Instructions for Continued Airworthiness

Installation of the Pratt & Whitney PT6A-42A
On the Cessna 208

Document Number: 201201-30
STC Number: SA02467LA
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Revision: B

Notice

This document must be referenced on Block 8 of FAA form 337 and added to the aircraft permanent record as required by 14 CFR Part 91, §91.417 (a)(2)(vi) when the reference FAA-STC modification is accomplished on eligible aircraft. This document complies with the requirements of 14 CFR Part 23, §23.1529, in accordance with 14 CFR Part 23, Appendix G.

Aircraft Serial Number: _____
Aircraft Registration Number: _____

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FAA ACCEPTED
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Proprietary Information

Record of Revisions

Revision	Date	Sections Affected
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A	Aug 2013	ALL
B	Mar 2013	ALL

List of Effective Pages

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1. Introduction

This document supersedes ICA 201201-30 in its entirety.

This document provides instructions for the continued airworthiness of the Cessna Caravan 208 modified in accordance with supplemental type certificate (STC) SA02467LA. This STC installs the Pratt & Whitney PT6A-42A turboprop engine with either the four blade Hartzell model HC-E4N-3P/D9900(K) propeller or the three blade Hartzell model HC-B3TN-3AE(Y)/T10290N(K)+2 propeller.

In accordance with 14 CFR Part 91, §91.417, keep these instructions with the aircraft maintenance/service information manuals or with the aircraft logbooks for reference during maintenance.

This document is a supplement to the current revisions of the Cessna Aircraft Model 208 Maintenance Manual (D2078), Pratt & Whitney Canada PT6A-42A Maintenance Manual (3021442) and the Hartzell Propeller owners/maintenance manual. The instructions herein supersede the instructions of these manuals only in the areas noted and only as specifically stated.

2. Revisions

Each time this ICA is revised or reissued, the revised ICA will be distributed to Owners/Operators using a Service Letter/Bulletin by Blackhawk Modifications, Inc. The revision will include a new Log of Revision page along with the revised pages. The lower left hand corner of each revised page will reflect the revision letter. That portion of text or an illustration, which has been revised by the addition of or change in, information is denoted by a solid revision bar located adjacent to the area of change, and placed along the inside margin or a page. Revision bars show only the information changed within the latest revision.

3. Description

The following descriptions are detail changes to basic Cessna Aircraft Model 208 Maintenance Manual that are applicable to this STC installation.

3.1 Engine

(a) Number of engines 1
(b) Engine Manufacturer ..... Pratt and Whitney Canada
(c) Engine Model Number PT6A-42A
(d) Rated Horsepower ..... 850 SHP
(e) Propeller Speed (RPM) 2000
(f) Gear Box Torque Limit ..... 2232 ft-lbs
(g) Power Turbine Limit Speed .....30,145 RPM at 2000 RPM
(h) Engine Type .....Free Turbine, Reverse Flow
Compressor Stages and type..... 3 axial stages, 1 centrifugal stage
Turbine stages and type .....1 stage compression, 2 stage power
Combustion Chamber type annular
(i) Engine Limits .....See Section 7 of this document

3.2 Propeller

The following propellers are eligible for installation:

1. Hartzell Four Blade Propeller (Option A).

   (a) Number of propellers.....1
   (b) Propeller Manufacturer.....Hartzell Propeller Inc.
   (c) Hub Model.....HC-E4N-3P
   (d) Blade Model .....D9900(K)
   (e) Number of Blades.....4
   (f) Propeller Diameter (inches).....100 inches (maximum), 98 inches (minimum)
   (g) Propeller Pitch Limits (At Sta. 30).....86.1°±0.5° Feather
   -10.0°±0.5° Reverse
   17.3° +0.1/-0.2° Low Pitch
   (h) Propeller Type .....Hydraulically Operated Constant Speed,
   Full Feathering, and Reversible.

2. Hartzell Three Blade Propeller (Option B)

   (a) Number of propellers.....1
   (b) Propeller Manufacturer.....Hartzell Propeller Inc.
   (c) Hub Model..... HC-B3TN-3AE(Y)
   (d) Blade Model ..... T10290N(K)+2
   (e) Number of Blades.....3
   (f) Propeller Diameter (inches).....104 inches (maximum), 100 inches (minimum)
   (g) Propeller Pitch Limits (At Sta. 42).....79.0°±1.0° Feather
   -15.0°±0.5° Reverse
   10.0°±0.1° Low Pitch
   0.0°±1.0° Start Lock
   (h) Propeller Type .....Hydraulically Operated Constant Speed,
   Full Feathering, and Reversible with option of start locks.

3.3 Propeller Control Lever

- The MAX position is used when high RPM is desired and governs the propeller speed at 2000 RPM. Propeller control lever settings from MAX to MIN position permit the pilot to select the desired engine RPM for cruise to as low as approximately 1600 to 1650 RPM.
- The existing propeller control cable has an extension to lengthen the cable at the propeller governor.

3.4 Fuel Condition Lever

- Low Idle
  - Hartzell Model HC-E4N-3P/D9900(K) installations (Option A). Positions the FCU idle control lever to provide a prop speed (Np) of 1050 rpm +30/-0 rpm which is usually between 58-61% Ng.
  - Hartzell Model HC-B3TN-3AE(Y)/T10290N(K)+2 installations (Option B). Positions the FCU idle control lever to provide an Ng between 53% - 55%
- High Idle
  - Positions the FCU idle control lever to provide an Ng between 68% - 71%.

3.5 Engine Instruments

Each original indicator can be replaced by a two-inch round electronic, micro-processor based single or dual pointer indicator. Two manufacturer's indicators are used, produced by Ultra Flightline and Howell Instruments respectively.

Each manufacturer's indicator:

- is electrically powered by the 28 vdc electrical bus for the engine instruments through a maximum 5 amp circuit breaker.
- indicates the engine parameter based upon a signal from its respective signal generator, thermocouple or transducer.
- displays the indication via the familiar rotating pointer showing power trends and limitations against a fixed scale plate, but now also provides a supplemental and secondary digital display.
- includes a two-color (green/red) status LED.
- is backlit and dimmable using the existing engine indicator lighting rheostats. Note: original post-lights have been removed.
- digital display will show a checkerboard pattern when the respective engine limitation has been exceeded. The analog needle will continue to indicate the proper value.

3.5.1 Ultra Flightline

For single pointer instruments, the pointer is powered by a servo motor, providing fast and accurate instrument response. Likewise, the dual instruments utilize servo motors to drive the pointers, but drives them through a coaxial shaft arrangement. Because servo motors are used, the pointers will return to their parked positions when power is removed.

The status LED provides information on fault conditions, engine exceedance for all instruments.

Figure 1 Ultra Flightline Single Pointer Engine Indicator

Figure 2 Ultra Flightline Dual Pointer Engine Indicator

The status LED provides information on fault conditions and engine exceedance for all instruments.

When the engine exceeds an established limit (red wedge or red dashed radial), the status LED of all the instruments will flash RED for a period of time then illuminate RED continuously until the engine parameter recedes below (or above if a lower limit has been established) the engine limitation.

All instruments are backlit and controlled via voltage input from the aircraft lighting system. If backlight power is removed from the instrument, the backlight will extinguish.

3.5.1.1 Instrument Initialization

Upon initial power up, each indicator performs a self-test. During this test and prior to assuming normal operation:

- the digital display initially displays "OKAY", then displays indicator name, followed by "----", then when the self-test is complete the actual engine indication is displayed.
- the status LED illuminates red then green twice, then extinguishes.
- the pointer is driven from the parked position to the full scale position, followed by the off scale zero position, then displays the actual indication.

