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Instructions for Continued Airworthiness

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REFERENCES

The following documents form a part of this report. Unless a specific revision of one of these documents is specified, the revision in effect at the time of original issue of this document shall apply.

Industry Specifications and Standards:

1. MMPDS-09 Metallic Materials Properties Development and Standardization
2. AC 43.13-1B Aircraft Inspection, Repair & Alterations
3. Aurora Bearing Technical Data Index

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

Autopilot	Trio Pro Pilot Autopilot
C.G.	Center of Gravity
ER	Engineering Record
FAA	Federal Aviation Administration
ICA	Instructions for Continued Airworthiness
LH	Left Hand
OEM	Original Equipment Manufacturer
OTBD	Outboard
PCS	Pilot Controlled Steering (CWS – Control Wheel Steering)
RH	Right Hand
Servo	Trio Gold Standard Servo
STC	Supplemental Type Certificate
WS	Wing Station

Chapter 01: Introduction

These Instructions for Continued Airworthiness, ICA, provide guidance necessary for authorized personnel to inspect and maintain the Trio Pro Pilot Autopilot system. This document should be printed and included with the aircraft Instructions for Continued Airworthiness and arranged for easy and practical use.

It should be noted that many of the maintenance tasks and inspections included in this manual do not meet the definition of preventative maintenance and therefore require FAA certification to perform. Users of this manual should refer to 14 CFR Part 43 to ensure that they hold the required credentials to legally perform maintenance on a FAA certified aircraft.

Accomplishment of this modification does not change the existing maintenance instructions or inspections required for the aircraft. All procedures and inspections included in the applicable aircraft manuals are not affected by this modification.

If a malfunction of the autopilot is experienced contact an authorized repair facility.

Chapter 02: Description

The Trio Avionics Pro Pilot is a two-axis autopilot that includes the following components:

Autopilot Controller

- EITHER: 10000000 Instrument Mount
- OR: 20000000 Panel Mount

Autopilot Servos

- 30000000 Standard Servo - Clockwise Rotation
- 31000000 Standard Servo - Counterclockwise Rotation
- 30010000 Capstan Servo – Clockwise Rotation
- 31010000 Capstan Servo – Counterclockwise Rotation

Additional Components

- 41000000 Wire Harness Assembly
- 44100000 Wiring Accessory Kit, Instrument Mount
- 44200000 Wiring Accessory Kit, Panel Mount
- P7-3A1126 Pushbutton Switch (Recover)
- P7-3A1221 Pushbutton Switch (Red / PCS)
- 7274-2-5 Circuit Breaker
- MS35058-22 Toggle Switch
- 1006451-1 Panel Labels
- 1006450-1 Autopilot Limitations Placard

Servo installations require installation of The STC Group Avionics Upgrade Provisions kit. Installation of the autopilot controller, servos, wire harness assembly, Red (PCS) and Recover pushbutton switches, circuit breaker, panel labels, and AP limitations placard is mandatory under this approval.

When installing panel mount autopilot controller, the installation of the MS35058-22 toggle switch and tray is mandatory.

The Trio Pro Pilot system-wide power requirement is 6.3 watts typical and 38.4 watts maximum, and can run on 12.5 - 28 volts. On a 12-volt system, this translates to about 2.8 amps of maximum current draw. On a 24-volt system, this translates to about 0.93 amps maximum current draw.

Chapter 04: Airworthiness Limitations

The Airworthiness Limitations Section is FAA approved and specifies maintenance required under 14 CFR 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

The following limitations apply to the installation approved by:

There are no special airworthiness limitations associated with or affected by this approval.

FAA Approved
Timothy Smyth
Manager, Chicago Aircraft Certification Office

Chapter 05: Recommended Inspection Practices

Except for the Airworthiness Limitations specified in Section 4 of this manual, the components constituting Trio Pro Pilot autopilot have no specified maintenance periods. All maintenance is on-condition.

At each aircraft annual/100-hour inspection a properly certified mechanic must perform all inspections (TASKS) listed in this Chapter.

The Trio Pro Pilot controller, pitch servo and roll servo have no field serviceable components. All components must be serviced by qualified and trained personnel. If a component of the autopilot malfunctions, contact an FAA authorized facility for repair or replacement of the malfunctioning component.

TASK 05-01 Basic Autopilot Operation

1. Complete operating instructions for the Trio Pro Pilot autopilot can be found in the Operating Manual on the Compact Disk (CD) provided with the autopilot system.
2. The ON/OFF switch, refer to Figure 6-1, for the instrument mount autopilot controller, applies aircraft power to the Pro Pilot.
3. In the OFF position, the Pro Pilot is disconnected from the aircraft control system.
4. Upon power up, the display presents a logo and the current Pro Pilot firmware code version (or a customized screen) and sets several default conditions:
   4.1. Display the un-calibrated field elevation in feet as shown in Figure 5-1.

FIGURE 5-1 UNCALIBRATED FIELD ELEVATION SCREEN ON POWER UP

   4.2. This value must be adjusted to agree with the primary aircraft altimeter.
5. PRESS the ENCODER KNOB to set this value and enter normal operation.
6. Initially, with GPS data available, the TRK (Track) mode is selected and the TRK LED is illuminated. This mode is not operational until valid GPS data is available. When GPS is unavailable for seven seconds, or after initial power up before the GPS receiver has acquired satellite lock, the display will default to a flashing "NO GPS" message.
7. The autopilot may be powered off by moving the front panel power switch down to the OFF position.

TASK 05-02 Operational Check

1. Turn on the autopilot by energizing the aircraft power to which the autopilot is connected.
2. Turn on the autopilot front panel power switch.
3. Ensure that the screen is bright and readable and that all instrument displays appear.
4. Move the aircraft controls through their full range of travel and verify that the servo clutches are not engaged.
5. Power on the servos by PRESSING the H NAV and V NAV buttons and verify that the servo LEDs are illuminated.
6. Turn off the H NAV and V NAV servos by quickly PRESSING the PCS button and observe that the H NAV and V NAV LEDs extinguish.

TASK 05-03 H NAV Operational Check

1. Use the following procedure to verify proper roll servo operation.
2. These procedures are performed on the ground with the engine off.
3. Attach a calibrated force scale to the control yoke as shown in Figure 5-2.
4. The method of attachment will depend on the force scale used. Shown below is a Nextech DFS 500 Force Scale attached to the control yoke using a cable tie. A spring scale or other type of force scales may be used.
5. Master power on.
6. Autopilot power on.
7. Neutralize control yoke.
8. Zero Force Gauge.
9. Verify that H NAV function is operational by PRESSING H NAV button to engage roll servo.
10. Depending on control yoke width, apply 3.0 pounds (+12 / -1 pounds) of force by pulling down on the force gauge to override the roll servo and verify proper slip clutch operation in the roll axis. Refer to Figure 5-2.

