EDO CORPORATION AVIONICS DIVISION

Century

Flight System

P.O. Box 610 Municipal Airport
Mineral Wells, TX 76067 (817) 325-2517
940 325 2517

FAA APPROVED FOR PIPER MODELS PA-24-250, PA-24-260,
AND PA-30
PER STC SA662SW

(14 VOLT SYSTEM)

AK220

C111 PA24

FAA APPROVED
BULLETIN NO. 322

EDO-AIRE MITCHELL
P. O. Box 610
Mineral Wells, Texas 76067

REVISION REFERENCE SHEET

Original dated May 27, 1966 covering installation in Piper PA-24-250, PA-24-260, & PA-30

Revision (1) dated May 27, 1966
To correct original to indicate both placards under "Limitations and Conditions".

Revision (2) dated January 10, 1969
To change to Globe Servos from old style servos.

Revision (3) dated December 18, 1969
To add bracket 7B1068 to Servo (Pitch) section
Also, added 3S184, 2S30 and 4S218 to parts list

Revision (4) dated 2-2-76 (Minor Change)
Removed 11S68 solvent capsule and changed 30A211-( ) to 30C211-( ). Changed 30A211-131P to 30C211-130P Reference FAA/DER Approved FECO # 756.

Revision (5) dated 10-21-77 (Minor Change)
Added 7A528 bracket to the Pitch Trim Sensor Installation. Reference FAA/DER Approved FECO # 1535.

Revision (6) dated 10-19-81 (Minor Change)
Added 43A178 spacer to Pitch Servo Parts List. Reference FAA/DAS Approved FECO #3516.

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MITCHELL INDUSTRIES, INC.
MUNICIPAL AIRPORT
MINERAL WELLS, TEXAS

BULLETIN NO. 322

I. CENTURY III

A. INSTALLATION NOTES:

This portion of this manual is intended to facilitate proper installation of the Mitchell Century III Automatic Pilot, therefore, before proceeding, read the manual carefully and study the drawings thoroughly. Inspect the kit parts individually to insure a complete understanding of their purpose and proper location.

The Century III Automatic Pilot is an electronic, light weight system incorporating the newest functional and electronic designs available. The Century III incorporates the following automatic features:

1. Mode button programmed engagement for ROLL, HDG, PITCH and ALT.
2. An Altitude Controller for maintaining a desired altitude.
3. A Course Selector built into the D.G. for selecting and maintaining automatically, any desired D.G. heading.
4. Optional items that can be used with the Century III.

    1. Lateral Guidance Radio Coupler.

    2. Automatic Elevator Trim.

    3. Back-up Roll Stabilization System.

The Century III Automatic Pilot is designed for maximum service with minimum installation time. The unit is principally composed of the two Gyro instruments which furnish the aircraft attitude sensing; the amplifier which interprets this sensing and the Power Servos which transmit them to the aircrafts controls.

INSTRUMENT INSTALLATION

B. 52D67 ATTITUDE GYRO

B1. The 52D67 Attitude Gyro is used for roll and pitch control sensing.

B2. Remove top cowl cover and false panel from Gyro instrument panel.

B3. Remove standard attitude Gyro from instrument panel, and remove vacuum line and vacuum gage fittings.

B4. Install AN917-2D tee, AN912-1D bushing, and AN911-2D and AN816-6D nipples in vacuum port of 52D67 Attitude Gyro. Existing aircraft fittings may be used if they are adaptable to this Gyro.

B5. Install adapter plate 64B90 on back side of instrument panel using (4) four 3S87 screws and (4) four 2S38 nuts if panel is not made for 3" instruments.

B6. Install 52D67 Attitude Gyro with (4) four mounting screws. Caution: Do not use mounting screws over 1/2" long.

B7. Connect direct vacuum and vacuum gage lines to proper fittings. If aircraft does not have a central filter for the Gyros, install Mitchell filter 1X314 per section V of this bulletin. Note: If aircraft central filter is used it must be 95% effective on .3 micron particles.

C. 52D54 COURSE SELECTOR DIRECTIONAL GYRO

C1. Using Dwg. 69A320 as a guide, enlarge D.G. hole and drill mounting hole in instrument panel for mounting 3" Directional Gyro if panel is not made for 3" instruments.

C2. Install AN917-2D tee, AN911-2D nipple and (2) two AN816-2D nipples in vacuum port of Directional Gyro. (Ref. Par. B4.)

C3. Install Directional Gyro with (3) three mounting screws. Caution: Do not use mounting screws over 1/2" long.

C4. Connect vacuum line to proper fitting & to central filter (Ref. Par. B7.)

D. ROLL SERVO 1C363-1-161R

D1. The Roll Servo attaches to the aileron balance cable that passes in front of the rear wing spar. Ref. Dwg. 69D440.

D2. Remove the back seat of the aircraft and the baggage compartment floorboard.

D3. Drill holes and make cut out in spar as shown on drawing 69D440.

D4. Attach brackets to servo with (4) 3S92 bolts and (4) 2S38 nuts as shown on drawing.

D5. Install servo in location shown using holes drilled in Paragraph D3 with 3S92 bolts.

E9. Attach 49A22 pulley to 7A598 bracket with one 3S240 bolt, one 2S38 nut, and two 43A178 spacers. Put a spacer on each side of pulley. Position this assembly in location shown, centered over outboard stabilator bridle cable. Drill two 3/16" holes, using bracket as a guide and attach bracket 7A598 with two 3S92 bolts and two 2S38 nuts.

E10. Move elevator through full travel to see that it is operating freely without binding or restriction due to servo installation.

F. 1C407 ALTITUDE HOLD

F1. The Altitude Hold is mounted behind the instrument panel as shown on drawing 69D579.

F2. Remove top cowl cover on the instrument panel. Using 7B316 bracket as a guide, drill two #2 (.221) holes in channel. Install two 2S67 rivnuts.

F3. Attach two 75S1 shcokmounts to the rivnuts. Attach 7B316 bracket to the shockmounts with 4S61 lockwashers and 2S92 nuts.

F4. Install Altitude Hold in clamps on bracket 7B316 and tighten clamps. Position Altitude Hold so that cover retaining screw and static port are in a vertical plane with the static port down.