3.5.1.2 Normal Operation

During normal operation each indicator is conducting a continuous self-test on the indicator and the transducer's signal. The result of this self-test is displayed using the status LED which is defined as follows:

Status LED Illumination	Description
None	Instrument is functioning normally. If the pointer is parked below zero, the indicator is not electrically powered.
Constant Red	Engine is exceeding limit and digital display is showing a checkerboard.
Flashing Red (4x per second)	Transducer signal has failed
Flashing Red (2x per second)	Instrument is not working correctly.

Note

The status LED on the oil temperature/oil pressure indicators may illuminate constant red when engine is shutdown.

3.5.1.3 Exceedance

Caution

When an exceedance indication is observed, take immediate action to return the engine to within the prescribed limits.

An exceedance occurs when an engine parameter exceeds a defined engine limitation. For the single pointer instruments, the limitation is defined as the red wedge or red dashed radial.

When the limitation is exceeded, the status LED will flash RED for a period of time, then turn solid RED until the engine parameter falls below the limitation.

The dual pointer instruments operate identically to the single pointer units, but also provide a lower red wedge. The status LED will follow the same sequence as the upper limitations, but will extinguish when the parameter rises above the lower limitation.

The lower limitation on oil pressure provides a functional verification of its exceedance feature prior to engine start. With the engine not running, the exceedance function could initiate immediately after test. When the engine starts,

the exceedance display should extinguish as soon as oil pressure rises above the lower red line.

3.5.2 Howell

For single pointer instruments, the pointer is powered by a stepper motor, providing fast and accurate instrument response. Likewise, the dual instruments utilize stepper motors to drive the pointers, but drives them through a coaxial shaft arrangement. Because stepper motors are used, the pointers freeze at their current positions when power is removed.

The status LED provides information on fault conditions, engine exceedance for all instruments, and in the case of the dual instruments, operational status. When the dual pointer instrument is not receiving power, the status LED is not lit. When operating, the status LED illuminates GREEN.

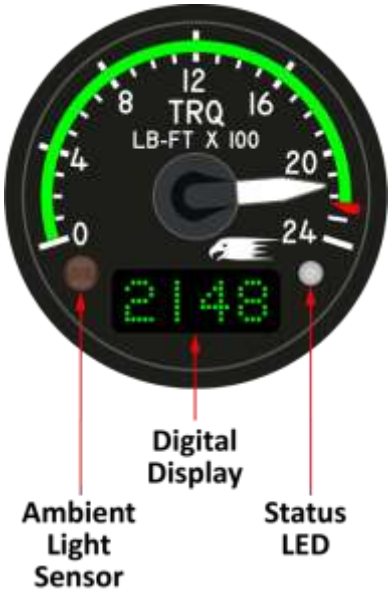


Figure 3 Howell Single Pointer Engine Indicator

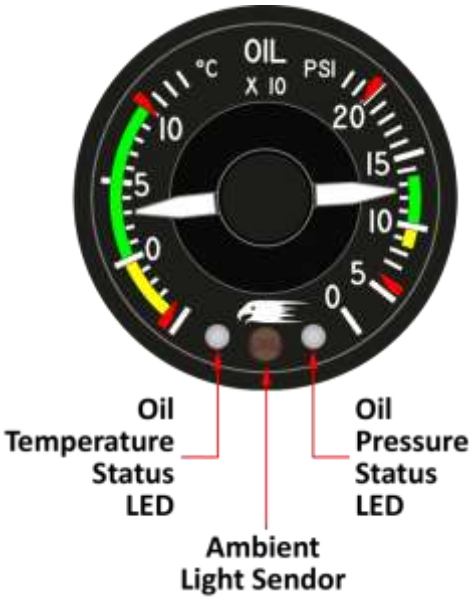


Figure 4 Howell Dual Pointer Engine Indicator

When the engine exceeds an established limit (red wedge or red dashed radial), the status LED of all the instruments will flash RED for a period of time then illuminate RED continuously until the engine parameter recedes below (or above if a lower limit has been established) the engine limitation.

All instruments are backlit with cool white LED's and controlled via voltage input from the aircraft lighting system. The backlight is powered via the main instrument power, but the lighting level is controlled or modulated by the input aircraft lighting voltage. If power is removed from the instrument, the backlight will extinguish.

The light level of the digital display and the status LED's is independent of the backlight and is controlled by a photo sensor. The digital display and the status LED's light level respond directly to the ambient light level automatically.

3.5.2.1 Instrument Initialization

Upon initial power up, each indicator performs a self-test. During this test and prior to assuming normal operation, the instruments display the following characteristics:

Single Pointer Instrument

Pointer:

1) The analog pointer will first find a registration point determined by the internal mechanical stop, and then move to,
2) Range/Scale maximum, and then move to,
3) Calculated scale zero or range/scale minimum, whichever is lower, and then move to,
4) Position according to input signal

Digital Display:

1) Displays all pixels for 1 second, then
2) Displays parameter code[1] specific to the instrument type for 1 second, then,
3) Displays dashes "- - - -" for 1 second, then,
4) Displays all pixels for the remainder of the test, then displays the primary signal value

Status LED:

1) The LED is cycled on red for 1 second, then
2) LED is cycled on green for 1 second, then
3) The LED is extinguished for the remainder of the test

[1] - The parameter codes for the specific instruments are:

TORQ – Engine Torque
ITT – Engine Interstage Turbine Temperature
NG – Gas Generator Rotational Speed
NP – Propeller Rotational Speed
FF – Fuel Flow

Dual Pointer Instrument

Pointer:

1) The analog pointer will first find a registration point determined by the internal mechanical stop, and then move to,
2) Range/Scale maximum, and then move to,
3) Calculated scale zero or range/scale minimum, whichever is lower, and then move to,
4) Position according to input signal

Status LED:

1) The LED is cycled on red for 1 second, then
2) LED is cycled on green for 1 second
3) The LED is extinguished for the remainder of the test

If the instrument fails its self-test, one of the following error conditions may be displayed:

Single Pointer Instrument

Status LED:

1) Flashes GREEN at a rate of 2 cycles per second.

Digital Display:

The following error codes may be displayed:

1) "Err1"
2) "Err2"
3) "Err3"

Dual Pointer Instrument

1) Flashes GREEN at a rate of 2 cycles per second.

In the event that the self-test fails and one of these indications is displayed, the instrument must be considered non-functional and returned to the manufacturer for diagnosis. Record and provide the indication to the manufacturer. Otherwise, the instrument may be considered operational.

3.5.2.2 Normal Operation

Upon the successful completion of the system self-test the instruments will display the current engine parameters. On single pointer instruments, the pointer and digital display will display the current engine information. The status LED will not illuminate unless an exceedance condition occurs.

On dual pointer systems, the pointers will display the current engine parameters and the status LED will illuminate GREEN. If the instrument has power and is operational, the status LED will be illuminated, providing a quick visual check of its operational status.

3.5.2.3 Exceedance

Caution

When an exceedance indication is observed, take immediate action to return the engine to within the prescribed limits.

An exceedance occurs when an engine parameter exceeds a defined engine limitation. For the single pointer instruments, the limitation is defined as the red wedge or red dashed radial.

When the limitation is exceeded, the status LED will flash RED for a period of time, then turn solid RED until the engine parameter falls below the limitation.

The dual pointer instruments operate identically to the single pointer units, but also provide a lower red wedge. The status LED will follow the same sequence as the upper limitations, but will extinguish when the parameter rises above the lower limitation.

The lower limitation on oil pressure provides a functional verification of its exceedance feature prior to engine start. With the engine not running, the exceedance function should initiate immediately after test. When the engine starts, the exceedance display should extinguish as soon as oil pressure rises above the lower red line

3.6 Torque Indicator

- The torque indicator is now electrically powered and operates in conjunction with an electro-piezoelectric type transmitter located on the upper right engine mount truss tube.
- The transmitter senses the difference between the engine torque meter pressure (on the right side of the reduction gear box, RGB) and the static pressure in the engine case (on the left side of the RGB) and transmits this data to the indicator.
- The torque indicator converts this information into an indication of torque in foot-pounds (ft-lbs).
- The torque indicator system is powered by 28-volt DC power through a circuit breaker, on the left sidewall switch and circuit breaker panel.
- If originally equipped with direct pressure lines from the engine gear box to the indicator, these lines have been removed and capped at the firewall.

