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SERVICE MANUAL & ICA FOR

CESSNA 208/208B WITH

YUKON 4-BLADE PROPELLER

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LOG OF REVISIONS

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NOTE
Revised text is indicated by a vertical black line along outer margin.

NOTE
View most current revision of this ICA at www.wipaire.com.

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CHAPTER 1 – INTRODUCTION

This service manual is provided to owners of Cessna 208 and 208B aircraft modified with a Hartzell 4-blade propeller. The STC provides for installation of a Hartzell HC-E4N-3KTV()/GC11114()-2 propeller when the aircraft is equipped with a PT6A-114A (675 shp) or PT6A-140 (867 shp) engine.

The information contained herein supplements or supersedes the information contained in the basic Cessna 208 Maintenance Manual (Doc. No. D2078-13) and/or Blackhawk Instructions for Continued Airworthiness (Doc. No. 203121-30) only in those areas listed. These Instructions for Continued Airworthiness (ICA) are organized to match the format of the basic Aircraft Maintenance Manual (AMM).

This manual has two priorities: to inform owners of the level and amount of servicing required to properly maintain their airplane and to provide the necessary technical data and servicing information to maintenance professionals charged with maintaining airplanes modified by the STC.

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When a part in this installation is significantly changed, or an additional inspection is recommended or required, a service letter and/or kit may be issued. If a warranty is issued, most commonly, it is for an 18 month time period. It is crucial to check for service letters at each periodic inspection to be eligible.

Service manuals and installation documents are revised periodically and need to be kept updated. This service manual is reissued in its entirety. The revision level, page number, and number of pages are marked on each page; revised text is indicated by a vertical black line along outer margin. The most current revision of service letters, service kits, and service manuals are maintained and distributed on our website at www.wipaire.com.

NOTE

It is critical to check for manual updates each time an inspection is executed.

WARNINGS, CAUTIONS, AND NOTES

WARNING!!

An operating procedure, technique, or maintenance practice which may result in personal injury or loss of life if not carefully obeyed.

CAUTION!

An operating procedure, technique, or maintenance practice which may result in damage to equipment if not carefully obeyed.

NOTE

An operating procedure, technique, or maintenance condition which is considered essential to emphasize.

LIST OF MANUFACTURERS TECHNICAL PUBLICATIONS

The following publications are necessary for support of this STC. Use the most current revision of the following documents in combination with this service manual and the basic AMM; contact the appropriate manufacturer to order the necessary publications.

CHAPTER 30 - DEICE

180 (30-61-80), Ice Protection System Manual, Hartzell Propeller Inc.

CHAPTER 61 - PROPELLERS

147 (61-00-47), Propeller Owner's Manual, Hartzell Propeller Inc.
170 (61-13-70), Composite Blade Field Maintenance and Minor Repair Manual, Hartzell Propeller Inc.

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CHAPTER 4 – AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA-Approved and specifies maintenance required under 14 CFR 43.16 and 91.403 of Title 14 of the Code of Federal Regulations, unless an alternative program has been FAA approved.

There are no additional Airworthiness Limitations associated with this equipment and/or installation.

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CHAPTER 5 – TIME LIMITS & MAINTENANCE CHECKS

Hartzell Propeller Owner's Manual 147 specifies the required maintenance, inspections, time intervals, and procedures. Refer to the most recent revision of Hartzell Service Letter HC-SL-61-61Y for TBO information; the propeller's recommended time between overhaul (TBO) is 4000 flight hours or 72 calendar months (whichever occurs first). Propeller overhaul must be accomplished by a certified propeller repair station with the appropriate rating.

All propeller inspection requirements contained in Chapter 5 of the basic Airplane Maintenance Manual (AMM) are unchanged. Reference the most recent revision of Hartzell Propeller Owner's Manual 147 and Hartzell Propeller Composite Blade Field Maintenance and Minor Repair Manual 170 for detailed service and maintenance information. When conducting the Propeller Ground Idle RPM Check, the minimum propeller idle speed is 1050 RPM; corrective action may require adjustment to engine rigging, propeller overhaul, and/or replacement of the propeller blades and hub.

