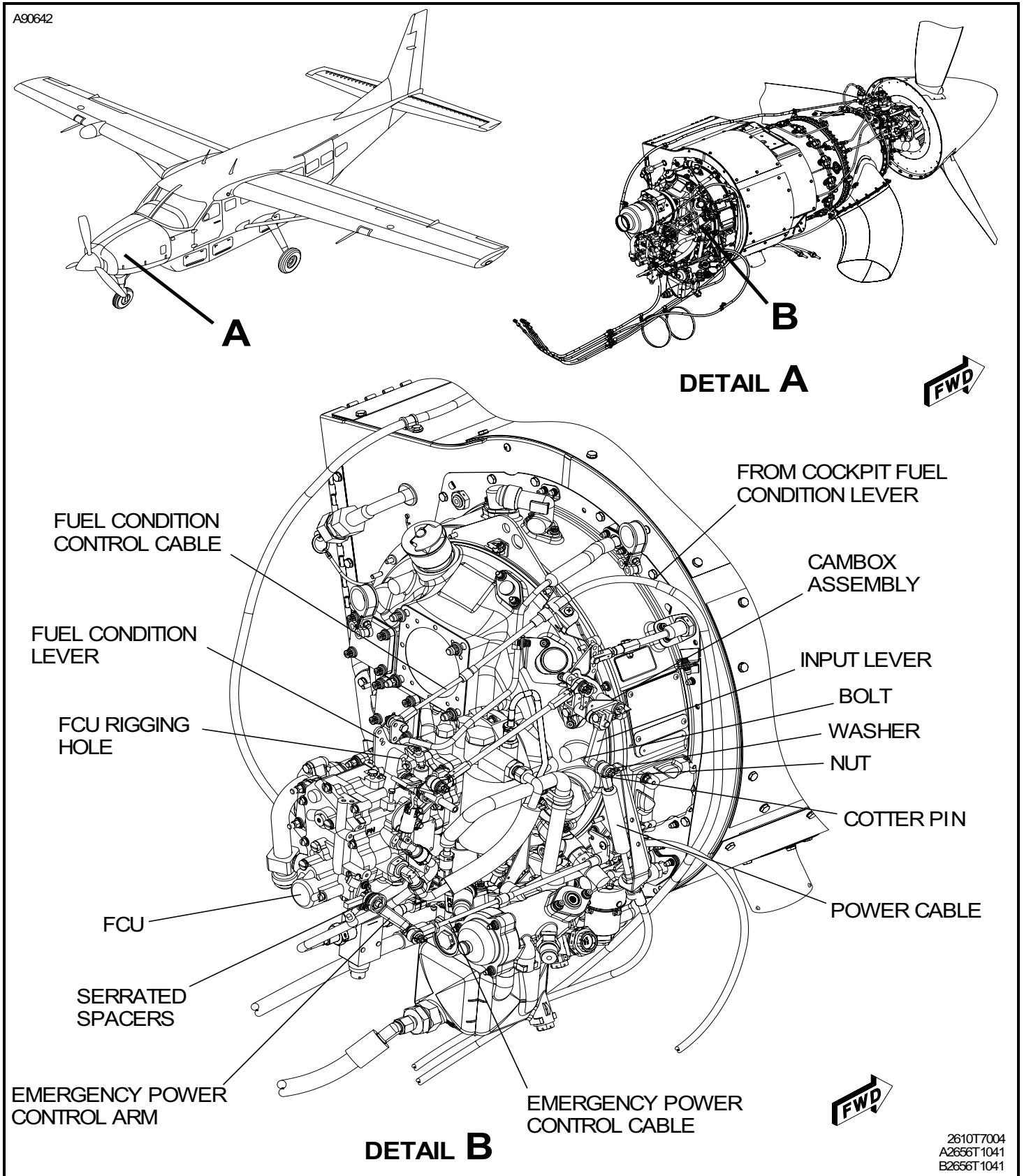


Figure 503 : Sheet 1 : Beta Forward Cable Adjustment