3.7 Oil Pressure Indicator

- The oil pressure indicator is now electrically powered and operates in conjunction with an electro-piezoelectric type transmitter located on the upper right engine mount truss tube.
- The transmitter senses the engine oil pressure at the gas generator section just downstream of the main oil filter & pressure relief valve and transmits this data to the indicator.
- The oil pressure indicator converts this information into an indication of oil pressure in pounds per square inch (psi).

- The oil pressure system is powered by 28-volt DC power through a circuit breaker, on the left sidewall switch and circuit breaker panel.

3.8 Engine Lubrication System

- A 40% larger capacity oil cooler has been installed in the same location as the original factory oil cooler in order to increase cooling margins.
- Breather air from the accessory gear box is now exhausted through an ejector installed on the lower right cowling via a firewall installed air/oil separator can and required hoses. Separated oil is collected from the air/oil separator can into an oil EPA drain can mounted to the lower right engine mount truss tube. The oil EPA drain can includes a drain and an overflow tube in the lower right cowling.
- The engine's oil tank capacity is still 9.5 U.S. quarts and the total system capacity is 14.5 U.S. quarts.
- For engine oil grades, refer to Section 7 of this document.

Figure 2

3.9 Exhaust system

The exhaust system now consists of an exhaust extension pipe attached to the engine exhaust case flanges on each side of the engine. Exhaust stacks are attached to each extension pipe and extend outside of the cowling to port the exhaust gases clear of the airframe.

3.10 Torque Limiter:

- The engine is equipped with a torque limiter designed to prevent over-torqueing the engine in an uncontrollable engine emergency event.
- This limiter is installed at the engine torque meter pressure boss on the reduction gear box.
- When an over-torque pressure is sensed, near 2410 foot-pounds, the limiter bleeds off Py air to the atmosphere thus reducing the fuel supply to the engine and thereby limiting the engine torque produced.

3.11 Chip Detector

Two chip detectors (one on each gear box) are now required and not optional.

3.12 Oil (or EPA) Drain Can

- All airplanes are now equipped, if not previously, with an oil (or EPA) drain can mounted on the right lower engine mount truss. This can collects any engine oil discharges coming from the accessory pads for the alternator drive pulley, starter/generator, air conditioner compressor (if installed), the separated oil from the engine breather air/oil separator can and hoses, and the propeller shaft seal.
- This can should be drained before or after any flight. A drain valve on the bottom right side of the lower engine cowling enables someone to drain the contents of the can into a suitable container.
- The allowable quantity of oil discharge per hour has increased to approximately 20 cc for airplanes with air conditioning and 17 cc for airplanes without air-conditioning. If the quantity of oil drained from the can is greater than specified, the source of leakage should be identified and corrected.

3.13 Oil Quick-Drain Valve

The oil quick-drain valve is not installed.

3.14 Engine Cowling and Inlet

- The engine cowling and inlet up to the engine's air box is now fabricated from carbon laminate plies.
- The cowl doors and spine include a honeycomb core.

- A lightning mesh is provided on all outside cowling and inside inlet surfaces to provide lightning protection.

3.15 Engine Mount Ring and Truss

- The engine mount truss is unchanged, but the engine mount ring has been modified to incorporate four vibration isolator mounts instead of three.
- Barry Control isolators are now used.

Figure 3

3.16 Overspeed Governor

The original overspeed governor has been re-calibrated for a PT6A-42A engine overspeed condition.

3.17 Bleed Air Supply and Environmental Heating

- Bleed air supply is obtained from the left side of the engine only.
- Supplemental ground heat is obtained from the right side of the engine only.

3.18 Fuel System

- The fuel system is unchanged from original except that different firewall to engine hoses have been used.
- The motive flow return and fuel supply pressures have increased.

3.19 Engine Trend Monitor System (optional equipment for Ultra Flightline Engine Instruments Only)

- The Engine Trend Monitor System (ETMS) monitors and records engine and airframe measurements taken by Checkpoint engine instrumentation.
- The resulting data recordings are used for engine maintenance and troubleshooting and to meet Pratt & Whitney's TBO extension requirements.

4. Special Procedures

Refer to the following sections of the approved aircraft flight manual supplement (AFMS) for information on Normal and Emergency operating procedures. The AFMS document number is 201201-1, Rev. A, Dated November 8, 2013, 201201-2, Rev. A, Dated November 8, 2013, or later FAA approved revision for aircraft equipped with Ultra Flightline engine indicators, or AFMS 201327, Revision IR, dated 17 April 2015, or later FAA approved revision for aircraft equipped with Howell engine indicators:

- Section 3: Emergency Procedures
- Section 4: Normal Procedures

5. Servicing

5.1 Exterior Cleaning

The exterior of the aircraft including the wing struts, wing deice boots, cowling and windshield should be cleaned on a regular basis using mild non-alkaline soap. Exhaust soot can build up on each wing strut and wing surface so more frequent cleaning and boot protection of these areas is highly recommended. Refer to the Cessna Maintenance Manual for cleaning and protection products.

5.2 Towing and Jacking

Caution

Do not tow or jack this aircraft at gross weights above 8785 lb.

5.3 Oil Grades

Oil grades conforming to Pratt and Whitney Engine Service Bulletin No. 3001, and all revisions or supplements thereto, must be used and these oil grades are limited to

- Aero Shell Turbine Oil 500
- Royco Turbine Oil 500
- Mobil Jet Oil II
- Castrol 5000

- Exxon or BP Turbo Oil 2380
- Turbonycoil 525-2A
- Turbonycoil 600

5.4 Oil Quantity and Operating Range

This engine now includes a visible site gage on the left side of the compressor inlet case. When oil indication is within the green range, the oil level is sufficient for safe operation. When oil indication is below the green range, the dipstick must be used to obtain and accurate indication of oil level.

Note

The sight gage is intended for quick reference only and does not supersede the dipstick when determining how many additional quarts of oil are required.

5.5 Oil Drain Period

Per the latest revision of PWC SB3001

5.6 Fuel

All approved fuel grade and alternate/emergency fuels in the basic AFM are acceptable, however, when using Grade 80 aviation gasoline as an alternate/emergency fuel, the aircraft's fuel system must be flushed when operations are complete.

5.6 Landing Gear

For aircraft equipped with the APE STOL kit (AFMS 201201-2), main Wheel Tire Pressure is 56 ± 5psi on 29x11.00-10, 10 ply. For nose gear, refer to Cessna Maintenance Manual; section 12-13-01.

For aircraft not equipped with the APE STOL kit (AFMS 201201-1), refer to Cessna Maintenance Manual for tire sizes/inflation pressures.

5.7 Engine Trend Monitor System (optional for Ultra Flightline)

The ETMS's internal battery will last for approximately five (5) years. The Configuration file shows when the battery was last replaced. Return the ETM to the manufacturer (Ultra Flightline Systems) within the 5-year period for factory replacement. Failure to do so will result in corruption of the internal clock and subsequent erroneous date and time stamping.

6. Standard Practices

Standard practices used on aircraft modified per this STC shall be performed in accordance with Cessna Aircraft Company Maintenance Manual D2078, Rev. 23, dated 7/1/10, or later approved revision, as outlined in the following sections, to include the additional information as stated:

- 20-00-01, Material and Tool Cautions Description and Operation except for the following:

    1. The external engine cowling, engine inlet, truss leg close out inside the airbox, both cowling bulkheads, and the air conditioner condenser inlet (if installed) are fabricated from carbon composite materials. Therefore, only use stainless steel, monel, or titanium hardware on all the assemblies, otherwise galvanic corrosion will occur. Do not use steel or aluminum hardware (including cad plated or chemical converted parts).
    2. If aluminum sheet or plate is used ensure a barrier (i.e. rubber gasket, silicone barrier, or stainless sheet) is used between the parts.
    3. The outside of the cowl is lightning protected by a copper mesh resin filled ply which also acts as a barrier for the aluminum air conditioner condenser louvers.