WARNING!!
Stabilized ground operation within the propeller restricted RPM range can generate high propeller stresses and result in fatigue damage to the propeller. This damage can lead to a reduced propeller fatigue life, propeller failure, and loss of control of the aircraft. The propeller restricted range is from 350 to 1050 RPM.

In the event of a lightning strike, refer to Hartzell Propeller Owner's Manual 147, Chapter 5, Inspection and Check, Special Inspections, Lightning Strike in addition to the lighting strike inspection criteria provided in the basic AMM. Hartzell Propeller Owner's Manual 147 also provides special inspections for overspeed/overtorque, foreign object/ground strike, fire/heat damage, sudden stoppage, and engine oil contamination.

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CHAPTER 6 – DIMENSIONS & AREAS

Dimensions and areas for the 208 and 208B are unchanged with the following exceptions.

AIRPLANE DIMENSIONS AND AREAS - DESCRIPTION AND OPERATION

DIMENSIONS AND AREAS - 208

Propeller Diameter. . . . . .110 Inches (2.8 m)
Propeller Ground Clearance (nose tire inflated and strut extended 4.50 inches) . . 9.86 Inches (250 mm)

DIMENSIONS AND AREAS - 208B

Propeller Diameter. . . . . .110 Inches (2.8 m)
Propeller Ground Clearance (nose tire inflated and strut extended 3.63 inches) . . 9.24 Inches (234 mm)

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CHAPTER 30 – ICE & RAIN PROTECTION

The ice and rain protection chapter of the basic Aircraft Maintenance Manual (AMM) remains applicable. The propeller may be protected by an electrical anti-ice system or a TKS fluid anti-ice system. Reference the most recent revision of Hartzell Ice Protection System Manual 180 for information on components used to keep ice from forming on the propeller.

TKS ANTI-ICE PROPELLER - DESCRIPTION AND OPERATION

The TKS propeller system uses a slinger ring and travel tubes to move fluid from the feed nozzle to each propeller blade; feed boots bonded to each propeller blade direct fluid to the leading edge. There are no changes to the propeller fluid flow or system pressures for the Hartzell 4-blade propeller.

TKS ANTI-ICE PROPELLER - MAINTENANCE PRACTICES

Refer to the most current revision of Hartzell Ice Protection System Manual 180 for feed boot removal and installation procedures and for component removal, installation, and adjustment procedures. The Hartzell HC-E4N-3KTV()/GC11114B-2 propeller uses a P/N 107122 anti-ice kit.

CAUTION!

Avoid bending travel tubes during propeller maintenance. Travel tube alignment is made with the propeller blades at low pitch; adjustment may require the propeller to be removed and placed on a test bench at a certified propeller repair station.

PROPELLER ANTI-ICE - DESCRIPTION AND OPERATION

The system consists of electrically heated de-ice boots bonded to each propeller blade, a slip ring assembly for power distribution to the propeller de-ice boots, a brush block assembly to transfer electrical power to the rotating slip ring and a timer. There is no change to cycle timing; when the PROP anti-ice switch is placed in the AUTO (upper) position electrical power is supplied to the four anti-ice boots in intervals of 90 seconds on and 90 seconds off. Operation of the propeller anti-ice system can be checked by monitoring the prop anti-ice ammeter. The anti-ice system is operating correctly when the ammeter indicates within the green arc; there is no change to the ammeter marking. The system adds an additional metal oxide varistor mounted on the lower portion of the brush block bracket.

PROPELLER ANTI-ICE - MAINTENANCE PRACTICES

Refer to the most current revision of Hartzell Ice Protection System Manual 180 for de-ice boot and electrical component removal and installation procedures. The Hartzell HC-E4N-3KTV()/GC11114K-2 propeller uses a P/N 108052 electric de-ice kit; propeller install uses a P/N 108053 airframe de-ice kit.

CAUTION!

Do not operate the de-ice boots for more than 30 seconds with the engine not operating. Overheating of the de-ice boots can cause damage to the propeller blades.

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CHAPTER 61 – PROPELLERS

This chapter contains information on the propeller. Refer to most current revision of the applicable maintenance manuals listed in the introduction of this manual - List of Manufacturers Technical Publications for additional information. Propeller governor information of the basic Aircraft Maintenance Manual (AMM) remains applicable.