F5. Cut the static air line to the Altimeter and install 58A11 tee fitting. Attach the 36" of 47A147 hose from the tee to the Altitude Hold static air fitting, clamp the fitting with AN735-5 clamps or equivalent. Hose to be installed so that positive drainage of moisture is provided. Route hose so that chafing, excessive distortion or restriction at bends is avoided.

G. 1C404 CONSOLE

G1. The Console is mounted in the lower portion of the radio cutout area as shown on drawing 69D576.

G2. Make a 5 1/16 x 2 13/16" cutout in this area for mounting or any existing instrument panel space that is accessible to the pilot.

G3. Remove the Console from its cover 15A188-1 by removing the Roll Knob and the three screws visible on the face plate. Now remove the 13B316 face plate and the 3S364 screw. Slide Console assembly out of cover.

G4. Drill the four mounting holes in the cover 15A188-1 as specified on drawing 69D576.

G5. Attach 64B125 plate to existing structure on each side of radio panel by drilling four #18 (.196) holes and attaching 64B125 plate and two 7A710 brackets with 3S226 screws, 4S97 washers and 2S30 nuts. Attach cover 15A188-1 to 7A710 brackets with four 3S254 screws and four 2S40 nuts.

G6. Reinstall console in cover in reverse order to the method it was removed in paragraph G3. Do not reinstall 13B316 face plate until flight adjustments are complete.

H. 1D395 AMPLIFIER

H1. The Amplifier is to be mounted on the aircraft radio rack in the aft section of the aircraft, as shown on drawing No. 69C500.

H2. Attach the 64B112 mounting bracket to the radio rack in any available space. Use the bracket as a template for drilling the holes for mounting. Attach with (4) 3S184 screws and (4) 2S30 nuts or 2S6 rivnuts.

H3. The Amplifier is attached to or removed from the 64B112 mounting bracket with the 42S176 fasteners.

J. CABLE HOOK-UP

J1. The 30D207-2 Harness cable is connected to the various components as shown on drawing 69D523 and according to code numbers on cable ends.

J2. Plug the large connector into the Amplifier and attach with (2) 3A327 screws. Route all of the cables per paragraph J11.

J3. Connect CD-20 to the Console.

J4. Connect CD-18 to the Attitude Gyro.

J5. Connect CD-33 to the Directional Gyro if a radio coupler is not being installed. If a Radio Coupler is being installed see the Radio Coupler section of this bulletin.

J6. Connect CD-47 to the roll servo with 30C211-36R extension cable if a stabilizer is not being installed. If stabilizer is being installed connect as described in that section.

J7. Connect CD-16 to the pitch servo with 30C211-130P extension cable.

J8. Connect CD-10 to the Altitude Hold.

J9. Connect the CD-26 lead from the Console to the variable voltage terminal of the aircraft instrument light rheostat. Caution: Check rheostat capacity for additional load of autopilot lights. If capacity is inadequate, add rheostat (Mitchell Part No. 18S38).

J10. Mount the Autopilot fuse 30B235 in the aircraft fuse panel. Connect the fuse to the aircraft bus bar.

J11. Secure all wiring to airframe with AN742 cushion clamps or equivalent to prevent damage and allow full freedom of controls. Clamp cables

within a maximum spacing of 18" to prevent damage. Route cables clear of flammable fluid lines. Refer to Advisory Circular 43.13-1A for additional information.

K. PLACARDS

K1. Apply placard 13A329-220 to instrument panel in full view of the pilot.

K2. Placard autopilot fuse with placards 13A132 and 13A239-5.

K3. Install 13A753 "S/N" placard with the aircraft records.

L. COMPONENTS WEIGHTS AND CURRENT DRAIN

L1.	52D67	Attitude Gyro	2.7 lbs.
L2.	52D54	Course Selector	2.9 lbs.
L3.	1C363-1-161R	Roll Servo	2.3 lbs.
L4.	1C363-1-186P	Pitch Servo	2.3 lbs.
L5.	1C407	Altitude Hold	.8 lb.
L6.	1D395	Amplifier	2.3 lbs.
L7.	1C404	Console	1.3 lbs.
L8.	Cables		1.6 lbs.
L9.	Current Drain Maximum Servo Action		3.5 Amps

II. AUTOMATIC PITCH TRIM INSTALLATION

A. INSTALLATION NOTES:

This portion of this manual is intended to facilitate proper installation of the Mitchell Pitch Trim Tab Servo and Automatic Pitch Trim Sensor, therefore, before proceeding read the following instructions carefully and study the drawings thoroughly. Inspect the kit parts individually to insure a complete understanding of their purpose and proper location.

B. 1C373-1-220 PITCH TRIM SERVO INSTALLATION

B1. The Pitch Trim Servo is installed in the location shown on Drawing 69D404. This location is aft of the baggage compartment.

B2. Remove partition between aft part of fuselage and baggage compartment.

B3. Place 7B380 bracket lips on outside of stringer flange and slide bracket forward until it is snug on stringers. With bracket pushed up within 1/16" of top fuselage skin. Check to see that angle of servo drive pulley aligns with angle of trim cable. Mark and drill (3) 3/16" holes on each end of bracket using the bracket as a template.

B4. Mount bracket 7B380 using (6) 3S237 screws and (6) 2S34 nuts.

B5. Add cable splice 30A153 to turnbuckle on cable that Pitch Trim Servo is attached.

B6. Remove cable guard bracket 7A382 from Trim Servo and 49A22 idler pulley.

B7. Install Pitch Trim Servo by passing pulley portion of servo up through the cut out in 7B380 bracket. Attach Servo to bracket with (4) 3S103 screws and (4) 4S106 flat washers. Safety wire screws together.

B8. Route trim tab cable from forward part of aircraft around top pulley groove to idler and back to lower pulley groove of trim tab servo. Reinstall idler with cable routed around it as shown on Dwg. 69D404. Connect trim cable together with splice. Set proper tension on trim cable as specified in Aircraft Manufacturers Service Manual. Check to see that trim cable is working properly and the cable is on all pulleys. NOTE: Check to see that the cable does not touch the side of the flanges on the capstan grooves and pulleys on the trim servo. Safety wire turnbuckles.

B9. Reinstall cable guard bracket 7A382 on top of mounting bracket 7B380. Position Bracket so it will be within 1/32" of pulley.

C. 1C365-152 AUTOMATIC PITCH TRIM SENSOR

C1. The Pitch Trim Sensor is to be mounted under the backseat of the aircraft as shown on Drawing 69D438.

