



Approach

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TRAINING ARTICLES

MEGGITT / S-TEC

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Happy Holidays!

Over the years you have indicated a need for both installation and maintenance training on S-TEC Autopilots. We expect to develop these programs in the future to provide you with additional material. Until we can deliver a comprehensive program, we thought a series of articles on these two topics would help in the interim, especially for your repair station training requirements.

As we move into a new year, we would like to present a new series of articles to the Approach newsletter to keep providing you with useful and fundamental information for your everyday use. There will be two new training sections in the Approach:

1. Installation of S-TEC Autopilots
2. Troubleshooting & Maintenance of an S-TEC Autopilot

The articles will be written to aid and assist you in your routine autopilot sales and installation business. The articles will be general to cover our entire S-TEC product line, rather than specific systems.

Below is the list of articles that will appear in the Approach newsletters over the next several months:

Installation of S-TEC Autopilots:

- A. Introduction
- B. Airframe inspection (prior to install)
 - a. Modifications installed (STC's)
 - b. Repairs
- C. Pre-installation preparation
 - a. Inventory of parts
 - b. Autopilot interface evaluation (existing NAV/COMs, FD/HSI/GPS/DG)
- D. Install fundamentals
- E. List of tools
- F. Removal of old equipment
- G. Cable routing
- H. Servo installation
- I. Transducer installation
- J. Computer/Mode Selector installation

Troubleshooting & Maintenance of an S-TEC Autopilot:

- A. Introduction
 - a. ICA (Instructions for Continued Airworthiness)
- B. System basics
 - a. Electrical Systems
 - b. Mechanical Systems
- C. Flight Line Tester Manual
 - a. List of test equipment
 - b. Use of test equipment
- D. Problem / Symptoms evaluation
- E. Troubleshooting flow chart
- F. Airframe inspection
- G. Corrective actions
- H. System Test / Flight Test / Return to Service

Along with the two main topics, we will continue to write articles of interest on specific subjects.

Continued on Page 2

From the President's Desk *Do you know your FMS?*

(Flight Manual Supplement)



Dain Miller
Meggitt / S-TEC President

As we close out yet another year, we wish to say "Thank You" for your continued business this past year.

Throughout the year you have expressed an interest in training for you and your staff. With this issue of the Approach, we have started a series of articles to bring you Autopilot installation, trouble-

shooting, and Maintenance training information. In addition to these training articles, this month we have included a note from the Warranty Department and the Technician's Bench reviews pitch porpoise.

Your suggestions for articles are welcome and encouraged. Contact the editor to discuss your ideas.

We have just returned from the Aircraft Owners and Pilots Association (AOPA) convention held in Philadelphia, Pennsylvania. Our participation in AOPA usually results in excellent autopilot conversations that lead to the purchase of S-TEC systems. When we go to these shows, we are there as your representatives. We are selling for you, to bring people to your front door. This was the case this year with many conversations with aircraft owners expressing an interest in purchasing their first autopilot or in upgrading their existing system.

On page 7 is our 2004 Trade Show Schedule. Please note, if you would like an S-TEC regional sales representative to be present at an Open House, EAA or such event, please give us as much advance notice as possible. We look forward to participating in those events, and will be there with demonstration equipment to help you sell our systems.

In closing, all of us at Meggitt/S-TEC would like to take this opportunity to wish you and yours a Happy Holiday Season and a prosperous 2004.



When an S-TEC Autopilot installation kit is sent to you, the Flight Manual Supplement (FMS) is included in the package. You need to review the FMS to become familiar with the operating limitations of the S-TEC autopilot. The autopilot Pilot's Operating Handbook (POH) is generic for each autopilot system. The Flight Manual Supplement (FMS) is aircraft specific.



Upon completion of the autopilot installation, the avionics shop manager, tech rep or customer service rep should go over the POH and FMS with the aircraft owner/operator. The autopilot POH and FMS must be in the aircraft at all times, for the pilot to reference during flight.