PROPELLER - DESCRIPTION AND OPERATION

The Hartzell HC-E4N-3KTV()/GC11114()-2 is a four-blade, constant-speed, full feathering, reversible, governor-regulated propeller equipped with carbon-composite blades. Reference the most recent revision of Hartzell Propeller Owner's Manual 147 for a detailed description of the propeller and its systems. Other than for operations with start locks (if equipped), there are no changes to the cockpit controls or propeller operating procedures provided by the basic AMM.

PROPELLERS EQUIPPED WITH OPTIONAL START LOCKS

The Hartzell HC-E4N-3KTVY/GC11114()-2 models incorporate start locks. To prevent feathering during shutdown, spring-loaded pins provide for the blades to be held at flat pitch. To engage the pins, place the power lever in the beta position before stopping the engine. Upon stopping, a large spring in the propeller moves a piston toward the feathered position. As the propeller speed decays below a few hundred RPM, the latch pins engage the piston preventing the propeller from feathering. To disengage the latch pins after engine start and before advancing the power lever, the power lever must be moved aft of the beta position from where it was shut down. This removes the lateral friction from the latch pins and prevents them from being damaged by the application of power. After adding power sufficient to advance the RPM in reverse, the latch pins disengage by centripetal action (move outward) to allow full control of the propeller.

To shut down in flat pitch (if equipped with start locks):

1. Propeller Control Lever – MAX RPM (full forward)
2. POWER Lever – BETA (aft of IDLE approximately one inch) Power Lever MUST NOT BE MOVED from this position after engine stops

CAUTION!

During shutdown in flat pitch, position POWER lever at first indication of N_g rise.

NOTE

If the propeller is in flat pitch before start, the propeller blades are held in position by the start locks and the power control lever will be aft of the IDLE position. The power lever must be moved slightly farther aft into the REVERSE range after engine start to assure that the blades become unlatched before moving the power lever to IDLE or forward.

CAUTION!

If the power lever is moved into the forward thrust range with the start locks still engaged, damage to the lock mechanisms may occur.

PROPELLER - MAINTENANCE PRACTICES

Refer to the most recent revision of Hartzell Propeller Owner's Manual 147 for removal and installation procedures. Propeller blade angles are set at the factory prior to shipping or by a certified repair station with the appropriate rating. The feathered blade angle is 82.4°±0.5°, low pitch blade angle is 10.3°±0.2° and a maximum reverse blade angle is -14.5°±0.5; if equipped with optional start locks, the start lock blade angle is -4.1°±0.1°. Adjustment to the as supplied blade angles is not allowed. If equipped with an ice protection system, refer to the most recent revision of Hartzell Ice Protection System Manual 180 for additional maintenance practices.

CAUTION!

When installing the propeller the ID chamfer of the washer must face toward the mounting nut, this positions the rolled edge of the washer against the engine flange.

PROPELLER - ADJUSTMENT/TEST

This section gives information necessary to do a functional test for the dynamic balancing of the propeller. Complete a dynamic balance of the propeller per the most recent revision of Hartzell Propeller Owner's Manual 147.

NOTE

Check propeller balance after three hours of installed running time to adequately seat the seals and distribute the lubricating grease.

NOTE

The maximum allowable vibration is 0.07 IPS. If the initial vibration value is greater than 2.0 IPS the propeller must be rejected for excessive unbalance.

PROPELLER - INSPECTION/CHECK

Refer to the most recent revision of Hartzell Propeller Owner's Manual 147 for inspection and check. Pre-flight checks, operational checks, periodic inspection and maintenance, inspection procedures, special inspections and long term storage information are provided. When conducting propeller ground idle RPM operational checks, the minimum propeller speed is 1050 RPM.

WARNING!!

Stabilized ground operation within the propeller restricted RPM range can generate high propeller stresses and result in fatigue damage to the propeller. This damage can lead to a reduced propeller fatigue life, propeller failure, and loss of control of the aircraft. The propeller restricted range is from 350 to 1050 RPM.