C2. Remove the backseat of the aircraft to expose the cable pulleys as shown on drawing.

C3. Attach the 7A528 bracket to the pitch trim sensor with (2) 3S102 screws and and (2) 4S84 lockwashers.

C4. Position Sensor on the elevator cables as shown with the elevator cables routed around the sensor pulleys as shown.

C5. Drill (2) #2 (.221) holes in bulkhead flange using sensor bracket as a guide. Drill (1) #2 (.221) hole in hat section using sensor bracket as a guide. Install 2S67 rivnuts in bulkhead flange and hat section. Attach sensor with (2) 3S464 screws, (3) 4S61 lockwashers, (1) 43A151 spacer and (1) 3S188 screw.

C6. Support elevator to remove all loading of cables in approximately neutral position.

C7. Lightly apply pressure to control yoke fore and aft to remove all influence control position may have on elevator cable tension.

C8. Loosen screws (A) (Ref. Dwg. #69D438) slightly and adjust contact assembly (B) until both contact points are not touching pivot block (C) by turning cam (D). Test by touching top of elevator cables alternately until an equal amount of pressure on each cable individually will cause the trim tab to move in proper direction.

C9. Repeat steps 6 and 7 until two consecutive checks produce desired adjustments. Retighten screws (A). NOTE: Check to see that the cables do not touch the side of the flanges on all pulleys on the sensor.

D. PITCH TRIM WIRING

D1. Drill a 1/4" hole in the upper left hand portion of the pilot's control wheel for push button switch and cable assembly 30B192. Drill this hole 2 3/8" to the left of center of the top portion of the control wheel and 5/8" up from the lower edge. Fasten push-button switch assembly 30B192 in control wheel with nut and lockwasher on switch.

D2. Drill a 13/32" hole in the instrument panel to the left hand side of the control column within 2" of the control wheel shaft O.D. Install 5S72 grommet in this hole. Route flex cable through this hole and anchor on back side of instrument panel. Clamp flex cable with AN742 clamps so it will not obstruct the pilots view of necessary information on the instrument panel.

D3. Plug 30B193 cable CD-40 receptacle into CD-40 plug on Auto-pilot consol (Ref. Dwg. 69D523).

D4. Mount circuit breaker on cable assembly 30B193 in fuse panel accessible to pilot in flight. Connect CD-42 lead on circuit breaker to aircraft bus bar.

D5. Connect CD-37 delco connector on 30B193 cable to CD-37 delco connector on 30B192 control switch cable.

D6. Connect CD-39 delco connector on 30B193 cable to CD-39 delco connector on 30B192 control wheel switch cable.

D7. Connect CD-44 wrist lock lead of 30B193 to CD-44 wrist lock lead of 30B195 cable.

D8. Connect CD-43 knife disconnect lead of 30B192 cable to CD-43 knife disconnect lead of 30B195 cable.

D9. Route 30B195 cable to pitch Trim servo.

D10. Plug CD-45 lead of 30B194 cable into CD-45 receptacle on the Pitch Trim Servo.

D11. Connect CD-44 and CD-43 leads of 30B194 to CD-44 and CD-43 leads of 30B195 cable.

D12. Route 30B194 cable to Pitch Trim Sensor. Plug CD-41 plug into CD-41 receptacle on trim sensor.

D13. Secure cables to aircrame with cushion AN742 clamps or equivalent within a maximum spacing of 18 inches to prevent damage and allow full freedom of controls. Route cables clear of flammable fluid lines.

E. PLACARDS

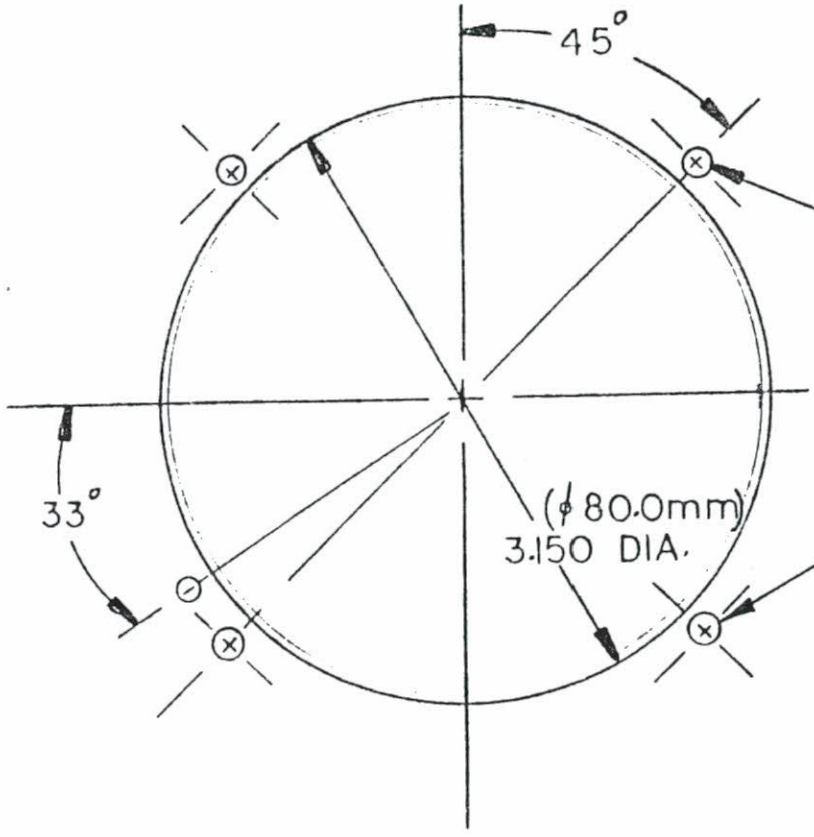
E1. Apply placard 13A216 to control wheel by switch in full view of pilot.

E2. Apply placard 13A216 by 65S29 circuit breaker.

F. COMPONENTS WEIGHTS AND CURRENT DRAIN

F1.	1C365-152	Trim Sensor	.5 lbs.
F2.	1C373-1-220	Trim Servo	2.8 lbs.
F3.	Cable Assemblies		.5 lbs.
F4.	Current Drain Maximum Continuous Drain		1.0 Amp.