- 20-10-10, Torque Data – Maintenance Practices.
- 20-10-20, Safetying – Maintenance Practices.
- 20-31-00, Interior and Exterior Finish Cleaning/Painting except for the following:

    For this new external cowling, all assemblies are primed with one or two coats of PRC-DESOTO International CA7650W epoxy sanding primer. For any new installation of any of these assemblies, it is strongly recommended to paint the top coat within 10-20 flight hours from when the installation has been completed. It is also recommended not to fly through heavy moisture until a top coat is applied. Otherwise, each cowling piece will possibly require re-priming. Top coat application should be applied inside and outside of the cowling in accordance with Cessna Maintenance Manual Section 20-31-00 except for the following:

    1. All grommets with retaining rings, receptacles, dimpled washers and screws should remain installed during painting. It is important that the area between the grommets, dimpled washers, and the cowling surface remain unpainted and clean in order to provide a good electrical bond for lightning protection.
    2. All studs should be removed.
    3. Any ground straps should be masked off.
    4. Do not paint the upper half of the cowling with dark colors.
    5. Recommended total top coat paint thickness should be no more than 18 mils. If paint becomes too thick, the lightning mesh becomes less effective and grommets become difficult to replace.

    Note: The internal cowling pieces such as the inlet, bulkheads, and air-conditioning condenser inlet (if installed) have been primed and have been top-coated with Dupont Exxon Gray (Paint Code P6175). Painting of these new parts are not required for these pieces.

7. Maintenance

Note

The airplane is modified for this STC only to the extent described herein. All other maintenance instructions and requirements are covered by their respective manufacturer's Maintenance/Service Manuals and are to be adhered to according to their requirements

7.1 Reference Aircraft Maintenance Doucments

Aircraft modified per this STC shall be maintained in accordance with the scheduled time limits and standards outlined by the current revision of the following documents:

1) Airframe: Cessna Aircraft Company Maintenance Manual D2078, Rev. 23, Dated 7/1/10, or later approved revision.
2) Engine: Pratt & Whitney Maintenance Manual 3021442, Rev. 45, Dated 12/10/10, or later approved revision. See below for rigging.
3) Propeller: Hartzell Propeller Owner's Manual 149, Rev. 12, Dated 4/12/11, or later approved revision for Model HC-E4N-3P/D9900(K) propeller or Hartzell Propeller Owner's Manual 139, Rev 12, Dated March 2013, or later approved revision for Model HC-B3TN-3AE(Y)/T10290N(K)+2. See below for rigging.
4) Engine and Propeller Rigging: Blackhawk Modifications Drawing No. 200803-800, Rev. B, Dated Feb. 2014, or later approved revision.
5) Engine Vibration Isolation System: Barry Controls Aerospace, Engine Vibration Isolation System Component Maintenance Manual 71-20-03, Rev. 4, Dated 7/1/06, or later approved revision.
6) AeroAcoustics Aircraft System, Inc. STC SA01805SE Installation and Maintenance Manual, Document AA1976, Rev. A, Dated 10/31/07, or later approved revision.
7) Composite Cowling: Blackhawk Composites Repair Manual for Caravan 208 Composite Engine Cowl with Blackhawk XP-42A Upgrade, BRM11001, Rev. A, Dated 11/18/11, or later approved revision and Blackhawk Modifications Drawing No. 201201-005, Rev. IR dated 11-30-2012, or later approved revision.

7.2 Engine Instrumentation

7.2.1 Cleaning

The lenses may be cleaned with the following approved material.

- Mild dishwashing soap (avoid types with hand crème)
- Microfiber cloth

Deviation from these materials is not allowed.

Caution

Avoid using caustic chemicals and sprays such as bleach, acetone, ammonia, chlorine, and other aerosols for cleaning the indicator lenses. The use of unapproved cleaners could damage the anti-reflective coating.

The Howell indicator lenses are treated with an anti-reflective coating. Care should be taken when cleaning the lenses to avoid scratches and damage to the coating.

7.2.2 Removal and Installation

The indicators are either removed or installed identically in accordance with the basic aircraft maintenance manual.

Caution

For Howell Indicators, do not exceed 8 in-lb of torque when installing the indicators. Excess torque can break the seal of the indicator. If damage to the seal has occurred or is suspected, the indicator should be returned to Blackhawk Modifications for repair.

7.2.3 Accuracy Checks

The following table presents the basic accuracty of the Howell indicators:

Indicator Symbol	Indicator Type	Digital Display Accuracy	Pointer Accuracy
TRQ	Torque	1. ±3 LB-FT from +20°C to +30°C ambient temperature 2. ±7 LB-FT from –40°C to +70°C ambient temperature	±1 angular degree of the digital indication
ITT	Interstage Turbine Temperature (ITT)	1. ±2°C from +20°C to +30°C ambient temperature 2. ±3°C from –40°C to +70°C ambient temperature	±1 angular degree of the digital indication
NP	Propeller Rotational Speed	1. ±2 RPM from +20°C to +30°C ambient temperature 2. ±4 RPM from –40°C to +70°C ambient temperature	±1 angular degree of the digital indication

Indicator Symbol	Indicator Type	Digital Display Accuracy	Pointer Accuracy
NG	Gas Generator Rotational Speed	1. ±0.1 % RPM from +20°C to +30°C ambient temperature 2. ±0.3 % RPM from –40°C to +70°C ambient temperature	±1 angular degree of the digital indication
OIL	Oil Temperature	----------N/A----------	±2°C from +20°C to +30°C ambient temperature
	Oil Pressure	----------N/A----------	±2 psig from +20°C to +30 °C ambient temperature
FF	Fuel Flow	1. ±1 lb/hr from +20°C to +30°C ambient temperature 2. ±2 lb/hr from –40°C to +70°C ambient temperature	±1 angular degree of the digital indication

End to end instrumentation accuracy checks for torque, ITT, or Np indications can be completed from the following directions:

7.2.3.1 Torque

a) Temporarily disconnect both pressure lines to the torque pressure transducer located on the engine mount truss.

b) Connect a pressure source (i.e. dead weight tester or pneumatic shop air setup) with a calibrated gage to the high pressure port (forward end) of the transducer. Leave the low pressure side open to atmosphere.

c) Apply the following pressures. Stabilize at each pressure, and compare the analog and digital indications to the tolerances provided.

Torque Pressure (psi)	Nominal Torque Indication (ft-lb)	Allowable Torque Indication (ft-lb)
0.0	0	0 to 60
18.0	550	510 to 590
40.0	1222	1182 to 1262
72.95	2230	2190 to 2270

Torque indication (ft-lbs) equals 30.57 x Test Point pressure (psig).

d) If the indication is outside the allowable range, contact Blackhawk.

e) Reconnect the pressure lines to the transducer when finished.

7.2.3.2 ITT

a) Check the analog and digital indications using the procedures for the "Airplane Check" in Chapter 77-21-00 of the basic Cessna Aircraft Model 208 Series Maintenance Manual except ignore indicator pin call-outs, (A & B) and use the following table of ITT set points and tolerances.

ITT Test Point (°C)	Allowable ITT Indication Range (°C)
0	0 to 20
770	760 to 780
800	790 to 810
1000	990 1010

b) If the indication is outside the allowable range, contact Blackhawk.