In addition, it is highly recommended once the autopilot installation is complete that someone from the avionics shop familiar with the S-TEC autopilot take the time and fly with the owner/operator to show the autopilot functions, operation and ease of use. This flight demonstration, along with the autopilot POH/FMS will enable your customer to take advantage of the wonderful piece of equipment they've just purchased and had installed.

TRAINING ARTICLES

Continued from Page 1

We'd like to encourage you to pass the Approach newsletter to the rest of your staff and then place it in a binder for future reference. If this is the beginning of your Approach library, drop the editor a note and we'll send you copies of previous issues.

As you continue to install more autopilots, you will become more efficient and your expertise will improve and you will sell autopilots to a larger audience. Customer's that are installing their very first autopilot will require more attention than a customer who is having an up-grade autopilot installed. Each customer's aircraft has to be checked on our S-TEC STC list to make sure that an autopilot is available for their make and model. This series of articles should help with your customer discussion.



Installation of S-TEC Autopilots

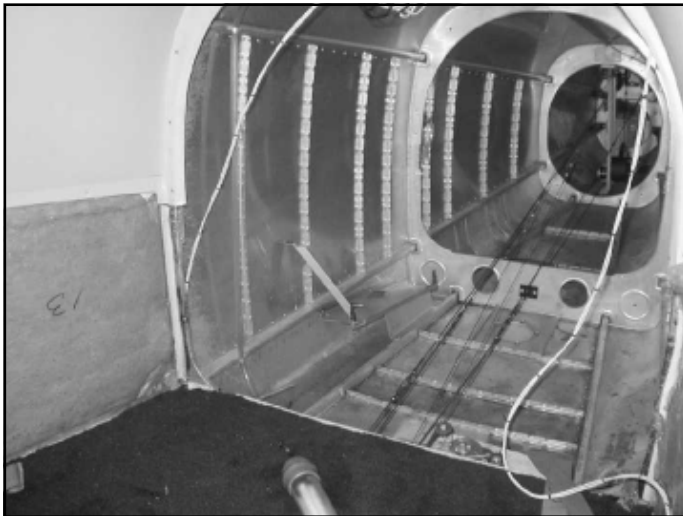
(A Continuing Series)

Introduction

The S-TEC autopilot has been in existence since 1978 and in recent years has captured a 90% market share as reported by the Aircraft Electronics Association. Because of this our goal is to work harder to improve our customer service and product support to you to provide a win – win situation for you and our company. The more knowledge and experience that you have the more efficient you'll become in providing a quality autopilot installation and workmanship to your customer.

Aircraft Modifications

Before you can give a customer a firm quotation for the installation of an S-TEC autopilot, it is very important to review the aircraft airframe logbooks and the aircraft flight manual. If the aircraft has modifications that will affect the flight envelope, characteristics or performance, the STC may not cover the modifications.



Examples of modifications of concern include:

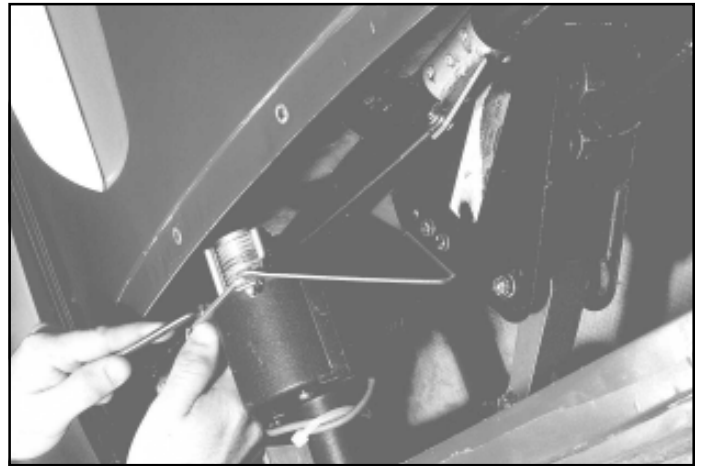
- STOL kits
- Extended range fuel tanks
- Vortex generators
- Modified wing tips
- Floats or skis
- Extended rear baggage compartment
- Gross weight increase or CG change
- Engine STC's for increased horsepower
- Propeller STC's
- Strobe light in the belly *
- Air conditioning system *

If you find one of these modifications which are not covered by our STC, it may be possible to get a local approval for the installation of one of our systems in the modified airplane. You and your relationship with the authorities will control that.