EDO-AIRE MITCHELL MINERAL WELLS, TEXAS		TITLE TEMPLATE		DWG. NO. 69A320			
DRAWN J F R	DATE 10/4/63	USED ON 3" DIRECTIONAL GYRO	SCALE 1/1	REV	DESCRIPTION	BY	DATE
CHECKED C. J. W	DATE 10-4-63			–	RELEASED PER E.O.		
ENGINEER	DATE	MATERIAL	FINISH	A	REDRAWN EO 8848	C.U.	4/14/76
APPROVAL C. WILTON	DATE 10-4-63						



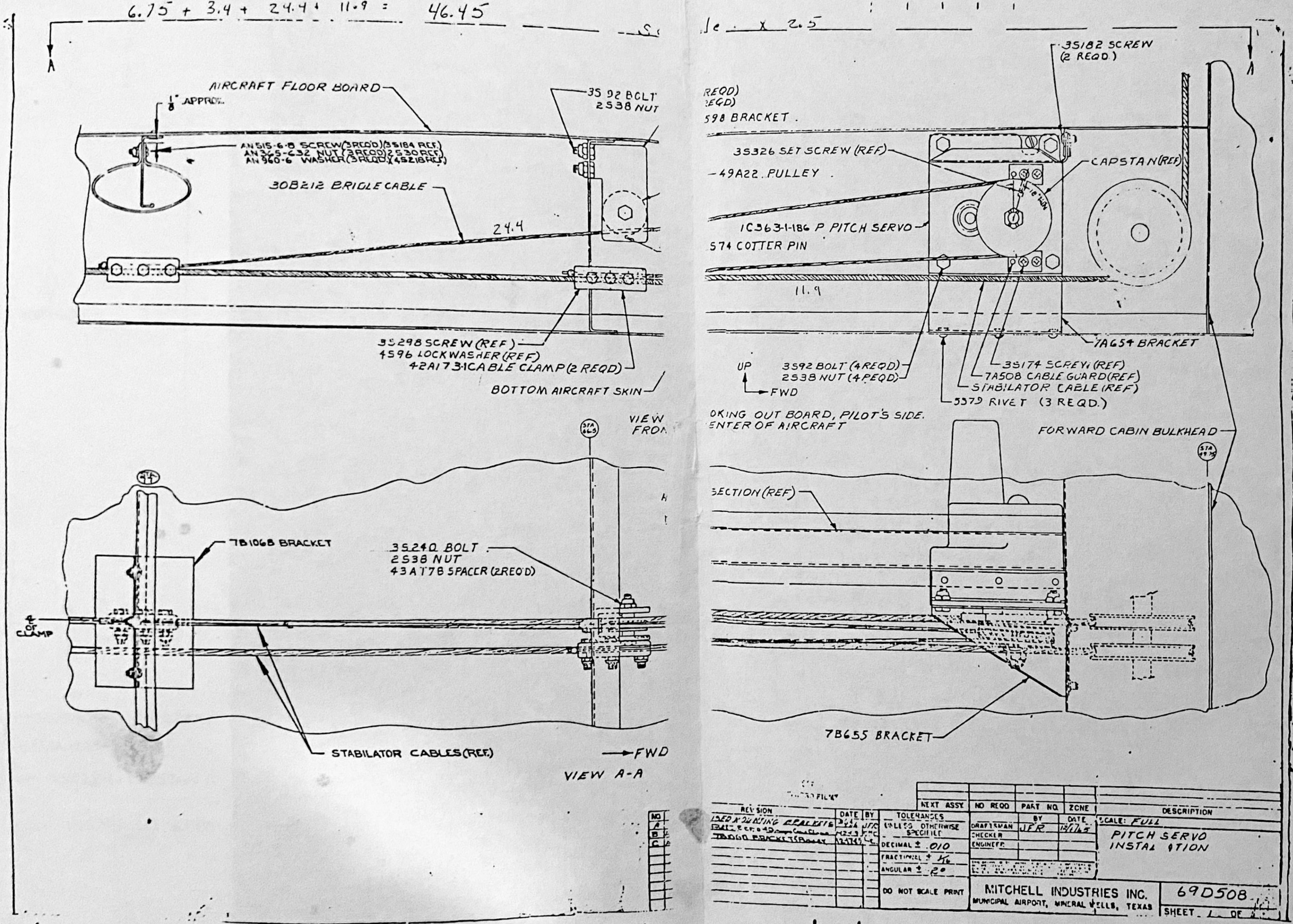
$\frac{5}{32}$" HOLE ON 3.500 DIA
(3 REQ'D)
ϕ3.97mm ON ϕ88.9mm