7.2.3.3 Propeller RPM (N_P)

a) Set propeller RPM at the following test points and with a calibrated hand-held propeller RPM vu-thru or strobe type RPM measurement device. Compare the analog and digital indications to the allowable ranges of the follwong table:

Test Point (RPM)	Allowable NP Indication (RPM)
1200	1160 to 1240
1800	1780 to 1820
2000	1980 to 2020

b) If the indication is outside the allowable range, contact Blackhawk.

7.3 Engine Trend Monitor System (optional, Ultra Flightline Indicators Only)

Periodic calibration of the OAT RTD measurement should be performed on installation, and any time the OAT RTD wiring is changed, in accordance with Checkpoint ETMS Operators Guide 7200-003, Revision D (or later approved revision), Section 3.

7.4 Elevator Trim Tab Riggging

Rig the elevator trim tab in accordance with Section 27-30-02 of the basic Cessna maintenance manual except set the elevator trim tab up travel (trim wheel rotated forward) to $17^{\circ} \pm 2^{\circ}$ degrees and the down travel (trim wheel rotated aft) to $15^{\circ} \pm 2^{\circ}$ degrees.

7.5 Exhaust Stacks

Frakes Aviation P/N 9911-1 Exhaust Stacks or Blackhawk Caravan P/N 200803-517-001 Exhaust Stacks may be operated with cracks at the exit end of the exhaust stack up to four inches in length as long as no more than four cracks are present in one stack and no two cracks are on an intersecting course. Any cracks running in the seam welds or in proximity to the mounting flange require immediate grounding until approval by Frakes Aviation for P/N 9911-1, or approval by Blackhawk Modifications Inc, for Blackhawk Caravan P/N 200803-517-001Exhaust Stacks, to continue flying.

7.4 Exhaust Extensions

Any cracks running in the seam welds or in proximity to the mounting flange of the exhaust extensions Frakes P/N 9910-1 or P/N 9920-2 require immediate grounding until approval by Frakes Aviation to continue flying. All repairs of Frakes Exhaust Extension P/N 9910-1 or P/N 9920-2 for USA based aircraft are to be made by Frakes Aviation unless otherwise approved. Contact Blackhawk Modifications at 254-755-6711 or Frakes Aviation at 817-556-0700. For Blackhawk Caravan Exhaust Extension P/N 200803-517-002 LH and 200803-517-003 RH Exhaust Extension Contact Blackhawk Modifications at 254-755-6711.

Repair cracks using the following procedure:

a) Remove the exhaust stack from the engine.

b) Remove all carbon from the interior and exterior surfaces using hot soapy water and a suitable brush. Allow the exhaust stack to dry thoroughly. If repair is in the exit stiffener use compressed air to blow the water out.

c) Wire brush both the inside and outside of the cracked area using a brush with fine stainless steel bristles.

d) Rinse the area to be repaired with solvent (Acetone, or suitable alternative) and allow to dry.

e) Prior to welding the crack, accomplish one of the following procedures:

   1) Place a copper sheet, a minimum of 0.063-inch thick, against the inside surface of the crack.

   2) Cap the openings in the exhaust stack and seal the remaining small crevices with tape. Introduce an argon purge at 10 cubic feet per hour for five minutes before welding. Continue until the repair is complete.

f) Repair crack(s) using the TIG (tungsten arc inert gas) welding process and welding rod ER308, ER308H. We use 0.035-inch rod, this makes the nicest looking welds.

g) For repair of spot welds, as long as the crack is confined to the original spot weld area we prefer to have the repair made as a rosette from the side that the crack appears on. No backside purging is necessary. After completing the repair simply clean the “sugar” off with a fine stainless steel brush.

7.4 Tanis Preheat System (Optional)

Tanis Engine Preheat system may be installed as optional equipment. For operation, inspection or repair of these heaters refer to the Tanis Instruction Manual TN01052. If further information or assistance is needed contact Tanis Aircraft Products at www.tanisaircraft.com or 1-800-443-2136.

8. Inspection

Aircraft modified per this STC shall be inspected in accordance with the information presented in this section.

8.1 Airframe

a) Cowling installations: to be inspected and repaired in accordance with BCI Manual BMM110001, Rev. A, Dated 11/18/11, or later approved revision.

b) Engine mount installations: to be inspected in accordance with Cessna Maintenance Manual D2078, Rev. 23, dated 7/1/10 (or later approved revision), Chapter 5.

c) Inertial Particle Separator (IPS): This inspection should be performed every 12 months not to exceed 400 hours of engine operation. This procedure replaces the IPS detailed inspection required in the Cessna 208 inspection program currently used.

1) Inspect the inlet air duct for cracks, chaffing and delamination.

2) Inspect the forward & aft door bearing blocks for security and corrosion. Lubricate bearings with light oil MIL-C-23411A or equivalent.

3) Inspect the forward & aft door levers for security, loose hardware or other damage.

4) Inspect the tie-rod assembly for chaffing, worn attach points, rod-end bearing play. Lubricate the aft pivot point and rod-end bearing with light oil MIL-C-23411A or equivalent.

5) Ensure the forward stationary turning vane & the aft splitter are not loose, cracked or otherwise damaged.

6) Ensure the aft door stop blocks are not loose and the doors and linkage move freely without binding.

7) Verify that with the control lever in the normal position (cockpit lever pushed in and locked), the AFT by-pass door is firmly against the closed position stop blocks while the FWD door is no more than 0.25" from the full open bumper.

8) Verify that when the control lever is pulled into the by-pass position (cockpit lever fully pulled), the FWD door contacts the stationary turning vane and forcefully snaps over-center as the AFT by-pass door comes in firm contact against the splitter. If adjustment is necessary; disconnect the 200803-504-004 push/pull rod from the aft inertial separator lever. With an appropriate force gauge measure the force required to snap the forward door over-center against the stationary turning vane, be sure to apply

the force perpendicular to the lever. Adjust the air box tie rod assembly to obtain a force of 30-35 lbs to pull the forward door over-center and the aft door against the splitter.

d) Engine Truss and Ring Assembly: The Engine Truss and Ring Assembly should be inspected in accordance with the Cessna Model 208 Nondestructive Testing Manual, Part 8 – Magnetic Particle Inspection, section 71-20-01 Engine Truss and Ring Assembly. The engine mount ring should be inspected at each engine overhaul but not exceed 5000 hours between inspections. Contact Blackhawk Modification's if any defects are noted.

8.2 Engine

a) The engine will be inspected in accordance with the latest revision of the Pratt & Whitney Maintenance Manual 3021442, Section 72-00-00, Engine, Turboprop Inspection.

b) Engine Ground Performance Check

This check should be performed prior to the return to service of the new engine installation, after a hot section inspection and engine overhaul to establish baseline performance. Thereafter at each inspection interval to compare performance history with the new or overhauled engine baseline to evaluate the effects of progressive engine performance deterioration or component replacement. This data should never be used as the sole criterion for determining the airworthiness of an engine, refer to the Engine Torque for Takeoff chart in section 5 of the Airplane Flight Manual Supplement AFMS 201201-1 or 201201-2 to determine if the engine is producing sufficient power for airworthy operation.

Prior to performing this check, the engine cowling must be in place in order to ensure consistency of engine parameters, F.O.D. screens must not be installed.

Instructions:

1) Record indicated outside air temperature (IOAT), in degrees Celsius, in Table 1, (Appendix A).

2) Record pressure altitude, which is the altimeter indication with 29.92 in-hg (1013 mb) set in the altimeter Kollsman window, in Table 1.

3) Using the IOAT and Pressure Altitude obtained in steps 1 and 2, determine the torque, ITT, fuel flow, and Ng target values from Chart 1 (Appendix A) and record them in the target column of Table 1

4) Start the engine as outlined in Section 4 of AFMS 201201-1 or 201201-2.

5) Position the airplane nosed into the wind. Ensure that the air-conditioning, bleed air and generator are all off and the IPS is in the normal position, the control pushed in and locked.