* An inspection of the aircraft for other equipment which is located where the S-TEC servo will be installed should be accomplished, as it may complicate installation.

Repairs

If there has been any structural damage to the aircraft, you should determine if the repair is structurally sound and check in areas where the autopilot equipment will be mounted. The repairs made should have been completed to the aircraft manufacturer's specifications and to industry standards and quality. It should be determined that the repair doesn't interfere with the autopilot installation.



If the autopilot's components need to be relocated from the STC specified location, an Approved Deviation can be requested and a DER (Designated Engineer Representative) can approve the installation.

The flight control system should be examined to be in accordance with the maintenance manual. If there is a question with the control surface balance, it should be rebalanced. The condition of the elevator trim tabs, jack screws and actuators should comply with manufacturer's specifications to avoid problems (See article on Pitch Porpoise on page 7 of this newsletter).

Troubleshooting & Maintenance of an S-TEC Autopilot

(A Continuing Series)

Introduction

It is a very frustrating situation when the owner/operator of an S-TEC autopilot has a problem and is not satisfied. As our dealer, you are the first line of defense in determining the problem and troubleshooting the installation. If you have trouble solving the problem, we encourage you to call our S-TEC product support team to get assistance in troubleshooting. Many techs have a fear of calling S-TEC for help. We are here to support you with your problems to get solutions. We want you to look like an “avionics genius” in the eyes of your customer.

Instructions for Continued Airworthiness

How and what to inspect?

These comments are provided to you in the ICA (Instructions for Continued Airworthiness) in the STC package. The ICA is provided as a guide for the aircraft maintenance personnel to ensure airworthiness of the autopilot.

Aircraft mechanics can do the ICA at the time of the aircraft annual inspection, however, if a mechanic feels that he is not qualified to work on radios and autopilots, he usually asks for assistance from an avionics shop to complete this portion of the annual inspection.

System Basics

The installation of any new autopilot is more complex and involved than the average avionics installation. It is certainly more than just mounting black boxes connected to A+ and ground.

When installing a new autopilot, you are attaching to the primary flight controls of the aircraft, interfacing with navigation equipment, and connecting to the aircraft electrical systems.

For the new autopilot system to work properly and up to its maximum performance capabilities, it is dependent on all the systems it is linked to and their performance. If any of these systems are not performing up to par, the autopilot system’s performance could be compromised. Therefore, at the beginning of an installation, it is recommended that the installer check the performance of the systems that the autopilot is interfaced to.

Electrical Systems

When connecting to the DC bus, check for the proper voltage output and be sure there is no AC ripple when the aircraft charging system is operating.

Navigational and other avionics equipment must be delivering optimum outputs to assure that the autopilot, which is interfacing with them, will perform properly. Be sure to check the outputs against manufacturer’s specifications.

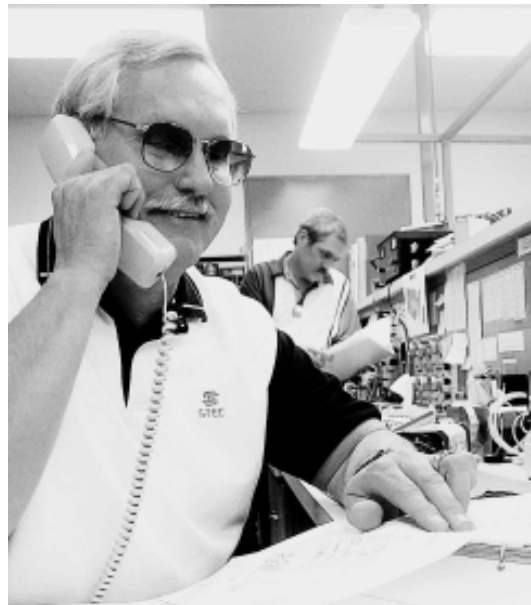
When routing the harness, avoid securing it with transmitter coaxes and any cable carrying high current or alternating current.