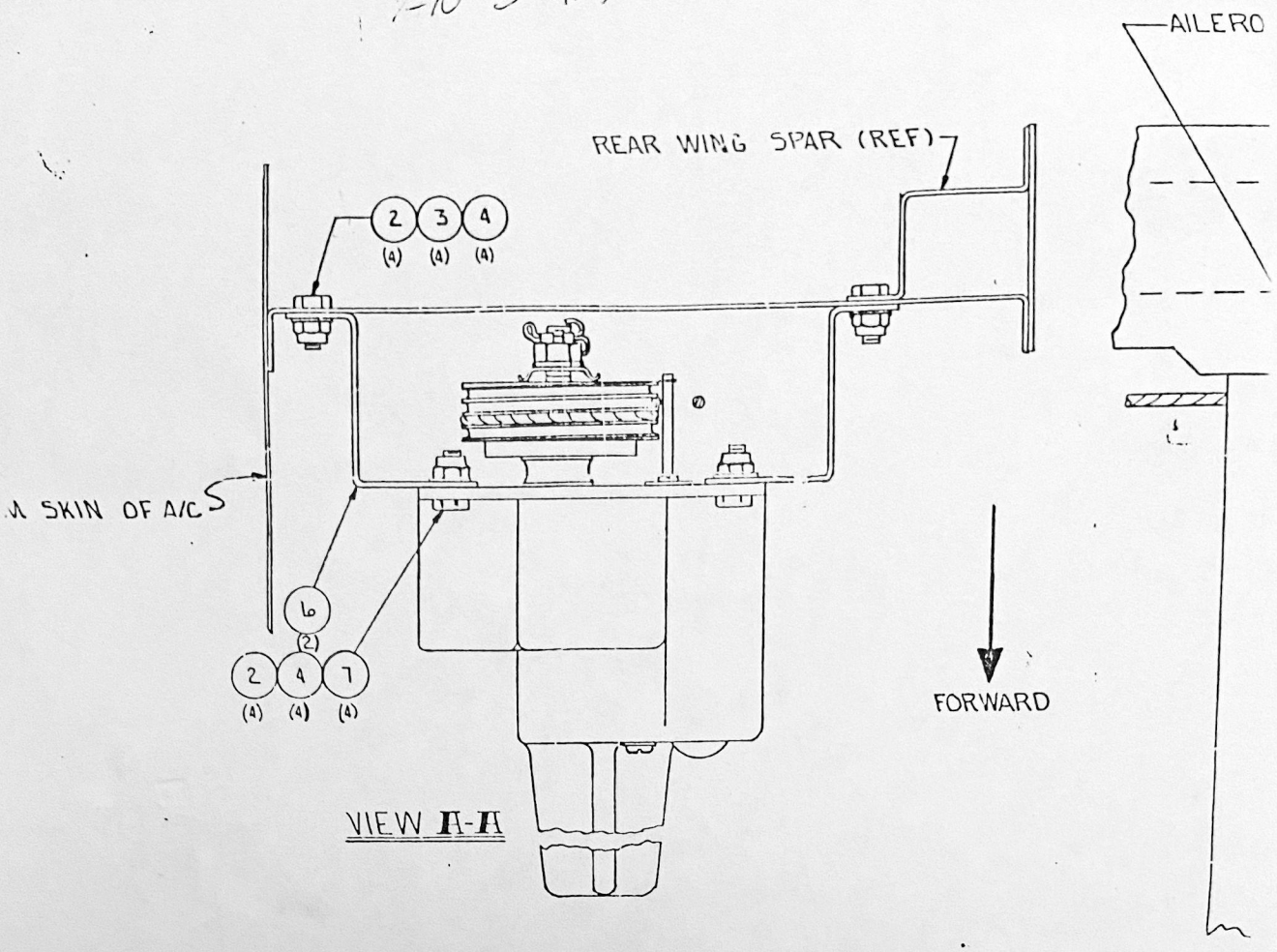
$\frac{3}{16}$" HOLE ON 3.500 DIA.
(2 REQ'D)
(ϕ4.76mm ON ϕ88.9mm)

TOLERANCES UNLESS OTHERWISE SPECIFIED:
DECIMALS XXX: ± .005
DECIMALS XX: ± .010
FRACTIONS: ± 1/64
ANGLES: ± 0° 30'
REMOVE BURRS AND BREAK SHARP EDGES .010
DO NOT SCALE DRAWING