6) Verify that the propeller control is in the HIGH RPM position and push the power lever forward to establish an engine torque equal to the target torque value determined in Step 3.

Caution

Do not exceed any engine operating limitations!

7) Let the engine stabilize at this power setting for 2-3 minutes then record the actual ITT, Np, Ng and fuel flow indications in the appropriate column of Table 1.

8) Return the engine power to idle and shut-down the engine as outlined in Section 4 of AFMS 201201-1 or 201201-2.

9) Compare the actual engine operational values recorded with the target values determined in step 3. If any of the actual values exceed the target values troubleshoot in accordance with the P&WC Maintenance Manual § 72-00-00.

10) Record this data in the engine maintenance logs for future trend history reference.

8.3 Propeller

8.3.1 Hartzell Model HC-E4N-3P/D9900(K)

Hartzell Model HC-E4N-3P/D9900(K) propeller installations will be inspected in accordance with the latest revision of Hartzell Propeller Owner's Manual 149, Sections 5, 6, and 7.

8.3.2 Hartzell Model HC-B3TN-3AE(Y)/T10290N(K)+2

Hartzell Model HC-B3TN-3AE(Y)/T10290N(K)+2 propeller installations will be inspected in accordance with the latest revision of Hartzell Propeller Owner's Manual 139, Section 5, 6 and 7.

8.4 Engine Trend Monitor System (Optional, Ultra Flightline Engine Indicators Only)

The ETMS will be inspected in accordance with Checkpoint ETMS Operators Guide 7200-003, Revision E (or later approved revision), Section 3.

9. Troubleshooting

Aircraft modified per this STC should be subject to the troubleshooting criteria outlined by the latest revision of the following documents:

9.1 Engine

The engine will be subject to troubleshooting in accordance with the latest revision of Pratt & Whitney Maintenance Manual 3021442, Section 72-00-00.

9.2 Propeller

9.2.1 Hartzell Model HC-E4N-3P/D9900(K)

Hartzell Model HC-E3N-3P/D9900(K) installations will be subject to troubleshooting in accordance with the latest revision of Hartzell Propeller Owner's Manual 149, Section 4-Testing and Troubleshooting.

9.2.2 Hartzell Model HC-B3TN-3AE(Y)/T10290N(K)+2

Hartzell Model HC-B3TN-3AE(Y)/T10290N(K)+2 propeller installations will be inspected in accordance with the latest revision of Hartzell Propeller Owner's Manual 139, Section 5, 6 and 7.

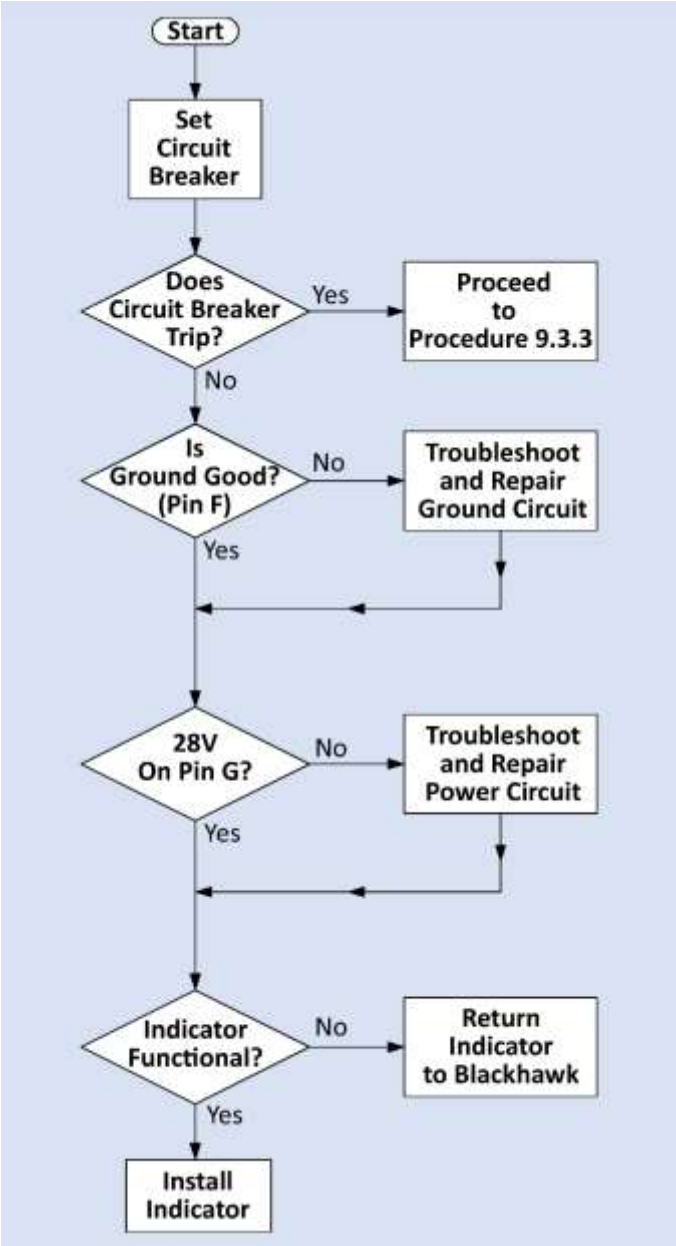
9.3 Engine Indicators

Note

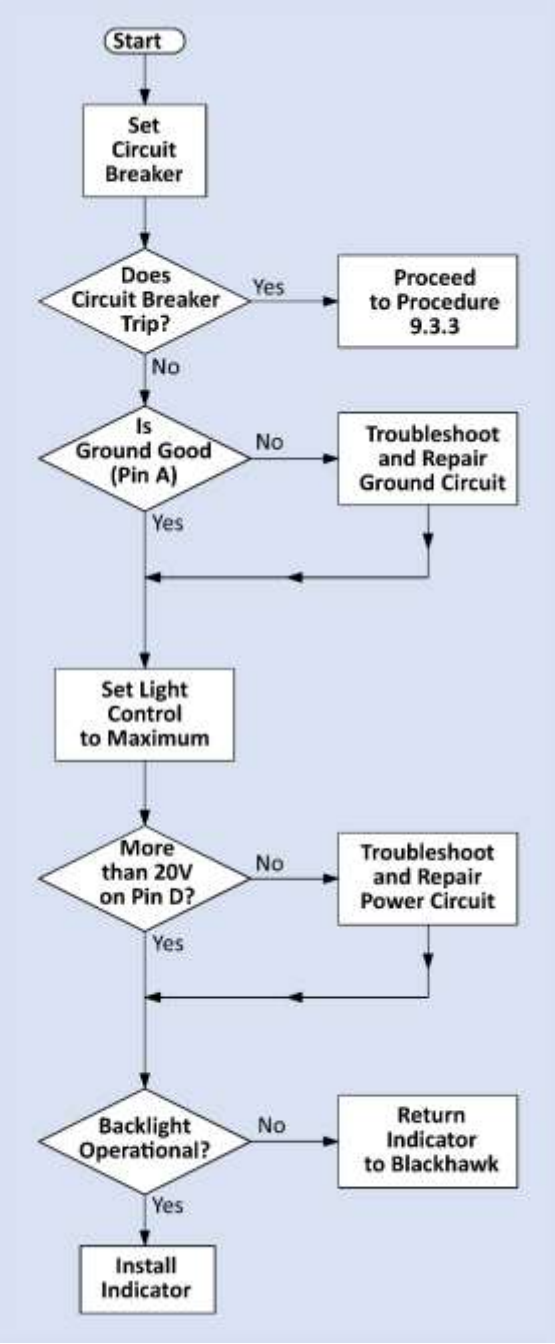
All Howell engine indicators are sealed, cannot be repaired in the field, and should not be opened. If an indicator malfunctions, it should be returned to Blackhawk Modifications for repair and certification. Opening a Howell engine indicator violates and nullifies the component warranty.