FIGURE 5-2 ROLL SERVO FORCE GAUGE MEASUREMENT (NEXTECH DFS500 FORCE GAUGE SHOWN)

11. When 3.0 pounds (+12 / - 1 pounds) of force have been applied to the yoke the autopilot screen will display Clutch Slip.
12. Release force on the control yoke.
13. Verify control yoke returns to neutral position.
14. Perform test in both Left and Right roll axes.
15. PRESS PCS button momentarily to release the servo and verify aircraft controls are free and correct and servo disconnect tone is heard in the audio system.

Note:

If any of the above tests fail to perform as listed contact an authorized repair facility.

TASK 05-04 Navigation Checks

1. If the aircraft is equipped with a rack mount or portable GPS place the aircraft in a position to receive a GPS signal from the GPS satellite system. Wait for the GPS system to achieve satellite lock.
2. Verify the NO GPS message on the control unit is removed and now displays the serial data information from the GPS
3. Enter a GOTO waypoint or flight plan in the GPS navigator.
4. BTW (bearing to waypoint) should appear in the upper left field of the display screen.
5. GTK (ground track) should appear in the lower left field of the display screen.
6. If the aircraft has a panel mounted WAAS GPS receiver the GPSS LED on the autopilot controller will be flashing at a one second rate.
7. PRESS the H MODE button to select CRS (course) mode. The CRS LED will illuminate.
8. Verify that CMD is displayed in the upper left side of the screen.

9. The lower left field will display GTK.
10. PRESS the H MODE button one time and verify that the TRK LED illuminates.
11. PRESS the RECOVER button for at least one (1) second.
12. Both servos will engage.
13. The autopilot screen will display RECOVER in the upper right display field.
14. Verify that the autopilot is in CRS (course mode).
15. Verify that the ALT HLD LED is illuminated.

TASK 05-05 V NAV Operational Check

1. Use the following procedure to verify proper pitch servo operation.
2. These procedures are performed on the ground with the engine off.
3. Attach a calibrated force scale to the control yoke as shown in Figure 5-3.
4. The method of attachment will depend on the force scale used. Shown below is a Nextech DFS500 Force Scale attached to the control yoke using a cable tie. A spring scale or other types of force scales may be used.
5. Master power on.
6. Autopilot power on.
7. Using the force gauge move the elevator to the neutral position.
8. Record the force required to move the elevator to the neutral position.
9. Engage the V NAV servo.
10. Apply an additional 10 pounds, + / - 2 pounds, of force to the control yoke in the pitch up position to verify proper slip clutch operation. Refer to Figure 5-4.

FIGURE 5-3 ELEVATOR HELD IN NEUTRAL POSITION USING FORCE GAUGE

11. When an additional 10 pounds, + / - 2 pounds, of force have been applied to the control yoke the autopilot screen will display a Clutch Slip message. You may also hear the pitch servo clutch slipping in some aircraft.

FIGURE 5-4 FORCE GAUGE USED TO OVERRIDE V NAV SERVO

12. Verify that the elevator control surface moves in the proper direction.
13. Gently release the force on the control yoke to allow the control yoke to return to the neutral position.
14. You will also observe that the V NAV servo will attempt to return the control yoke to the neutral position.
15. PRESS PCS button momentarily to release servo and verify the aircraft controls are free servo disconnect tone is heard in the audio system.

Note:

If any of these tests fail to perform as listed contact an authorized repair facility.

TASK 05-06 Cleaning

The front bezel of the autopilot controller should be cleaned with a dry, soft cotton cloth. No solvents or cleaning solutions should be used. Inspect the servo installation for damaged, missing or loose fasteners.

TASK 05-07 Pitch and Roll Servo Installation Inspection

1. Inspect all wiring harnesses for anchor security and chafing on structure.
2. Inspect the servo DB9 connectors and verify that they are securely connected.

TASK 05-08 Inspection of Servo Bracketry and Linkage

1. Inspect the servo arm, or capstan, for uninhibited full and free motion with full travel of the control surfaces from primary stop to stop. Inspect servo mounting brackets for security and looseness of attaching hardware.

2. Any looseness resulting from vibration, material fretting, or cracking of mounting brackets or airframe structure must be noted and reported to The STC Group LLC for structural disposition prior to return to service.
3. For push pull tube installations, inspect all push pull tubes for contact of surrounding structure throughout full motion of the control surfaces. Any contact must be noted and reported to The STC Group LLC for disposition prior to return to service.
4. For push pull installation, inspect for any unusual wear patterns, ~~,~~corrosion, and/or damage (scratches, nicks, and dents).
5. For capstan installations, inspect the drum, bridle cable, bridle cable retainer, cable clamps and supporting hardware for improper installation, apparent defects, and unsatisfactory operation throughout full motion of control surfaces. Examine bridle cable runs for incorrect routing, fraying, twisting, or wear at clamps, drum, and guards. Look for interference with adjacent structure, equipment, wiring, plumbing, and other controls. Inspect bridle cables for binding, full travel, and security of attaching hardware. Bridle cable tensions are 15 +/- 2 pounds. See Table 1 for damage limitations.
6. If any damage is noted during inspection, refer to Table 1 for damage and repair limits.
7. Inspect all rod end fasteners for galling, corrosion, bending, debris, looseness, loss of locking cotter pins, or excessive play. If the above components are damaged contact an authorized repair facility for repair or replacement instructions.
8. Inspect rod ends for free motion, misalignment, brinelling (rolling element indents the surface of the race), corrosion, debris (pitting), lubrication failure (annealing from excessive heat), stretching, breakage, bearing ball pushout, or fretting corrosion due to vibration which will cause excessive play.
9. Replace any binding or excessively loose rod-end with equivalent part (Aurora Bearing p/n MM3 rod ends are installed for the roll servo & aileron bellcrank assembly. MM4 rod ends are installed for the elevator idler bellcrank and pitch servo assembly).
10. Lubricate all rod-ends with Mobilux EP2 Lithium Extreme Pressure grease, or equivalent extreme pressure grease.

Note:

Trio Pro Pilot aluminum components were treated with a gold anodic treatment per MIL-A-8625 TYPE II OR BETTER when manufactured and should give maintenance free service for many years. Indications of corrosion are (1) corrosion deposits indicated by white or gray powder on aluminum or rust colored deposits on steel, (2) pits in the aluminum or steel surface, (3) blisters bulging or flaking of protective coatings.

TASK 05-09 Wiring

1. Repair of wiring is allowed per Table 1.
2. Whenever it becomes necessary to repair or replace a wire or group of wire maintain the same wire separation that was used to install the system.
3. Any wire added to or removed from the aircraft should satisfy separation requirements and wiring standards in accordance with FAA Advisory Circular AC43.13-1B, Chapter 11, Section 8, Paragraphs 11-96(w), (z), and (dd).
4. Whenever it becomes necessary to repair or replace a wire or group of wire maintain the same routing that was used to install the system using proper bend radius, drip loops, and slack to allow for easy access for maintenance repairs and inspection and in such a manner that it does not violate any regulatory safety requirements and wiring standards in accordance with FAA Advisory Circular AC43.13-1B.
5. Whenever it becomes necessary to repair or replace a wire or group of wire clamps of the proper size, type, and material should be used.
6. When stripping wire for termination, be sure not to nick or cut strands of wire.
7. Use the proper tools. Be sure tools are set to proper setting for the crimp.
8. Use shrink tubing of the proper size. AC43.13-1B.
9. Install clamps in the same location as the original installation.