Refer to the most recent revision of Hartzell Composite Blade Field Maintenance and Minor Repair Manual 170 to determine if damage to the composite blades is airworthy/unairworthy. Minor repair may be performed by qualified mechanics. Major damage must be corrected by personnel/repair station with a valid Hartzell Propeller Inc. composite blade repair certification. There is no allowable reduction to the propeller diameter.

When cleaning use a non-caustic/non-acidic soap solution and potable water rinse to remove dirt, unwanted material, and soap residue from the propeller blades; position the blades downward to avoid the soap solution and/or contaminates from flowing into the hub/blade seal area.

CHAPTER 71 – POWERPLANT

This section contains maintenance information on the powerplant and associated components. The powerplant chapter of the basic Aircraft Maintenance Manual (AMM) remains applicable except as modified herein.

POWERPLANT - ADJUSTMENT/TEST (PT6A-114A)

The minimum propeller speed at low dle is 1050 RPM; proper rigging of the engine prevents operating in a vibration restricted range from 350 to 1050 RPM. The low idle gas generator is set from 56.5% to 58.5% N_g to provide a propeller speed greater than 1060 RPM. All other engine operating limits and acceleration checks provided by the basic AMM remain applicable.

WARNING!!
Stabilized ground operation within the propeller restricted RPM range can generate high propeller stresses and result in fatigue damage to the propeller. This damage can lead to a reduced propeller fatigue life, propeller failure, and loss of control of the aircraft. The propeller restricted range is from 350 to 1050 RPM.

POWERPLANT - ADJUSTMENT/TEST (PT6A-140)

The minimum propeller speed at idle is 1050 RPM; proper rigging of the engine prevents operating in a vibration restricted range from 350 to 1050 RPM. The low idle gas generator is set from 56.0% to 57.5% N_g to provide a propeller speed greater than 1060 RPM. When conducting the idle low idle check, if the propeller speed is less than 1060 RPM or the percent N_g is not between 56.0% and 57.5% N_g refer to Chapter 76 Engine Control Adjustment - Adjustment/Test of this manual. All other engine operating limits and checks provided by the basic AMM remain applicable.

WARNING!!
Stabilized ground operation within the propeller restricted RPM range can generate high propeller stresses and result in fatigue damage to the propeller. This damage can lead to a reduced propeller fatigue life, propeller failure, and loss of control of the aircraft. The propeller restricted range is from 350 to 1050 RPM.

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CHAPTER 76 – ENGINE CONTROLS

This chapter describes those controls which govern operation of the engine. The engine controls chapter of the basic Aircraft Maintenance Manual (AMM) remains applicable except as modified herein. Propeller characteristics at low idle require increasing the gas generator speed for the propeller's 1050 RPM (minimum) to be maintained. Characteristics in reverse may require adjustment for gas generator pickup and torque.

ENGINE CONTROLS - DESCRIPTION AND OPERATION

When the fuel condition lever is in the low idle position the FCU is nominally at 58 percent (PT6A-114A) or 57% (PT6A-140) gas generator speed (N_g). This provides for a propeller speed greater than 1060 RPM at low idle. The high idle position of the FCU remains at 65% N_g.

ENGINE CONTROLS - INSPECTION CHECK

During Functional Check of Engine Power Lever when moving the power control lever from idle toward reverse, make sure that the propeller RPM increases to peak, then decreases 10 RPM to 50 RPM before the gas generator speed (N_g) begins to increase. Propeller RPM will continue to decrease as the power control lever is moved further into reverse. Make sure propeller RPM remains above 1060 RPM with smooth response from power control lever. If necessary, do the Power Control Lever Reverse Gas Generator (N_g) Pickup Adjustment.

During Functional Check of the Fuel Condition Lever, make sure that the gas generator (N_g) at low idle is from 56.0 to 58.5 percent and propeller speed exceeds 1060 RPM. If N_g or propeller speed is not as specified, do the Fuel Control Lower Idle Adjustment.

Do a Ground Run Torque Check:

(1) Start engine, observing all operating limitations. Refer to the Airplane Flight Manual Supplement and basic Airplane Flight Manual.