	Failure Description	Troubleshooting Action or Procedure	Page
1)	Error Codes	If any error code appears with an indicator, as defined in Section 3.5, return the instrument to Blackhawk for evaluation.	-
2)	Power		
	a) Inoperative Indicator	See procedure 9.3.1	28
	b) Inoperative Indicator Lighting	See procedure 9.3.2	29
	c) Circuit Breaker Trip	See procedure 9.3.3	30
3)	Sensor Out of Expected Range Display	Troubleshoot sensor in accordance with original Maintenance Manual procedures. If transducer checks out, return indicator to Blackhawk.	-
4)	Moisture in Indicator	Return the indicator to Blackhawk	-

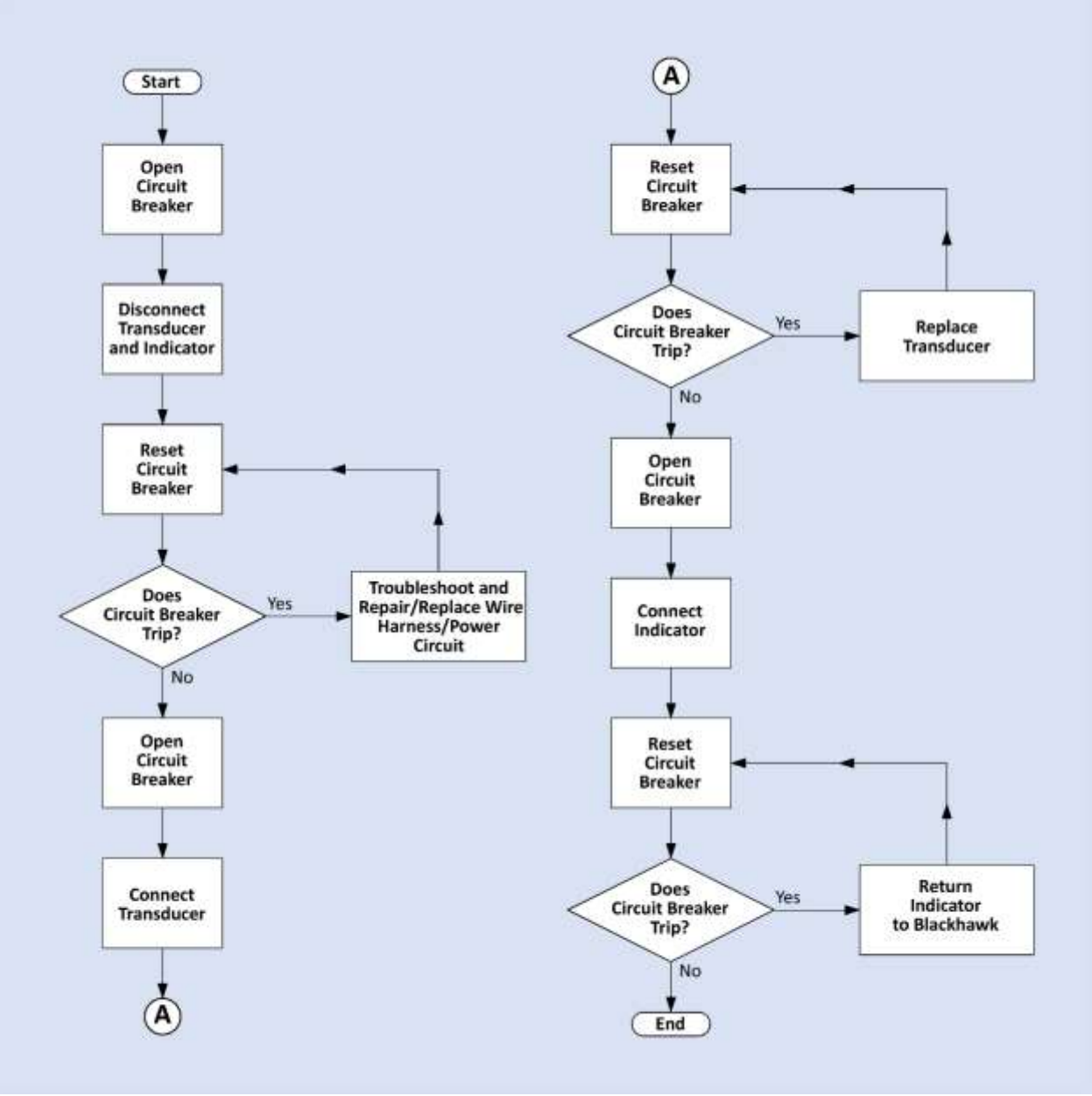
Procedure 9.3.1 Inoperative Indicator



Procedure 9.3.2 Inoperative Indicator Lighting



Procedure 9.3.3 Circuit Breaker Trip



9.4 Engine Trend Monitor System (Optional, Ultra Flightline Engine Indicators Only)

The ETM system will be subject to troubleshooting in accordance with Checkpoint ETMS Operators Guide 7200-003, Revision E (or later approved revision), Section 3-System Troubleshooting.

10. Removal and Replacement

All standard components and parts that have not been replaced or altered per installation of this STC shall be removed and replaced in accordance with the following documents:

a) Airframe: The latest revision of Cessna Aircraft Company Maintenance Manual D2078.

b) Engine: The latest revision of Pratt & Whitney Maintenance Manual 3021442

c) Propeller:

1) For Model HC-E4N-3P/D9900(K) propeller, the latest revision of Hartzell Propeller Owner's Manual 149

2) For Model HC-B3TN-3AE(Y)/T10290N(K)+2 propeller, the latest revision of Hartzell Propeller Owner's Manual 139.

d) Blackhawk STC SA01805SE Installed Components

1) Installation Instructions, Document No. 201201-001, Rev. C, Dated 1/17/2014, or later approved revision.

2) Engine Installation, Drawing No. 201201-002, Rev. IR, Dated 11/30/2012, or later approved revision.

3) Engine Indicator Installation, Drawing No. 201201-003, Rev. A, Dated 2/6/2013, or later approved revision.

4) Propeller Installation and Propeller De-icing, Drawing No. 201201-004, Rev. A, Dated 2/15/2013, or later approved revision for Model HC-E4N-3P/D9900(K). Drawing No.201201-009, Rev IR, Dated 07/10/13, or later approved revision for the Hartzell Model HC-B3TN-3AE(Y)/T10290N(K)+2.

5) Cowling/Inlet Installation, Drawing No. 201201-005, Rev. IR, Dated 11/30/2012, or later approved revision.

6) Engine Trend Monitoring System, Drawing No. 201201-006, Rev. A, Dated 02/11/2013, or later approved revision.

7) Overspeed Governor Alteration, Document No. 201201-007, Rev. IR, Dated 11/30/2012, or later approved revision.

8) Engine Rigging Procedures, Document No. 201201-800, Rev. B, Dated Feb, 2014, or later approved revision.

Replacement parts can be found in the applicable Blackhawk documents listed above. Wiring diagrams required for maintaining or repairing electrical wiring are also included in the documents listed above.

11. Recommended Time Between Overhaul

Engines..... See Pratt & Whitney Service Bulletin No 3003 latest revision

Propellers .....See Hartzell Service Letter HC-SL-61-61Y latest revision

12. Airworthiness Limitations

Notice

The Airworthiness Limitations Section is FAA approved and specifies maintenance required under §43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

Airframe

This STC does not change or replace any requirements in the latest revision of the Cessna Maintenance Manual D2078, Chapter 4 Airworthiness Limitations Section.

Engine

All airworthiness limitations associated with the Pratt & Whitney PT6A-42A engine installed under this STC are defined in the latest revision of Pratt & Whitney Maintenance Manual 3021442, under the Airworthiness Limitations Section.