TASK 05-10 Servicing

1. Rod ends should be lubricated at each 12 calendar months or at the annual inspection period with Mobilux EP 2 or and equivalent Lithium Extreme Pressure grease.
2. Servos with or without capstan assemblies should not be lubricated.

TASK 05-11 Inspection of the PCS Button

1. Disconnect the aircraft battery.
2. Inspect the PCS Button for structural security to the switch mounting bracket.
3. Inspect the PCS Button for proper button color (Red)
4. Inspect the switch wire harness attachment to the switch wire terminal for wire breakage, corrosions, and wire strain relief.
5. Reconnect the aircraft battery.

TASK 05-12 Aircraft Placards

At each 100 / annual inspection a certificated mechanic must ensure that the Limitations Placard, The STC Group LLC Part Number 1006450-1, is installed on the instrument panel in the pilot's primary field of view and must be legible.

Table 1. Damage and Repair Limits

Maximum Allowable Damage and Repair Limits Damage and corrosion may be repaired as noted if it does not exceed the limits in this table. If replacement components are required contact an authorized facility for repair or replacement components.			
Component	**Scratches / Nicks / Dents / Corrosion**	**Cracks**	**Fraying**
Aluminum	**Depth:** Up to 10% of original part thickness **Area**: Up to 20% of part surface area	None	N/A
Wiring	N/A	None	None allowed. Repair, as necessary.
Push Pull Tubes	None	None	None
Bridle Cables	None	None	None allowed. Repair, as necessary.

Chapter 06: Trio Pro Pilot Autopilot Removal, Installation, & Configuration

FIGURE 6-1 INSTRUMENT MOUNT CONTROLLER FRONT VIEW

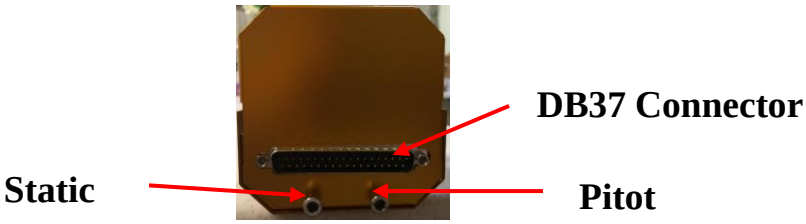

FIGURE 6-2 INSTRUMENT MOUNT CONTROLLER REAR VIEW

TASK 06-01 Record Autopilot Servo Gain Settings

1. Before the autopilot controller is removed the autopilot gain settings for the specific aircraft must be recorded.
2. Use the following procedure to record the autopilot gain settings:
   - 2.1. Power on the autopilot by moving the front panel power switch up to the ON position.
   - 2.2. The field elevation screen will appear.
   - 2.3. PRESS the ENCODER KNOB to set this value and enter normal operation.
   - 2.4. Simultaneously PRESS and HOLD the V MODE button and the ENCODER knob for at least three (3) seconds until the MAINTENANCE screen appears then release the buttons and knob.
   - 2.5. Turn the ENCODER knob clockwise until the V NAV GAIN SETS screen appears.
   - 2.6. Record the AH gain, VS gain, and AS gain.
   - 2.7. Turn the ENCODER knob clockwise until the SET SERVO GAINS screen appears.
   - 2.8. Record the H NAV and V NAV servo gains.
   - 2.9. Turn the ENCODER knob clockwise until the SET H NAV GAIN screen appears.
   - 2.10. Record the TRK gain, CRS gain, and PI gain.
   - 2.11. Shut down aircraft power and disconnect the aircraft battery.

TASK 06-02 Removal of Instrument Mount Autopilot Controller

1. Shut down the aircraft power and disconnect the aircraft battery.
2. Remove the four instrument retention screws shown in Figure 6-1.
3. Loosen the DB37 connector screws on the rear of the controller. Refer to Figure 6-2.
4. Mark the pitot and static lines for identification. Refer to Figure 6-2.
5. Remove the pitot and static lines and cap to seal the lines and prevent contamination from entering the lines.
6. Secure the pitot and static lines and the wiring harness clear of any moving controls or electrical power sources.
7. Remove the autopilot controller from aircraft.

TASK 06-03 Autopilot Instrument Mount Controller Installation

1. Insert pitot and static lines onto the correct fittings. Refer to Figure 6-2.
2. Check that the pitot and static lines are a tight fit around their fittings.
3. Connect the DB37 securely to the back of the autopilot controller. Do not overtighten.
4. Return the autopilot controller it's original instrument panel location.
5. Reinstall the autopilot controller using the screws that were removed.
6. Check screws for wear and replace if necessary using MS24693-BB26 screws or equivalent.
7. Perform static system check per 14 CFR 91.411.
8. Connect the aircraft battery.
9. Perform Task 06-04, Autopilot Configuration, and Task 06-05, Operational Check.

TASK 06-04 Autopilot Configuration

1. Power ON the autopilot.
2. The field elevation screen will appear.
3. PRESS the ENCODER KNOB to cycle past the field elevation screen.
4. Simultaneously PRESS and hold the V MODE button and the ENCODER knob for at least three (3) seconds until the MAINTENANCE screen appears then release the buttons.
5. Turn the ENCODER knob clockwise until the V NAV GAIN SETS screen appears.
6. PRESS the H MODE button. An arrow will appear next to the AH gain setting.
7. Enter the AH gain recorded above by turning the ENCODER knob.
8. PRESS the H MODE button to cycle to the VS gain.
9. Enter the VS gain setting recorded above by turning the ENCODER knob.
10. PRESS the H MODE button to cycle to the AS gain.

11. Enter the AS gain setting recorded above by turning the ENCODER knob.
12. PRESS the H MODE button. The arrow will disappear.
13. Turn the ENCODER knob clockwise until the SET SERVO GAINS screen appears.
14. PRESS the H MODE button to activate the arrow.
15. Enter the H NAV servo gain to the value recorded in TASK 06-02 above.
16. PRESS the H MODE button to cycle to the V NAV gain setting.
17. Enter the V NAV gain setting recorded in TASK 06-02 above.
18. PRESS the H MODE button and the arrow will disappear.
19. Turn the ENCODER knob clockwise until the SET H NAV GAIN screen appears.
20. PRESS the H MODE button to activate the arrow.
21. Enter the TRK gain setting recorded in TASK 06-02 above.
22. PRESS the H MODE button to cycle to CRS.
23. Enter the CRS gain setting recorded in TASK 06-02 above.
24. PRESS the H MODE button to cycle to PI.
25. Enter the PI gain setting recorded in TASK 06-02 above.
26. PRESS the H MODE button and the arrow will disappear.
27. If this task was accomplished because of performance degradation, then reset defaults and restore previously recorded settings.
28. Turn the autopilot off.