Mechanical Systems

Be sure to check the aircraft control system for excessive friction, as this will be a problem if not detected early. Given the average age of the fleet, it would be a good idea to inspect and fly an aircraft with the owner prior to quoting and starting the installation of a new autopilot.

Mechanical systems to be checked should be:

- The aircraft control system cable tension
- The control system pulleys, bellcranks, and control surface hinge friction
- The cables on a standard system and the rod ends on a push-pull system



Butch Nimmo of Product Support assists a customer

Continued on Page 5

Troubleshooting & Maintenance

Continued from Page 4

If there is excessive rubbing or lack of lubrication, this leads to surface friction which will greatly impact the operation of any autopilot.

Be sure to check the aircraft manufacturer's manual for method of inspection. Following these basis procedures in the initial phase of a new autopilot installation will assure that the S-TEC system you are installing performs to its full potential leading to another happy S-TEC user.

Training Articles in the next issue of The Approach

Installation of S-TEC Autopilots

Pre-Installation Preparation

- a. Inventory of Parts
- b. Autopilot Interface Evaluation
(Existing NAV/COMs, FD/HSI/
GPS/DG)

Troubleshooting & Maintenance of S-TEC Autopilots

Flight Line Tester Manual

- a. List of Test Equipment
- b. Use of Test Equipment

Problem / Symptoms evaluation



A Note From the Warranty Department

Our repair service department receives many units for repair that seem to be out of warranty based on ship date, when in fact, due to the date of installation, are actually still covered under warranty. Remember, in accordance with our warranty manual, the system warranty technically begins one month after shipment, and lasts for 12 months thereafter. All units exchanged under warranty, during that time, are good for the remainder of the warranty.

Paperwork submitted with the repair request should include the following information:

1. Unit PN & S/N
2. Detailed reason for return
3. Aircraft Model number
4. Aircraft Serial number
5. Aircraft Registration number
6. Date of installation
7. Name of installer if other than sender
8. Reason for warranty request if over 1 year

This information is also valuable for Non-Warranty repairs.

Because of field component changes and the fact that warranty applications are not always submitted properly, it is often easier for us to verify warranty based on aircraft information rather than the S/N of the unit.

One exception to the standard warranty rules involves OEM installed equipment. Some OEM installed equipment carries a two year warranty from the date of initial aircraft delivery. This two year warranty is not standard with all OEM's. Please consult with your OEM or aircraft warranty documentation for details.

When returning units for repair from these aircraft, it is imperative that some description or proof of warranty be supplied.

Regardless, whether or not the unit is under warranty, please try to provide as much aircraft information as possible when sending units in for repair. This will expedite the repair and help track the system's history. For instance, with a servo repair, the aircraft model is required to determine proper clutch setting. A detailed description of the reason for return can also assist the repair technician in focusing on a specific area of suspected fault.

The more information provided with the unit when you send it in, the less need for a clarification phone call, and the greater likelihood of a successful and timely repair.

Installation of an Altitude Selector/Alerter

Preflight Testing & Troubleshooting

While going through the Altitude Selector/Alerter (P/N 01279) preflight test, you can troubleshoot any wiring errors that may occur during installation by using the following guide.



- When power is applied, the unit performs a self-test of the computer electronics display annunciators, and the altitude alerter audio tone “ding-dong”. Successful completion of self-test is indicated by the display of the barometric pressure setting of “29.9”.

Note: If the Altitude Selector/Alerter is not receiving a valid encoder signal, the altitude (ALT) display will read three dashes (---) followed by three “ding-dong” chimes. A period of time, sometime several minutes, should be allowed for the encoder to come on-line which will be indicated by encoded altitude being displayed on the Altitude Selector/Alerter. At this time, recycle power to the Altitude Selector/Alerter and continue with the pre-flight test.