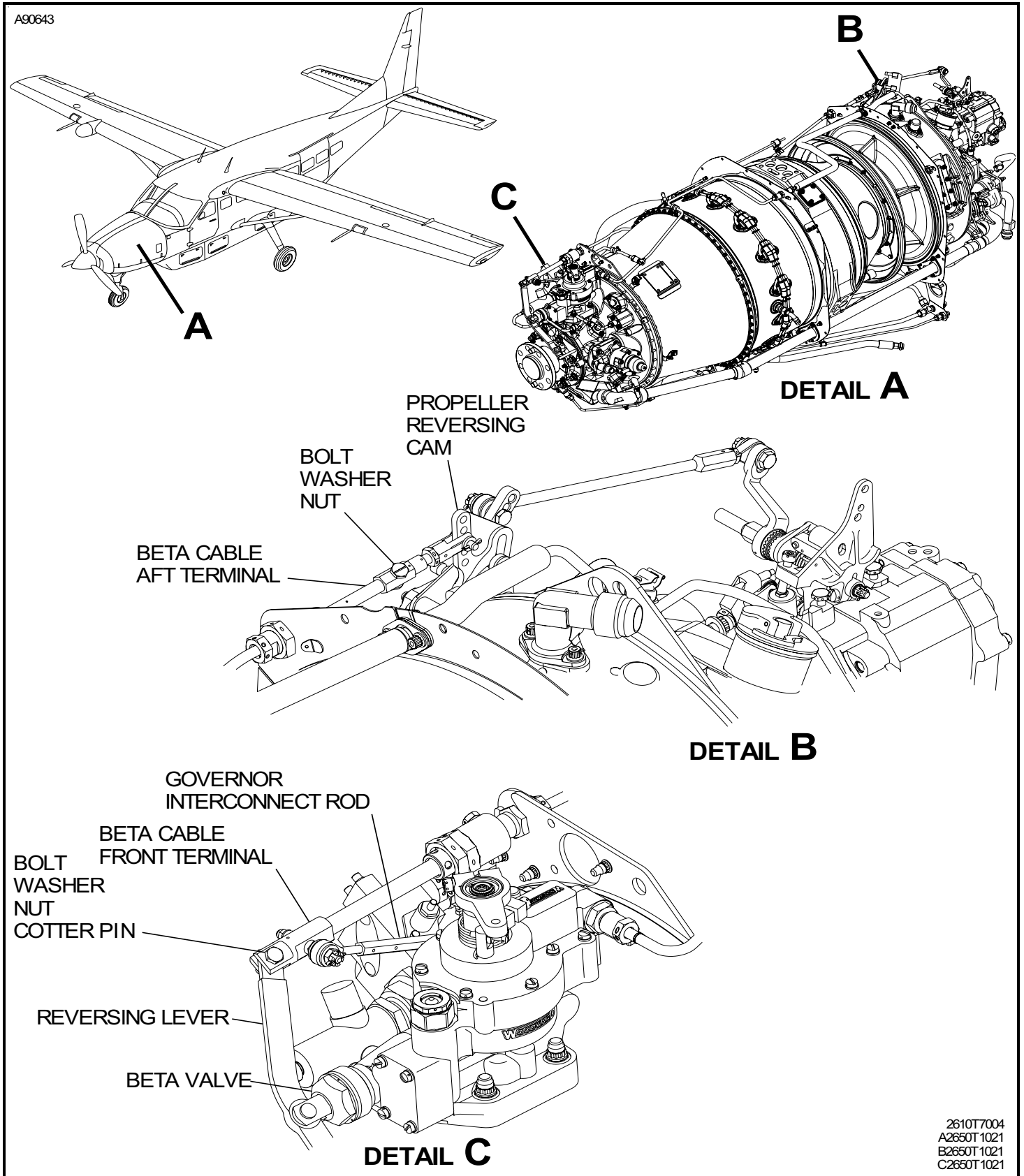


Figure 504 : Sheet 1 : Propeller Speed Control Lever Adjustment