Task 06-05 Autopilot Operational Check post installation for return to service

1. Power on the autopilot.
2. Enter the current field elevation.
3. Center the controls yoke in the wings level (neutral) position.
4. Engage the H NAV and V NAV servos
5. Verify that the H NAV and V NAV servo LEDs are illuminated.
6. Override the H NAV servo by turning the control yoke to the left.
7. Verify that the left aileron moves in the proper direction.
8. Release the control yoke and verify that the control yoke and ailerons return to neutral position.
9. Override the H NAV servo by turning the control yoke to the right.
10. Verify that the right aileron moves in the proper direction.
11. Release the control yoke and verify that the control yoke and ailerons return to neutral position.
12. Place the control yoke in the neutral elevator position.
13. Pull back slightly to override the V NAV servo.
14. Verify that the elevator moves in the proper direction.

15. Observe that the V NAV servo will attempt to push the flight controls to the level flight position.
16. Push forward slightly to override the V NAV servo.
17. Verify that the elevator moves in the proper direction.
18. Observe that the V NAV servo will attempt to push the flight controls to the level flight position.
19. Disengage servos by pressing the H NAV and V NAV buttons.
20. Observe the H NAV and V NAV servo LEDs extinguish and that three beeps are heard.
21. Update logbook and maintenance records per 14 CFR 91.405 (Return to Service), 91.417, and 14 CFR 43.9.

TASK 06-06 Removal of Rack Mount Autopilot Controller

FIGURE 6-3 RACK MOUNT CONTROLLER FRONT VIEW

FIGURE 6-4 RACK MOUNT CONTROLLER REAR VIEW

1. Before removing the unit record the servos gain following the procedure in TASK 06-02 above.
2. Shut down aircraft power and disconnect the aircraft battery.
3. Using a 1/16” hex key (1.5mm) loosen the autopilot controller locking screw while gently pulling on the unit to assist with removal.
4. Loosen the DB37 connector screws on the rear of the controller. Refer to Figure 6-2.
5. Mark the pitot and static lines for identification. Refer to Figure 6-2.
6. Remove the pitot and static lines and cap to seal the lines and prevent contamination from entering the lines.
7. Secure the pitot and static lines and the wiring harness clear of any moving controls or electrical power sources.
8. Remove the autopilot controller from aircraft.

TASK 06-07 Installation of Rack Mount Autopilot Controller

1. Shut down aircraft power and disconnect the aircraft battery.
2. Connect the DB37 securely to the back of the autopilot controller. Do not overtighten.
3. Connect the pitot, and static lines to the autopilot controller.
4. Check that the pitot and static lines have a tight fit around their fittings.
5. Insert the autopilot controller into the sleeve.
6. Gently PRESS the autopilot controller into the sleeve while using a 1/16" hex key (1.5mm) to tighten the screw.
7. Connect the aircraft battery.
8. Follow the instructions in TASK 06-04 and Task 06-05 above.

TASK 06-08 Roll and Pitch Servo Removal

NOTE:

For capstan servos, If the locking pin cannot be inserted into the drum with the flight control centered +/- 1 degree of drum rotation (Read on Trio Controller > MAINTENANCE SETTINGS > V NAV SERVO SET), then contact The STC Group before removing the cable clamps and do not continue.

1. Disconnect the aircraft battery.
2. Remove the access panel for the servo to be removed. Refer to the servo installation locations depicted in Figures 7-1, 7-2, 7-3, and 7-4.
3. If the pitch servo must be removed from the Cessna 172 and 182 aircraft it can be accessed by removing the baggage compartment cover.
4. Take care not to disturb elevator and trim cables. Padding should be used for protection of aircraft structure and cables.
5. For push pull installations, disconnect the push pull tube from the servo arm by removing the cotter pin, nut, bolt, spacer, and washers.
6. For capstan installations, Center the applicable flight control, lock the flight control in this position, insert the capstan drum lock pin, then disconnect bridle cable and clamps from the primary control cable.
7. Inspect fasteners for condition.
8. Set these parts aside in a container.
9. Remove the fasteners securing the servo to the mounting plate or tray.
10. Inspect the fasteners and washers for condition, place them in the above container and store in a secure location for reuse.
11. Disconnect the DB9 connector from the servo.
12. Remove servo from aircraft.

TASK 06-09 Roll and Pitch Servo Installation

1. Disconnect the aircraft battery.
2. Install the servo in its original location using the fasteners that were removed.
3. Replace servo fasteners on condition with same or equivalent parts. MS27039-0807 preferred.
4. For push pull installations, connect the servo arm push pull tube using the fasteners, spacers, and washers that were removed.
5. For capstan installations, center the applicable flight control, lock the flight control in this position, connect the bridle cable/clamps, re-tension bridle cable, torque cable clamp bolts, and then remove the capstan drum lock pin. On some aircraft models it may be necessary to remove the drum lock pin before re- tensioning the cable clamps and in this case, follow the applicable installation instructions for installing the servo.
6. Connect the aircraft battery.
7. Perform TASKS 06-05 post installation Operational Checks.

Task 06-10 Wiring Harness Repair

Due to environmental, vibration, or as the aircraft ages it may become necessary to repair or replace a wire or group of wires. Before replacing wiring or other harness components contact an authorized repair facility for repair or replacement instructions.

When making repairs use the same wire used in the original wiring harness, and maintain the same wire separation that was used to install the autopilot wiring harness.

Any wire added to or removed from the autopilot wiring harness should satisfy separation requirements and wiring standards used in the original wiring harness installation.

TASK 06-11 Removal PCS Button

1. Disconnect the aircraft battery.
2. Note wire label markings and wire attachment points and remove connecting wire harness from the yoke.
3. Remove the switch mounting nut and washers and remove the switch.
4. Reconnect the aircraft battery.

TASK 06-12 Installation of the PCS Button (PCS) Button

1. Disconnect the aircraft battery.
2. Install the switch, mounting nut and washers, and tighten until secure from rotation.
3. Review previously noted wire label markings and wire attachment points and reconnect the wire harness.
4. Reconnect the aircraft battery.

TASK 06-13 Operational Check of the PCS Button

1. Power on the autopilot.
2. Engage the autopilot H NAV and V NAV servos by pressing the H NAV and V NAV buttons.
3. Confirm that the servos are engaged by noting illumination of the H NAV and V NAV LEDs.
4. Press the PCS button and confirm that the H NAV and V NAV lights go out indicating servo disconnect.
5. Three audible beeps will be heard through the aircraft audio system when the servos disconnect.
6. It is possible, in some cases, to hear the servos engage and disengage on the ground without the engine running.