- Rotate the selector input knob to set baro setting to the nearest .1 in. hg. (if in millibars, push the baro switch to select the millibar scale)
- Push the VS switch to activate VS selector then rotate the selector switch knob to input your desired climb (+) or decent (-) vertical speed. (If the select light is not displayed on the 60-2, 65, 55, or the Fifty FiveX remote annunciator and the VS numbers do not extinguish on the 55 and Fifty FiveX then check the manual VS select wiring from pin 9 of the Altitude Selector/Alerter to pin of 54 PFGC (60-2,65) or pin 21 on connector P2 of the System 55 or Fifty Five X.) Push autopilot disconnect on yoke. VS numbers should extinguish on Altitude Selector/

Alerter. If they do not extinguish, check wiring from Pin 16 of Altitude Selector/Alerter to autopilot disconnect switch. Re-engage VS switch on Altitude Selector/Alerter.

- Push ALT to switch to access altitude select mode –ALT SEL.
- Engage the HDG mode on the autopilot.
- Simultaneously depress the VS and ALT switches on the autopilot programmer. (VS and ALT annunciators will both illuminate.) If you cannot get VS and ALT to illuminate together, check the ALT engage wiring from pin 10 of the Altitude Selector/Alerter, to pin 18 on the 60-2 programmer annunciator, and the system 65 remote annunciator, or pin 20 of the P2 connector on the system 55 and Fifty Five X. Also check for the jumper between pins 1 and 2 of the optional flap/compensation connector on the system 55 or Fifty Five X. Push VS select on Altitude Selector/Alerter and adjust VS with the select knob. The yoke should respond to changes in VS. If not, check the VS command wiring of pin 17 on the Altitude Selector/Alerter to pin 74 of PFGC (60-2, 65) or pin 22 of the P2 connector on the system 55 and Fifty Five X.
- Press ALT switch to annunciate “ALT SEL.” Press DTA switch to access data entry mode. While “SEL” is flashing, rotate the altitude selector knob to change your selected altitude to match field elevation. VS annunciation on autopilot programmer should extinguish when Altitude Selector setting is within 100ft. of indicated altitude on the altimeter. Extinguishing of VS annunciation with ALT remaining illuminated indicates the altitude hold mode has been engaged. (If VS does not extinguish check encoded ALT on Altitude Selector/Alerter to that of altimeter. If the Altitude Selector/Alerter has incorrect reading check grey code inputs from altimeter.)

If there are any questions about the set up of Altitude Selector/Alerter refer to the Altitude Selector/Alerter POH or call one of our technical support technicians in the Product Support Department.

Troubleshooting Pitch Porpoise

When dealing with a pitch porpoise squawk, there are several different approaches that can be used. We recommend that the first step be to reduce the variables involved. By asking yourself a few questions you can save yourself a lot of time.

In a new installation, is the altitude transducer mounted correctly? If the hose bib is vertical, gravity will affect the sensor. The hose bib must be mounted horizontally.

Is the pitch bridle cable tension set properly? If the bridle cable tension is not set correctly the autopilot will be working harder to maintain selected altitude hold. It is also important to check bridle cable tension in an older installation.

Is the computer mounted securely? In some installations (ie, 60-2, 60PSS, 65), if the remote mounted computer is not mounted securely, vibrations from the aircraft will affect the accelerometer possibly causing pitch porpoise.

Control system friction is another factor that needs to be considered when autopilots exhibit poor performance in one axis or another. Excessive friction in the primary control surface causes the autopilot to work harder and slows its overall response time leaving the pilot and technician to think

the problem is in the autopilot system when in fact it is not. Control system friction is something that should be checked any time the flight control system appears to respond slowly in one axis or another. Consult the aircraft manufacturer's manual for procedures to determine acceptable system friction limits.

For an existing installation, the first suspect should be the pitch servo. High start up voltage is the indicator and it can be checked two ways. First, measure the resistance across the motor leads (Pins 3 & 4). 12 Volt motors should read 3 to 4 Ohms. 24 Volt motors should read 8-10 Ohms. If you see a reading fifty percent higher than these, that would indicate a high start up voltage. The second way to check high start up is by applying voltage to the motor. A 12 Volt motor should start by 1.5 Volts or less and a 24 Volt motor should start by 2 Volts or less. Unfortunately, the pitch servo is often the hardest component in the system to remove and therefore the most neglected in servicing.