(2) Operate engine at idle for five minutes, allowing temperatures to stabilize.

(3) Place propeller lever full forward.

(4) Advance power lever to obtain exactly 1700 PRM; record torque, OAT, and pressure altitude.

  (a) Torque to be within 4% of Figure 1 for the recorded OAT and pressure altitude, i.e., torque at 48°F (8.9°C) and 3000 feet (914 m) pressure altitude is 520 foot-pounds (384 Nm); the tolerance is 499 to 541 foot-pounds (368 to 399 Nm).

(5) Complete the following adjustment if necessary:

  (a) If torque is not within tolerance, do the Power Control Forward Linkage Rigging. Refer to PT6A-114A Engine Rigging Adjustment/Test.

  (b) If torque is not within tolerance, do the Beta Cable Adjustment (Forward). Refer to Engine Controls Rigging - Adjustment/Test (PT6A-140).

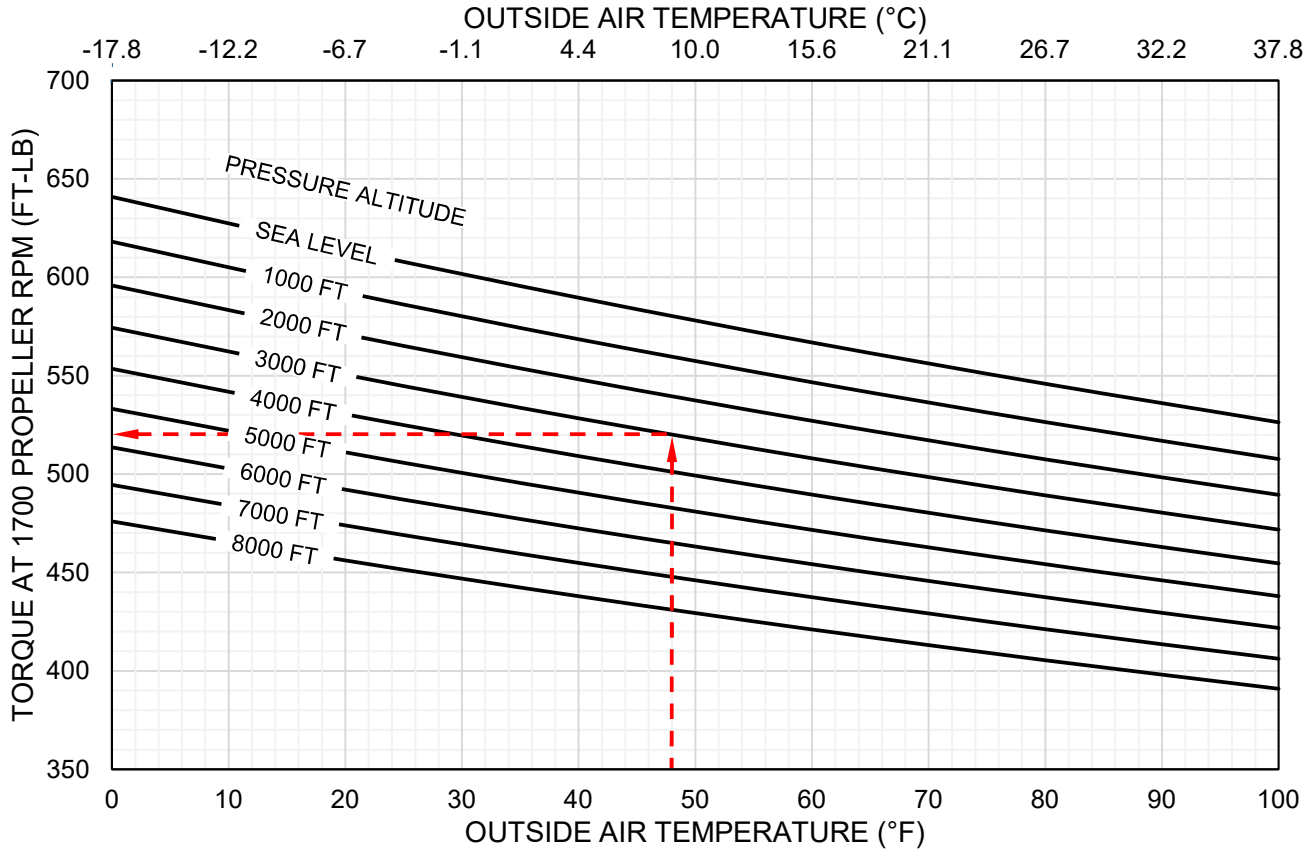

FIGURE 1, GROUND RUN TORQUE CHECK

Ground run torque is set using the low pitch stop adjuster to position the Beta Valve clevis slot. Adjust Beta Valve FORWARD to increase torque. Mark the forward and rear portions of the adjuster assembly to provide for an accurate adjustment; one half-turn changes torque by approximately 100ft-lb.

CAUTION!

After adjusting torque make sure the beta valve clevis slot is positioned per Figure 2. Beta Valve clevis slot may not be recessed below front face of cap nut. Beta Valve clevis slot may not extend more than 0.031 inches (0.8 mm) from the front face of the cap nut.

FIGURE 2, ACCEPTABLE RANGE OF BETA VALVE ADJUSTMENT

PT6A-114A ENGINE CONTROL RIGGING - ADJUSTMENT/TEST

POWER CONTROL LEVER REVERSE GAS GENERATOR N_g PICKUP ADJUSTMENT

Power Control Lever Reverse Gas Generator (N_g) Pickup Adjustment procedures of the basic AMM are modified as follows:

(4) Move power control lever from IDLE, then slowly aft to REVERSE position.

(a) Verify propeller RPM increases to peak, then decreases 10 RPM to 50 RPM before the gas generator N_g begins to increase. As the power control lever is moved further into reverse, verify the propeller RPM remains above 1060 RPM with smooth response. Adjust control lever reverse gas generator (N_g) pickup as required per basic AMM.