Chapter 07: Typical Equipment Location

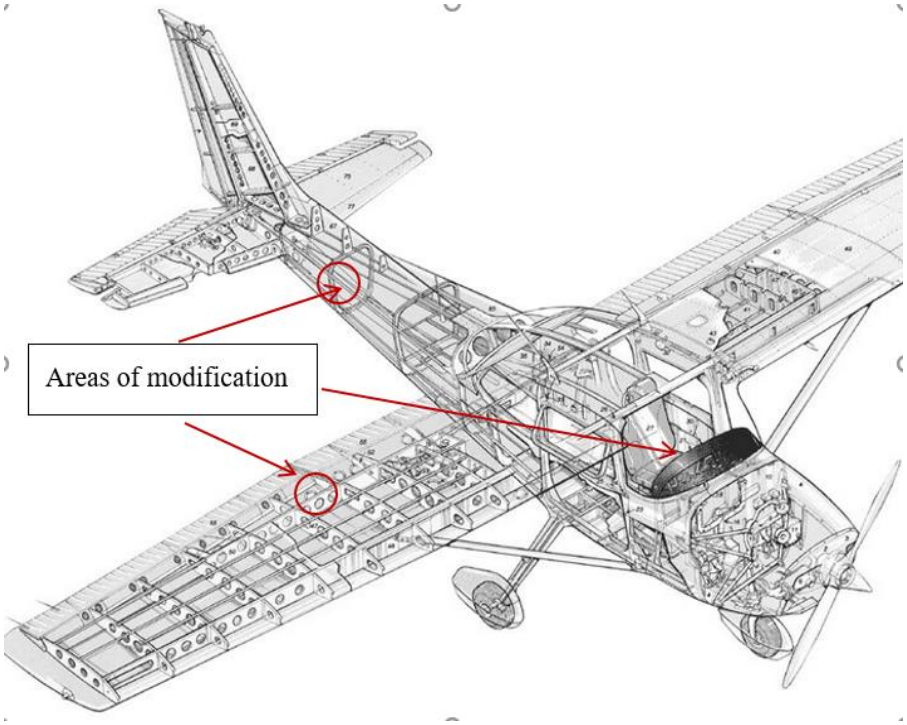

FIGURE 7-1 TYPICAL CESSNA 100 SERIES INSTALLATION

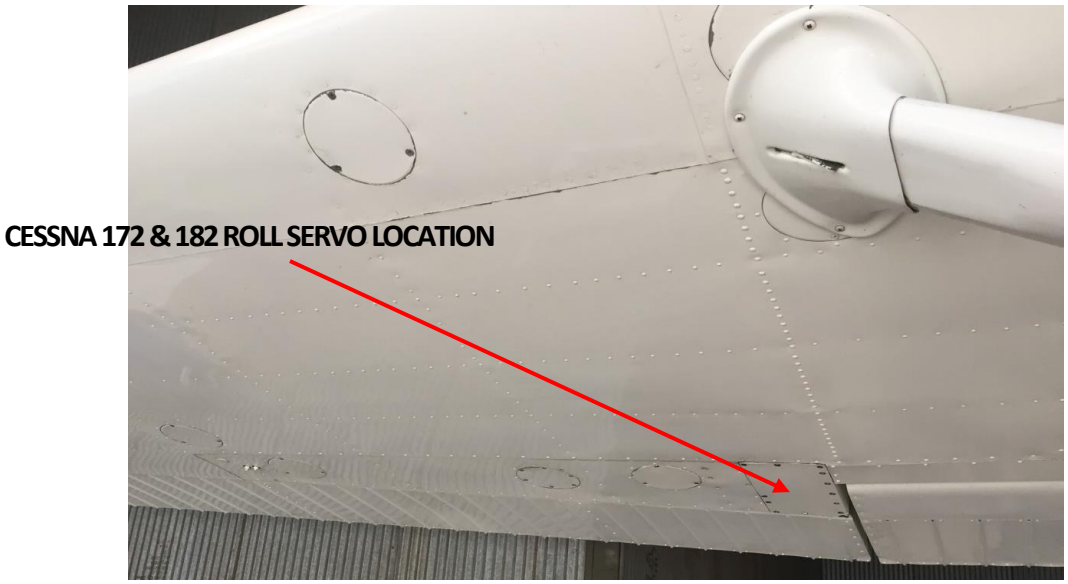

FIGURE 7-2 CESSNA 172 &182 ROLL SERVO LOCATION

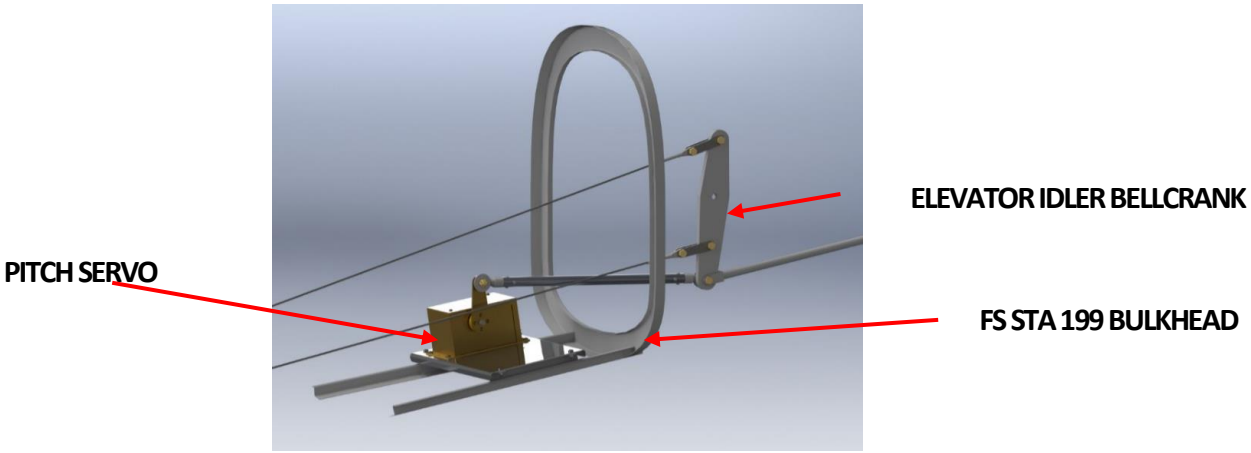

FIGURE 7-3 CESSNA 182 PITCH SERVO INSTALLATION LOCATION

ELEVATOR BELLCRANK

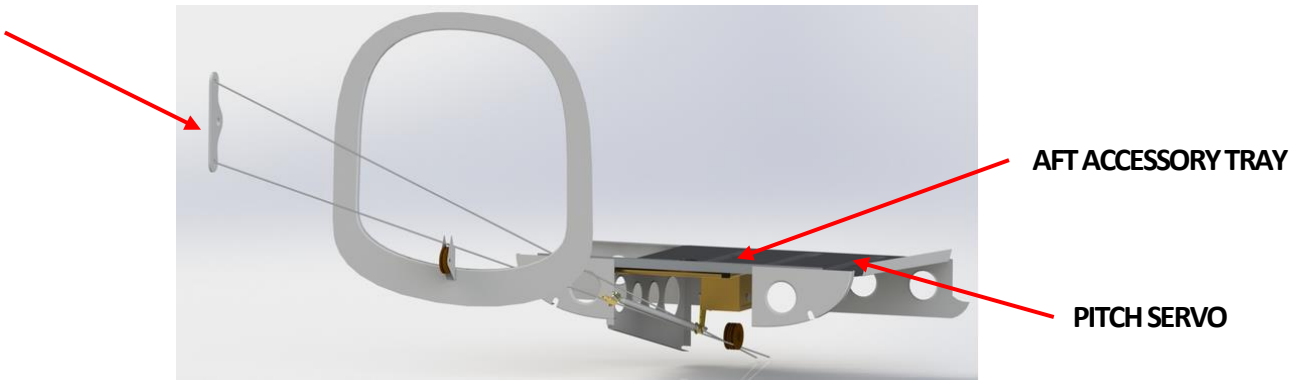

FIGURE 7-4 CESSNA 172 PITCH SERVO INSTALLATION LOCATION

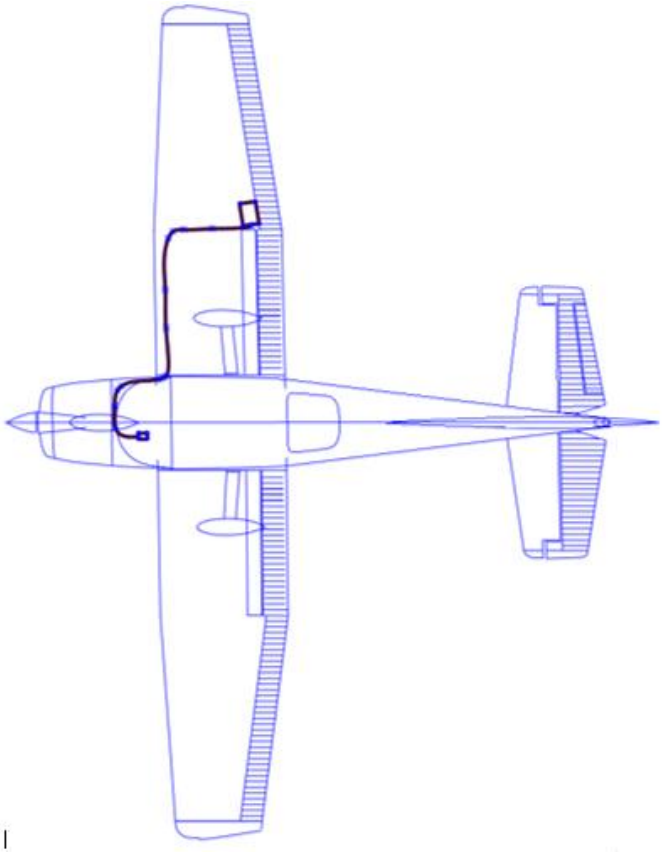

FIGURE 7-5 CESSNA 172 AND 182 ROLL SERVO WIRING HARNESS ROUTING

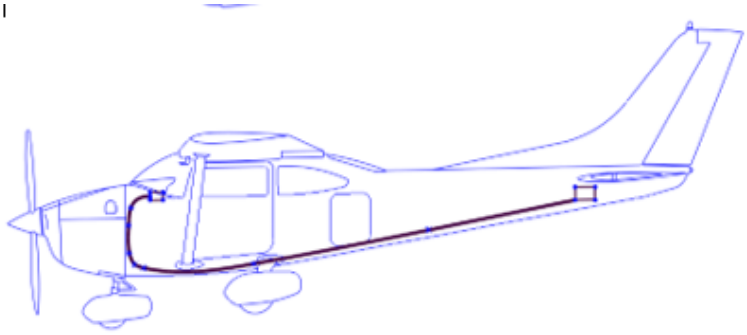

FIGURE 7-6 CESSNA 172 AND 182 PITCH SERVO WIRING HARNESS ROUTING

Chapter 08: Trio Pro Pilot Autopilot Placarding

Limitations placard, P/N 1006450-1 must be installed in clear view of the pilot as depicted in Figure 8-1.

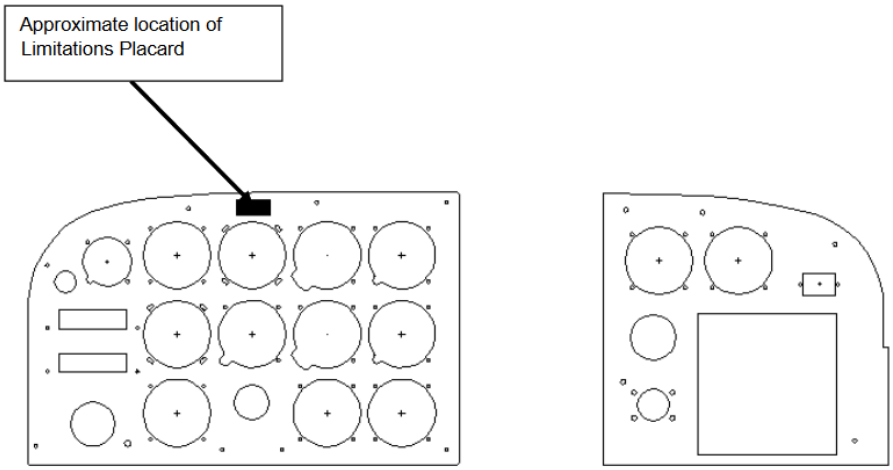

FIGURE 8-1 LOCATION OF AUTOPILOT LIMITATIONS PLACARD P/N 1006450-1

Chapter 09: Trio Pro Pilot Autopilot Troubleshooting

Introduction

The Trio Pro Pilot autopilot employs sensors to monitor proper operation in the control electronics and the servos. The autopilot should be powered up, but not engaged, as soon as possible after engine start to ensure sensor stabilization prior to flight. Power losses in flight of 5 minutes or less, pose no restrictions to the immediate use of the autopilot use after power is restored to the autopilot. Longer power loss periods may cause minor excursions in roll or pitch when the autopilot servo is re-energized. When an extended period of power loss is experienced in flight the autopilot should be powered up but not engaged for several minutes. This will allow sensor stabilization before the servos are engaged.

When the autopilot detects a problem, it will notify the pilot via messages on the display screen and, if appropriate, alert the pilot with an audible alarm.

Autopilot messages and alarms are denoted in the tables below.

The following tables list troubleshooting aids that can be performed to mitigate and/or diagnose a system anomaly or malfunction.