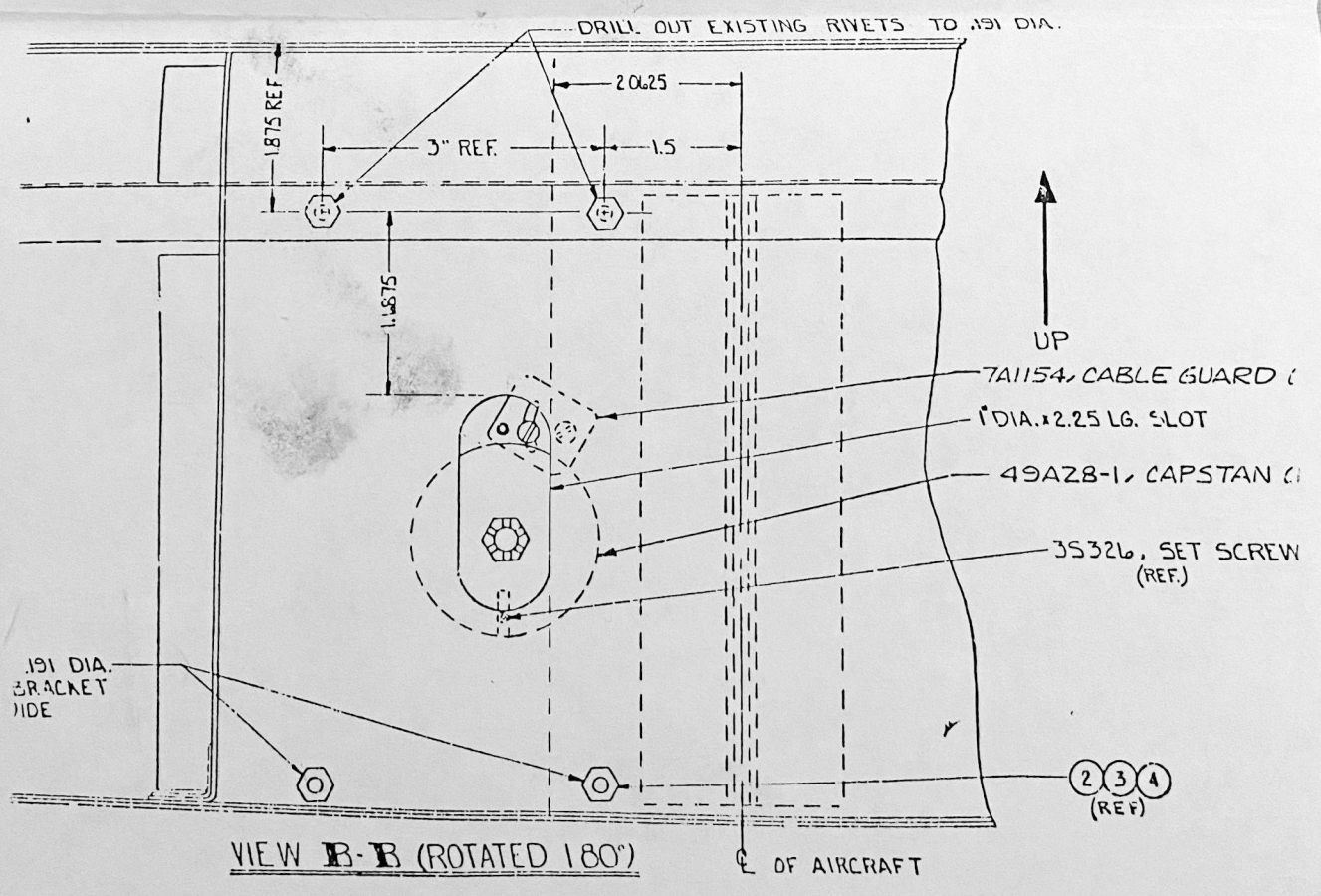
25 - 21.5

6.75 + 3.4 + 24.4 + 11.9 = 46.45



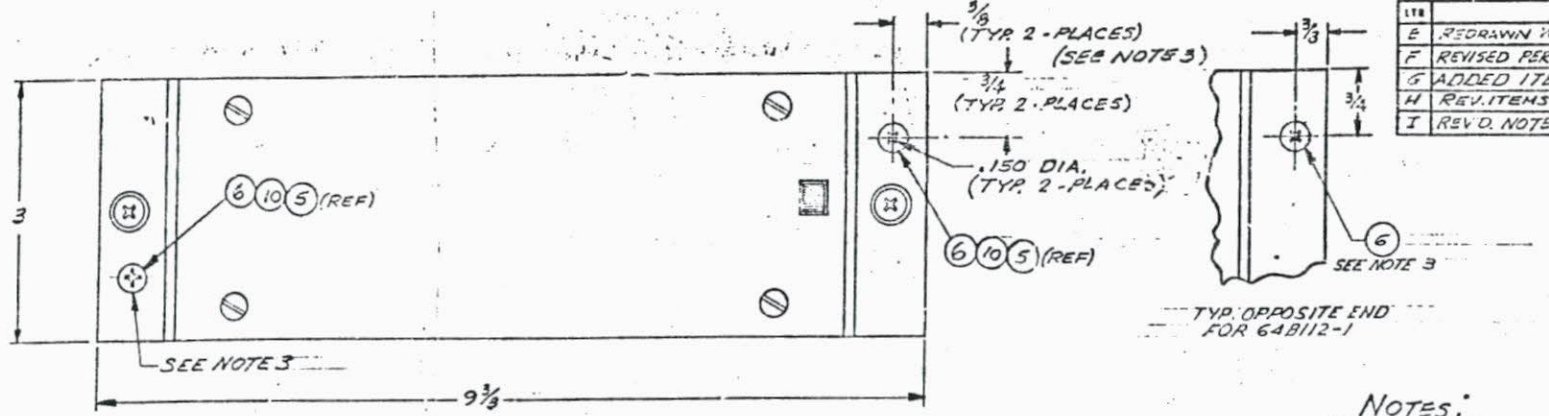


VIEW A-A



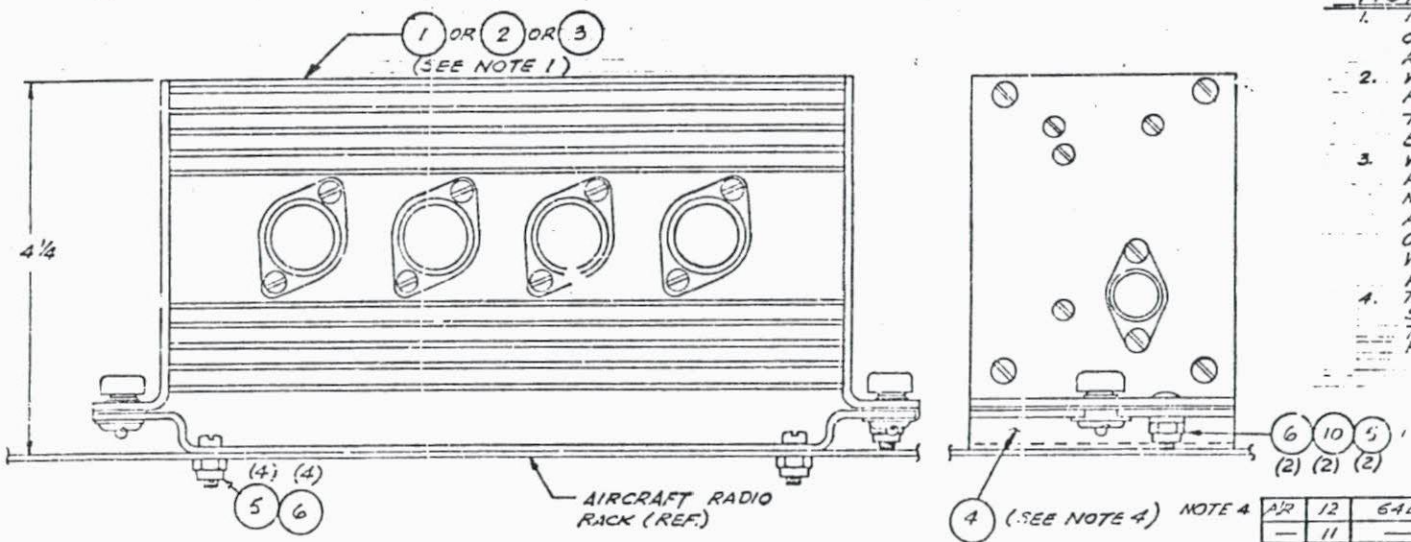
VIEW B-B (ROTATED 180°)

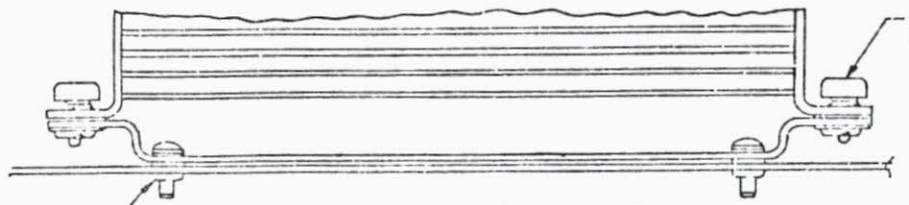
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
E	REDRAWN WITHOUT CHANGE E.O. 8223	12-24-74	[illegible]
F	REVISED PER FECO #375	1-6-75	ACK
G	ADDED ITEM 12 PER E.O. 8223	3-3-75	V. TORRES
H	REV. ITEMS 5, 6, 7, 10. DELETE 11	3-8-75	[illegible]
I	REV'D. NOTE 4 PER F.E.C.O. #1380	8-1-77	ACK



NOTES:

1. IC515 AMPLIFIERS ARE APPROVED FOR INSTALLATIONS ONLY WHEN SPECIFIED IN THE APPROPRIATE INSTALLATION BULLETIN.
2. WHEN USING 8-32 (35464) SCREWS FOR MOUNTING PURPOSES, ENLARGE THE FOUR EXISTING HOLES IN THE (ITEM 4) 64B112 OR 64B112-1 AMPLIFIER MOUNTING BRACKET TO .166 DIA. (#19 DRILL).
3. WHEN THIS ASSEMBLY IS MOUNTED IN ANY POSITION OTHER THAN WITH THE (ITEM 4) 64B112 MOUNTING BRACKET HORIZONTAL AND THE AMPLIFIER SECURED ABOVE IT, THE UPPER TWO OR DIAGONAL CORNERS OF THE 64B112 OR 64B112-1 BRACKET WILL BE SECURED TO THE AMPLIFIER BASE IN TWO PLACES WITH ITEMS 6, 10, & OR 5.
4. THE 64B112 OR 64B112-1 BASE PLATE BRACKET IS SUPPLIED WITH 1D395, IC515 & IC515-( ) AMPLIFIER. THE 64B112-1 BASE PLATE IS EQUIPPED WITH 25109 PLATE NUTS THAT REPLACE THE 2530 NUTS.





ALTERNATE BRACKET MOUNTING DETAIL

7 8 9 (SEE NOTE 2)
(4) (4) (4)

QTY	ITEM	PART NUMBER	DESCRIPTION
A/R	12	64B112-1	MOUNTING BRACKET
—	11	—	—
2	10	4594	WASHER, AN960-6
4	9	2567	RIVNUT, #AB-75, B.F. GOODRICH
4	8	4561	LOCKWASHER, AN936-A3
4	7	35464	SCREW, A11525-932-R3
6	6	35182	SCREW, AN515-6-8
6	5	2530	NUT, AN364-632
A/R	4	64B112	MOUNTING BRACKET (SEE NOTE 4)
1	3	IC513-1	AMPLIFIER
1	2	IC515	AMPLIFIER (SEE NOTE 1)
1	1	1D395	AMPLIFIER

LIST OF MATERIALS

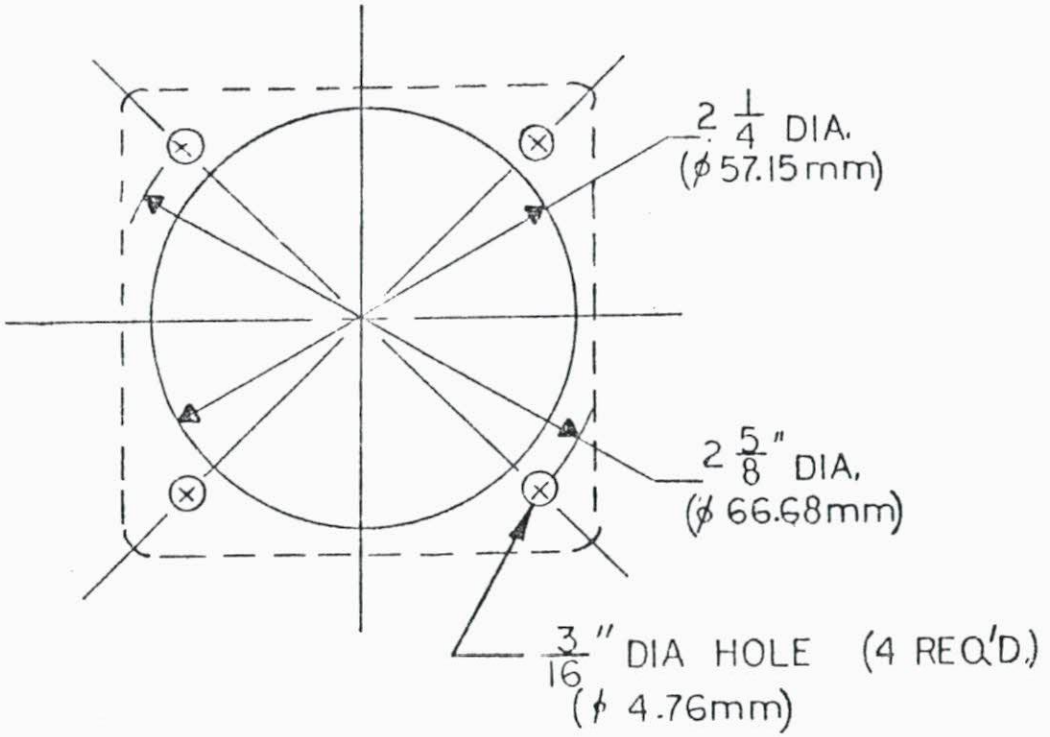
REDRAWN	C. KITCHENS	12-6-74
CHECKED	J F R	11-15-65
ENGINEER	A. B. C	6-6-66
APPROVED	C J [illegible]	6-6-66
MATERIAL	~	