FUEL CONTROL LOWER IDLE ADJUSTMENT

Fuel Control Lower Idle Adjustment procedures of the basic AMM are modified as follows:

(1) Start engine, observing all operating limitations. Refer to the Airplane Flight Manual Supplement and basic Airplane Flight Manual.

NOTE

Low idle maximum has been approved at 58.5% for the PT6A-114A.

(a) Operate engine at idle for five minutes, allowing temperatures to stabilize.

(b) Advance power lever as required to achieve a propeller speed of 1060 RPM.

(7) Verify propeller speed exceeds 1060 RPM and N_g is 56.5 to 58.5 percent; if propeller speed or N_g is not achieved, adjust idle adjusting screw per basic AMM.

PT6A-114A ENGINE RIGGING - ADJUSTMENT/TEST

POWER CONTROL FORWARD LINKAGE RIGGING

Power Control Forward Linkage rigging procedures of the basic AMM are modified as follows:

(6) Position the rear of the Beta Valve clevis slot flush to 0.031 inches (0.8 mm) forward of the front face of the cap nut. Refer to Figure 2 for acceptable range of adjustment.

(a) To adjust the slot FORWARD, turn the low pitch stop adjuster CLOCKWISE as viewed from the front of the airplane. To adjust the slot AFT turn the low pitch stop adjuster COUNTERCLOCKWISE.

(1) With the safety wire cut, loosen the locknut.

(2) Hold the threaded forward portion of the assembly and rotate the aft portion.

(b) Torque low pitch adjuster locknut 150 to 200 inch-pounds (17.0 to 22.6 Nm) and lockwire.

ENGINE CONTROL ADJUSTMENT - ADJUSTMENT/TEST (PT6A-140)

LOW IDLE ADJUSTMENT

Low Idle Adjustment procedures of the basic AMM are modified as follows:

(2) Start engine, observing all operating limitations. Refer to the Airplane Flight Manual Supplement and basic Airplane Flight Manual.

NOTE

Low idle maximum has been approved at 57.5 percent for the PT6A-140 engine.

(a) Operate engine at idle for five minutes, allowing temperatures to stabilize.

(b) Advance power lever as required to maintain a propeller speed of 1060 RPM.