Alert Message	Description	Action Required
CLH SLIP	This message can appear in the upper left (H NAV) or upper right (VNAV) display field when the control system loads cause the servo slip clutch to activate. This is usually caused by an out of –trim condition or manually overriding the servo. A very short audible alarm is emitted to draw the pilot's attention to the display message.	Re-trim the aircraft to release the servo loading, or release the override pressure on the aircraft controls
TRIM UP Or TRIM DN	This message can appear in the lower left (H NAV) or lower right (VNAV) display field when the system senses a significant load on the servo. A very short audible alarm is emitted to draw the pilot's attention to the display message	Re-trim the aircraft to release the servo loading
VS ERR and ALT ERR	This can occur if a preselect altitude is input that is above the current altitude with a vertical rate that causes a descent. Similarly, if a preselect altitude is set below the current altitude and the vertical rate is for a climb the ERR message will be displayed. A very short audible alarm is emitted to draw the pilot's attention to the display message	Correct either the vertical rate or preselect altitude

Alert Message	Description	Action Required
SERVO IO ERROR	This message can appear in the left (H NAV) or right (VNAV) display fields when communications between the servo and the control head are no longer available. This can be caused by a fault in the control head, the servo, or the harness wiring and connection between these units. When this message occurs, all power is removed from the servo and the HNAV (VNAV) servo LED will flash until the HNAV or VNAV button is pressed. The servo disconnect tone (3 audible beeps) will be emitted when the servo disconnects from the control system.	The H NAV or VNAV button can be pressed to remove the fault message. The servo can then be re-engaged. If the message returns there may be a failure in the control head or servo. Contact an authorized facility for troubleshooting assistance.
NO GPS	This message can appear in the autopilot display top line if the serial data to the Pro Pilot becomes corrupted or reception of the GPS data from the GPS host is lost. If the blue GPSS LED is on the autopilot will continue to perform lateral navigation functions	Verify the GPS is still locked to the satellites. If so the GPS data on the autopilot should return within 14 seconds. If the normal data display does not return, check the RS-232 serial data bus wiring from the GPS to the autopilot system

System Failure	Description	Troubleshooting Procedure
One or both servos fail to disconnect via the yoke mounted PCS button	Momentarily pressing the yoke mounted servo disconnect button should release the both servos from the control system.	If both servos fail to disconnect suspect a failed disconnect button or wiring. In this case the servos can be disconnected using the front panel H NAV and V NAV buttons. If only one servo fails to disconnect this indicates an internal failure in either the servo or the control head. In this case power should be removed from the system and the suspect components removed for service
Servo does not activate when the H NAV or V NAV buttons are activated.	Momentarily pressing the H NAV and/or V NAV button should turn the servos ON/OFF.	If the H NAV or V NAV front panel LED flashes and the servos fail to engage after the servo is activated the probable fault is a defective servo disconnect button or grounded wire connected from the switch to the autopilot. If no fault can be found in the switch or wiring the control head should be removed for service.

System Failure	Description	Troubleshooting Procedure
Display flashes all pixels when power is applied. controller does not sequence past this display.	This malfunction indicates the computers in the display unit are not operating properly.	Remove power from the system. The autopilot controller should be removed for service.
The autopilot controller display is blank when power is applied.	The autopilot controller should always sequence to the ELEVATION SET display on power up.	If the display is blank on power up, press the ENCODER knob and observe the TRK LED. If this LED illuminates for seven seconds, then extinguishes, the display has failed. If the TRK LED does not illuminate the power and ground wiring to the autopilot system should be verified for proper voltages and connections. If no problems with the power wiring can be found the controller should be removed for service.

System Failure	Description	Troubleshooting Procedure
Either servo fails to disengage when the power is removed from the system.	This type of malfunction indicates a mechanical failure in the servo.	The servo should be removed from the aircraft for service.
Autopilot performance suddenly degrades in either the roll or pitch axis.	This type of malfunction may indicate a problem with the static system connection, bridle cable tensions (if applicable), or an internal EEPROM malfunction.	If the problem is isolated to the pitch axis, then inspect the static system and static system connections at the rear of the autopilot, and check the pitch servo bridle cable tension (if applicable), or If the roll axis is the degraded axis, check the roll servo bridle cable tension (if applicable) and complete Task 06-04, Autopilot Configuration. If none of the above corrects the degradation, then contact Trio Avionics for resolution.