Propeller

- All airworthiness limitations associated with the Hartzell HC-E4N-3P/D9900(K) propeller installed under this STC are defined in the latest revision of Hartzell Propeller Owner's Manual 149, under the Airworthiness Limitations Section.
- All airworthiness limitations associated with the Hartzell HC-B3TN-3AE(Y)/T10290N(K)+2 propeller installed under this STC are defined in the latest revision of the Hartzell Propeller Owner's Manual 139, under the Airworthiness limitations Section.

13. Assistance

For questions or assistance of any matter concerning this STC installation or operation contact Blackhawk Modifications Product & Customer Support Department at:

Blackhawk Modifications, Inc.
7601 Karl May Drive
Waco, Texas, USA 7670

Phone: +1 254 755 6711
Email: Customer.service@blackhawk.aero
Web: www.blackhawk.aero

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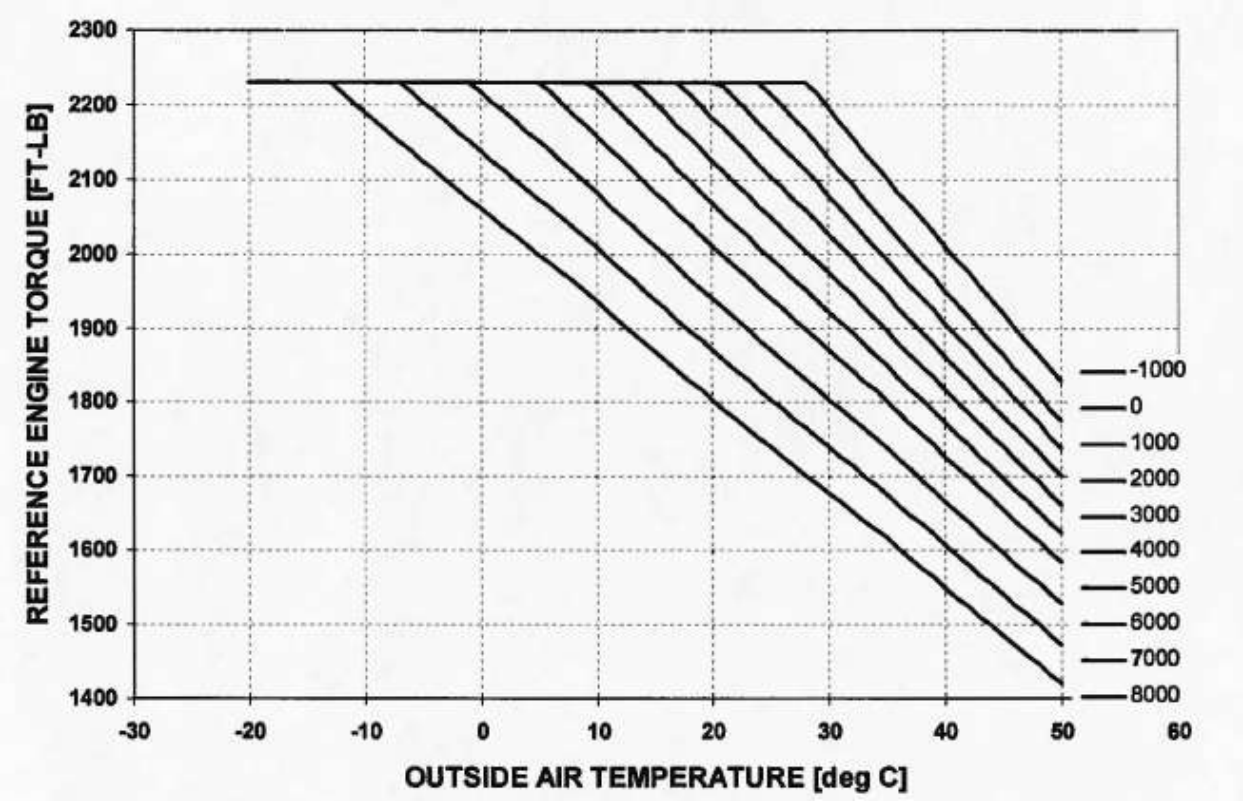
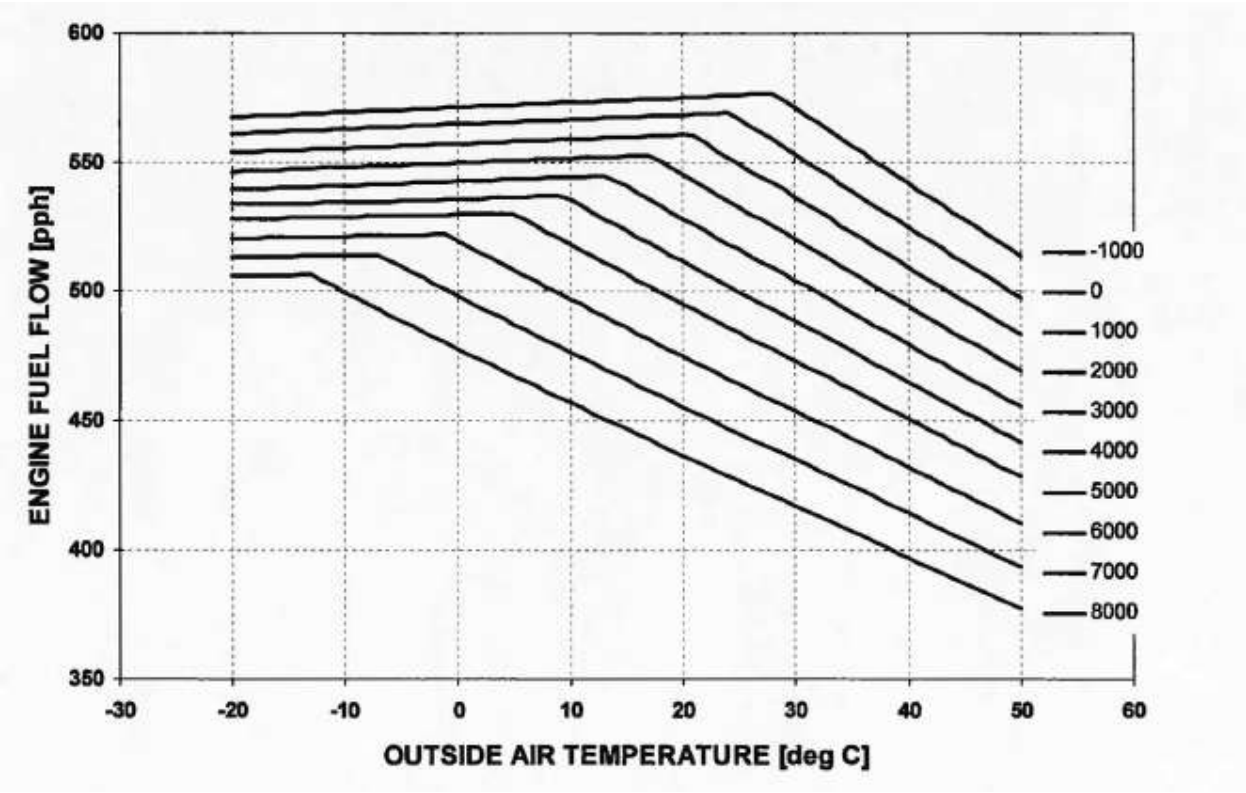
Appendix A

Table I – Ground Performance Record

Outside Air Temperature (IOAT) (°C)			
Pressure Altitude (ft)			
		Target Values	**Engine Indication**
Torque (TQ) (ft-lb)			
Propeller Rotational Speed (NP) RPM			
Interstage Turbine Temperature (ITT) (°C)			
Gas Generator Rotational Speed (NG) (%)			
Oil Temperature (OIL) (°C)			
Oil Pressure (OIL) (psi)			
Fuel Flow (FF) (lb/hr)			

Ground Performance Chart





Ground Performance Chart (cont'd)