The static system needs to be checked for leaks and any moisture in the system.

We hope these suggestions will help you find and eliminate system problems before you decide the pitch computer is at fault.

2004 TRADE SHOW SCHEDULE

Aircraft Electronics Association

March 29 - April 1, 2004 Las Vegas, NV

Sun 'N' Fun

April 13 - 19, 2004 Lakeland, FL

EAA AirVenture

July 27 - August 2, 2004 Oshkosh, WI

Malibu / Mirage Owners and Pilots Association

October 6 - 9, 2004 Palm Springs, CA

National Business Aviation Association

October 12 - 14, 2004 Las Vegas, NV

Aircraft Owners and Pilots Association

October 21 - 23, 2004 Long Beach, CA

AEA Regionals To Be Announced

Dealer Open Houses

Let us know as far in advance as possible if you'd like us to participate.



STC UPDATE

APPROVALS SINCE THE LAST NEWSLETTER

SYSTEM **AIRCRAFT**
55/55X (14V) Lancair Models LC40-550FG and LC42-550FG

IN-PROCESS STC's

SYSTEM **AIRCRAFT**
20/30 (14V) Cessna models 206, P206, U206, P206A, TP206A, U206A, TU206A, P206B, TP206B, U206B, TU206B, P206C, TP206C, U206C, TU206C, P206D, TP206D, U206D, TU206D, P206E, TP206E, U206E, TU206E, U206F, TU206F; and U206G AND TU206G (landplane, floatplane or amphibian configuration) and models U206G AND TU206G (landplane, floatplane or amphibian configuration) when modified by any of the following STCS: STC SA1513WE (Robertson STOL) or STC SA2353NM (Soloy engine conversion) and/or STC SA3634SW (extended range fuel tanks) and/or STC SA914NE (wing tip extensions)

40/50 (14V) Cessna models 210G, T210G, 210H, T210H, 210J, and T210J and models T210G, T210H and T210J when modified per STC SA2689SW (RAM modification)

55/55X (28V) Cessna models R182 and TR182 and the above models when modified per STC SA950CE (Horton STOL) and/or STC SA2285CE (Horton flap gap seals); Reims-Cessna model FR182 and the above model when modified per STC SA2422CE (Horton STOL).

55/55X (28V) Piper Aircraft Company Models PA-32-301, PA-32-301T, PA-32R-301, PA-32R-301T, PA-32-301FT, and PA-32-301XTC

60-2 (14V) Cessna models 210G, T210G, 210H, T210H, 210J, and T210J and models T210G, T210H and T210J when modified per STC SA2689SW (RAM modification)

Otto Pilot Says

If you have a web site, e-mail us at info@s-tec.com so that we can establish a link to your site from your dealer directory listing on our web site. We only ask that you link back to www.s-tec.com.

If you already have a link from your listing on our dealer directory, please confirm that it is still a valid link.



Publications Index Updates

There have been many updates to our Flight Control Systems Publications Index since the last issue of the Approach. The current Flight Control Systems Publications Index is the 32nd Edition, dated 13 November, 2003. The current S-TEC Flight Control Systems Service Bulletins, Letters, and Memos is the 25th Edition, dated 27 October, 2003.

To obtain a current copy of these indexes, as well as the Tec Line Avionics Publications Index and the Tec Line Avionics Service Bulletins, Letters, and Memos, go to www.s-tec.com/pubs. They are available in Adobe Acrobat PDF format. If you prefer a hard copy from Meggitt / S-TEC, contact Bob Austin at 800-872-7832 extension 145.

**Back Issues of the Approach
are available at
www.S-TEC.com**

Approach

Published and copyrighted by Meggitt / S-TEC, the *Approach* is intended to provide S-TEC dealers with information valuable in the everyday selling and servicing of S-TEC Autopilots and electronic instruments.

Comments and suggestions are encouraged and welcomed. For additional copies of the *Approach* for others in your organization or for distribution to your own mailing list, contact:

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