Chapter 10: Trio Pro Pilot Autopilot Equipment

FIGURE 9-1 TRIO PRO PILOT AUTOPILOT INSTRUMENT MOUNT CONTROLLER

FIGURE 9-2 TRIO PRO PILOT AUTOPILOT RACK MOUNT CONTROLLER

FIGURE 9-3 TRIO PRO PILOT AUTOPILOT GOLD STANDARD SERVO

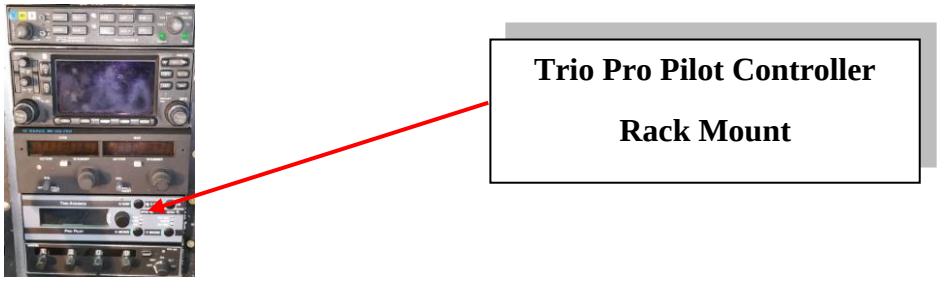

FIGURE 9-4 TRIO PRO PILOT RACK MOUNT CONTROLLER TYPICAL INSTALLATION

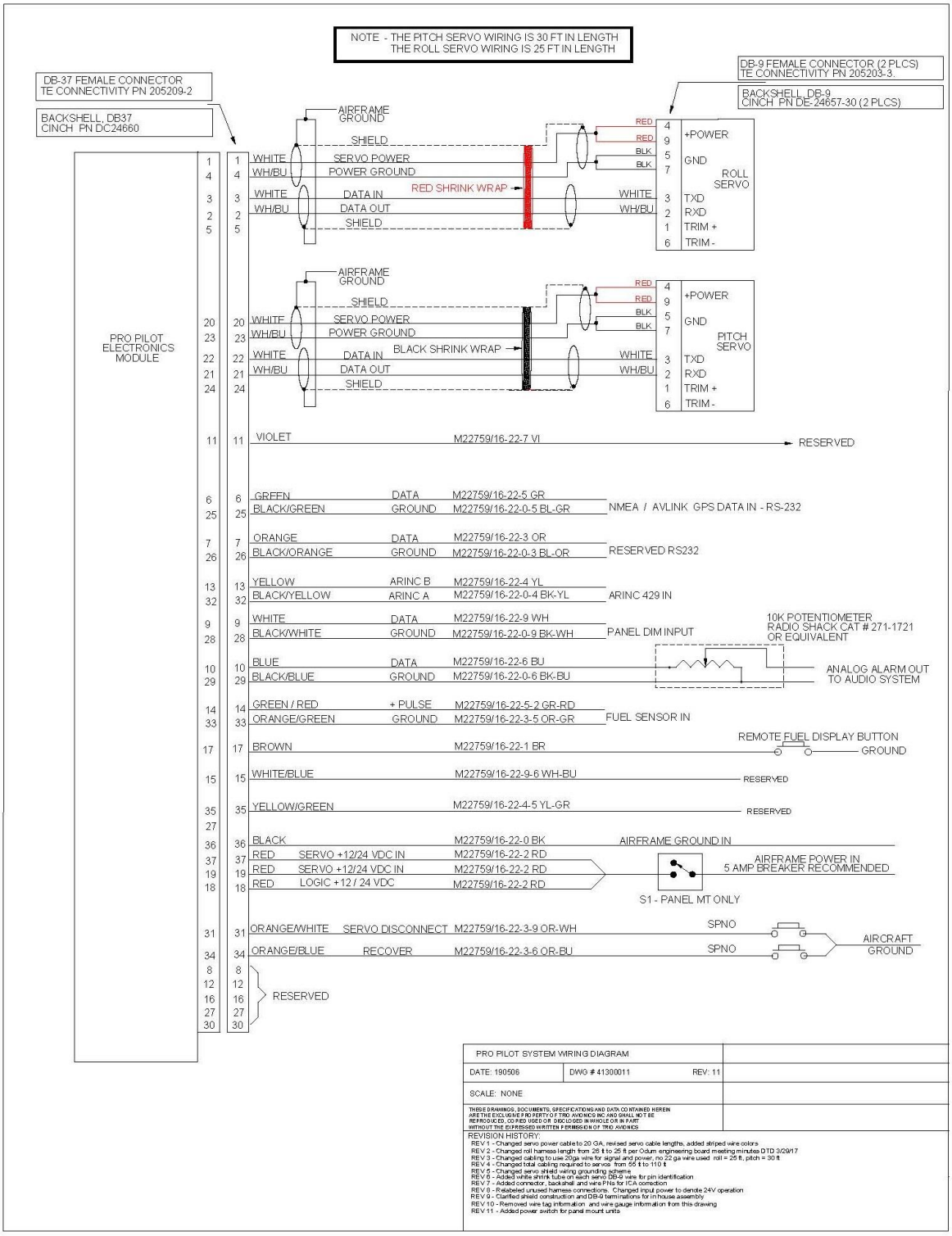

FIGURE 9-5 TRIO PRO PILOT SYSTEM WIRING DIAGRAM

APPENDIX A APPLICABILITY OF ILLUSTRATED PARTS CATALOGS

The following table is used to find the applicable Illustrated Parts Catalog per aircraft model. For additional reference, the top-level assembly drawing numbers have been included in the table. All drawing number references are from The STC Group's current Master Data List.

ITEM	AIRCRAFT MAKE	AIRCRAFT MODEL	ORIGINALTYPE CERTIFICATE NUMBER	ILLUSTRATED PARTS CATALOG MDL DWG #	ROLL TOP LEVEL DRAWING MDL DWG #	PITCH TOP LEVEL DRAWING MDL DWG #
1(a)	Textron Aviation Inc.	172 172A 172B 172C	3A12	1006901	1006203-1	1006204-1
1(b)	Textron Aviation Inc.	172D 172E 172F (USAF T-41A) 172G 172H (USAF T-41A) 172I 172K 172L 172M 172N 172P 172Q 172R (non G1000 equipped aircraft only) 172S (non G1000 equipped aircraft only)	3A12	1006901 (No Previous Navomatic) 1006905 (Previous Navomatic)	1006203-1 (No Previous Navomatic) 1006205-1 (Previous Navomatic)	1006204
2(a)	Textron Aviation Inc.	182 182A 182B 182C 182D	3A13	1006904	1006203-1	1006206-1
2(b)	Textron Aviation Inc	182E 182F 182G 182H 182J 182K 182L 182M 182N 182P 182Q 182R R182 T182 TR182 182S (non G1000 equipped aircraft only) T182T (non G1000 equipped aircraft only) 182T (non G1000 equipped aircraft only)	3A13	1006903 (No Previous Navomatic) 1006902 (Previous Navomatic)	1006203-2 (No Previous Navomatic) 1006205 (Previous Navomatic)	1006206

ITEM	AIRCRAFT MAKE	AIRCRAFT MODEL	ORIGINALTYPE CERTIFICATE NUMBER	ILLUSTRATED PARTS CATALOG	ROLL TOP LEVEL DRAWING	PITCH TOP LEVEL DRAWING
3(a)	Textron Aviation Inc.	175 175A 175B 175C 172RG	3A17	1006901 (No Previous Navomatic) 1006905 (Previous Navomatic)	1006203-1 (No Previous Navomatic) 1006205-1 (Previous Navomatic)	1006204-1
3(b)	Textron Aviation Inc.	P172D R172E (USAF T-41B) (USAF T-41C or D) R172F (USAF T-41D) R172G (USAF T-41C or D) R172H (USAF T-41D) R172J R172K	3A17	1006901 (No Previous Navomatic) 1006905 (Previous Navomatic)	1006203-1 (No Previous Navomatic) 1006205-1 (Previous Navomatic)	1006204
4(a)	Piper Aircraft Inc.	PA-28-151 PA-28-161 PA-28-181 PA-28R-201 PA-28R-201T PA-28-236 PA-28-201T	2A13	1028900	1028802	1028811
4(b)	Piper Aircraft Inc.	PA-28-140 PA-28-150 PA-28-160 PA-28-180 PA-28-235 PA-28S-160 PA-28S-180 PA-28R-180 PA-28R-200	2A13	1028901	1028804	1028811
5	Textron Aviation Inc.	177 177A 177B	A13CE	1177801 (No Previous Navomatic) 1177800 (Previous Navomatic)	177401 (No Previous Navomatic) 177400 (Previous Navomatic)	177100
6	Textron Aviation Inc.	177RG	A20CE	1177800	177400	177100
7	Textron Aviation Inc.	180 180A 180B 180C 180D 180E	5A6	1006904	1006203-1	1006206-1
8	Textron Aviation Inc.	180F 180G 180H 180J 180K	5A6	1006906	1006203-1	1006206-2

ITEM	AIRCRAFT MAKE	AIRCRAFT MODEL	ORIGINALTYPE CERTIFICATE NUMBER	ILLUSTRATED PARTS CATALOG	ROLL TOP LEVEL DRAWING	PITCH TOP LEVEL DRAWING
9	Textron Aviation Inc.	185 185A 185B 185C 185D 185E A185E A185F	3A24	1006906	1006203-1	1006206-2
10	True Flight Holdings LLC (Grumman)	AA-5 AA-5A AA-5B AG-5B	A16EA	1AA5900	1AA5400	1AA5100
11	Textron Aviation Inc	190 195 195A 195B LC-126A LC-126B	A-790	1195900	1195400	1195100
12	Piper Aircraft Inc.	PA-32-260 PA-32-300 PA-32S-300 PA-32R-300	A3SO	1032901	1028804	1028811
13	Piper Aircraft Inc.	PA-24 PA-24-250 PA-24-260 PA-24-400	1A15	1024900	1024802	1024803