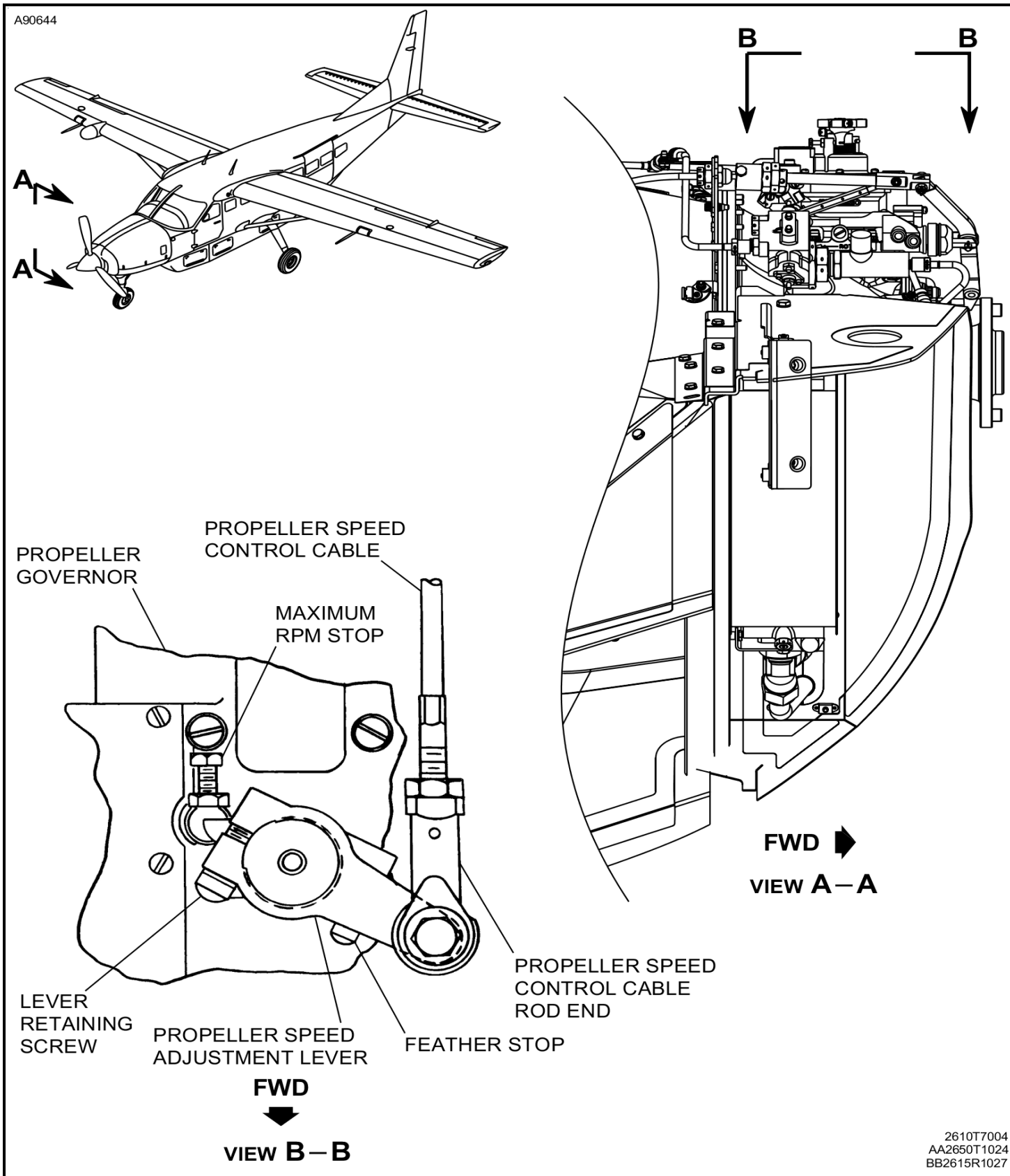


Figure 505 : Sheet 1 : Propeller Torque Limiter Adjustment