(7) Verify propeller speed exceeds 1060 RPM and N_g is 56.0 to 57.5 percent; if propeller speed or N_g is not achieved, adjust idle adjustment screws per the basic AMM.

NOTE

Low idle adjustment also affects the high idle setting. Set low idle then adjust high idle.

REVERSE POWER ADJUSTMENT

Reverse Power Adjustment procedures of the basic AMM are modified as follows:

(5) Move power control lever from IDLE, then slowly aft to REVERSE position.

(a) Make sure that the propeller RPM increases to peak, then decreases 10 to 50 RPM before gas generator N_g begins increasing from idle.

(b) Make sure that the propeller RPM remains above 1060 RPM with smooth response.

(6) If N_g pickup occurs after the 10 to 50 RPM drop or propeller RPM is below 1060 RPM, correct the reverse power adjustment as follows:

(a) Adjust deadband screw counterclockwise to decrease deadband width. Refer to Chapter 76 of the basic AMM, Engine Control Adjustment - Adjustment/Test (PT6A-140), Deadband Width Adjustment.

(b) Check the forward deadband setting and adjust serrated spacer at FCU arm clockwise if necessary. Refer to Chapter 76 of the basic AMM, Engine Control Adjustment - Adjustment/Test (PT6A-140), Power Lever Deadband Adjustment.

(c) If a large adjustment is necessary:

1 At the aft beta cable terminal end, remove and discard the cotter pin.

2 Remove the clevis pin and washer that attach the cable end to the reversing cam.

3 Move the beta terminal end down one hole in the reversing cam.

4 Install the clevis pin, washer, and new cotter pin at the aft beta terminal.

(7) If N_g pickup occurs before the 10 to 50 RPM drop, correct the reverse power adjustment as follows:

(a) Adjust deadband screw clockwise to increase deadband width. Refer to Chapter 76 of the basic AMM, Engine Control Adjustment - Adjustment/Test (PT6A-140), Deadband Width Adjustment.

(b) Check the forward deadband setting and adjust serrated spacer at FCU arm counterclockwise if necessary. Refer to Refer to Chapter 76 of the basic AMM, Engine Control Adjustment - Adjustment/Test (PT6A-140), Power Lever Deadband Adjustment.

(c) If a large adjustment is necessary:

1 At the aft beta cable terminal end, remove and discard the cotter pin.

2 Remove the clevis pin and washer that attach the cable end to the reversing cam.

3 Move the beta terminal end up one hole in the reversing cam.

4 Install the clevis pin, washer, and new cotter pin at the aft beta terminal.

(5) Move power control lever from IDLE, then slowly aft to MAX REVERSE position.

(a) Make sure at MAX REVERSE there is a minimum torque of 900 foot-pounds (1220 Nm).

(b) Make sure at MAX REVERSE propeller RPM is limited by the FCU reverse stop and RPM is less than 1750 RPM. Make sure the propeller speed and torque response do not level out due to the underspeed pneumatic limiter (fuel topping governor).

(10) If reverse torque adjustment is required, correct the torque adjustment as follows:

(a) Cut and remove safety wire on FCU reverse stop.

(b) Adjust FCU reverse stop clockwise to increase torque or counterclockwise to decrease torque.

(c) Safety the FCU reverse stop. Refer to Chapter 20 of the basic AMM, Safetying - Maintenance Practices.

NOTE

Deadband stop screw adjustment affects the low and high idle settings. Complete the reverse power adjustment then adjust low and high idle.

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

BETA CABLE ADJUSTMENT (FORWARD)

Beta Cable Adjustment procedures of the basic AMM are modified as follows:

(10) Position the rear of the Beta Valve clevis slot flush to 0.031 inches (0.8 mm) forward of the front face of the cap nut. Refer to Figure 2 for acceptable range of adjustment.

(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 align with the second hole from the bottom of the reversing cam.

(d) Lengthen clevis one-half turn:

1 Install the clevis pin, washer, and new cotter pin at the aft beta terminal.

(14) Operate the power lever from IDLE to MAX POWER; check for free movement.

NOTE

The beta terminal position in the reversing cam may differ. Refer to Engine Control Adjustment - Adjustment/Test (PT6A-140), Reverse Power Adjustment.