EDO-AIRE MITCHELL
MINERAL WELLS, TEXAS

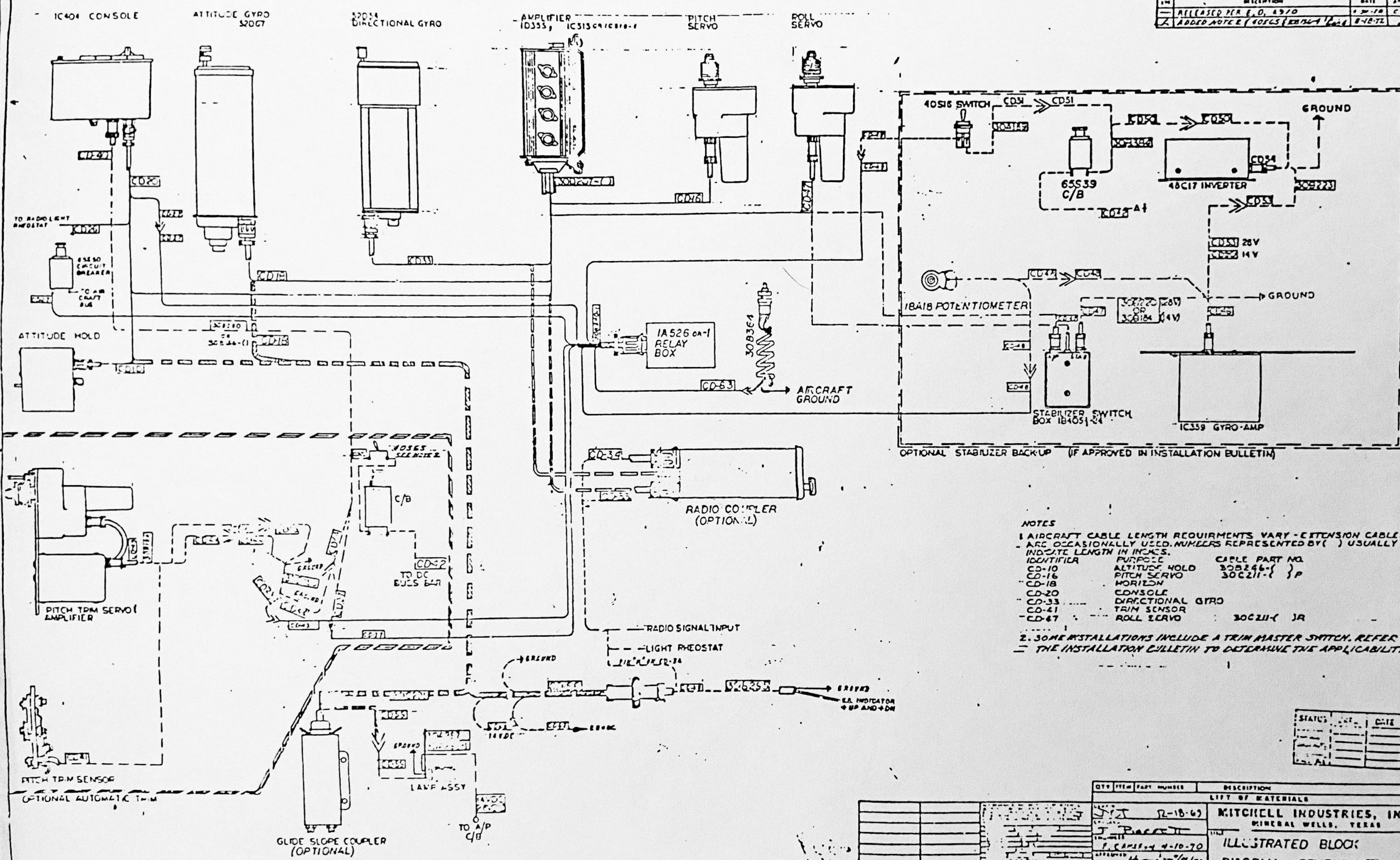
TITLE: AMPLIFIER AND MOUNTING BRACKET INSTALLATION

SIZE | DWG NO. C96500 | REV

EDO-AIRE MITCHELL MINERAL WELLS, TEXAS		TITLE TEMPLATE		DWG. NO. 69A313			
DRAWN J.F.R.	DATE 7-24-63	USED ON RADIO COUPLER ID292	SCALE 1/1	REV	DESCRIPTION	BY	DATE
CHECKED J.C.P	DATE 5-8-74			–	RELEASED PER E.O.		
ENGINEER	DATE	MATERIAL ~	FINISH ~	B	REDRAWN E.O.8847	C.V.	4/16/76
APPROVAL C.J.W.	DATE 5-9-74						



TOLERANCES UNLESS OTHERWISE SPECIFIED:	
DECIMALS XXX:	± .005
DECIMALS XX:	± .010
FRACTIONS:	± 1/64
ANGLES:	± 0° 30'
REMOVE BURRS AND BREAK SHARP EDGES .010	
DO NOT SCALE DRAWING	



NOTES

1. AIRCRAFT CABLE LENGTH REQUIRMENTS VARY - EXTENSION CABLES ARE OCCASIONALLY USED. NUMBERS REPRESENTED BY ( ) USUALLY INDICATE LENGTH IN INCHES.

IDENTIFIER	PURPOSE	CABLE PART NO.
CD-10	ALTITUDE HOLD	30B246-( ) P
CD-16	PITCH SERVO	30C211-( ) P
CD-18	HORIZON	
CD-20	CONSOLE	
CD-33	DIRECTIONAL GYRO	
CD-41	TRIM SENSOR	
CD-67	ROLL SERVO	30C211-( ) R

2. SOME INSTALLATIONS INCLUDE A TRIM MASTER SWITCH. REFER TO THE INSTALLATION BULLETIN TO DETERMINE THE APPLICABILITY.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVED
—	RELEASED PER E.O. 4910		C/W
1	ADDED NOTE 2 (40565 ...)	8-18-72	

LIST OF MATERIALS

MITCHELL INDUSTRIES, INC
MINERAL WELLS, TEXAS

ILLUSTRATED BLOCK DIAGRAM CENTURY III

D | 4-10-70 | 690672-1

NOTED | N/A

APPLICATION: AK 335, AK 310

6-27-67
1-10-69 R
12-18-69 R
2-02-76 R
10-21-77 R
10-19-81 R

MITCHELL CENTURY III AUTOMATIC FLIGHT SYSTEM MODEL AK220 PARTS LIST FOR INSTALLATION IN PIPER PA-24-250, PA-24-260 AND PA-30 AIRCRAFT

(14 VOLT SYSTEM)

1. CENTURY III AUTOMATIC PILOT

Part No.	Description	Qnty.
	GROUP I	
52D67	Attitude Gyro	1 _____
64B90	Plate	1 _____
3S87	Screws 10-32 x 1/2 F.H.	4 _____
2S38	Nuts 10-32 Esna	4 _____
	GROUP II	
52D54	Course Selector D.G.	1 _____
	GROUP III	
1X314	Air Filter	1 _____
	GROUP IV	
1C363-1-161R	Roll Servo	1 _____
7B533	Bracket	2 _____
3S92	Bolt 10-32 x 1/2	8 _____
42A173-1	Cable Clamp	2 _____
30B199	Cable Assembly (Bridle)	1 _____
	GROUP V	
1C363-1-186P	Pitch Servo	1 _____
7B655	Bracket	1 _____
7A654	Bracket	1 _____
7A598	Bracket	1 _____
49A22	Pulley	1 _____
3S240	Bolt 10-32 x 1 1/4 H.H.	1 _____
3S92	Bolt 10-32 x 1/2 H.H.	6 _____
3S182	Screw 6-32 x 1/2 R.H.	2 _____
2S38	Nut 10-32 Esna	7 _____
30B212	Bridle Cable	1 _____
42A173-1	Cable Clamps	2 _____
5S79	Rivet	3 _____
22S74	Cotter Pin	1 _____
3S184	Screws	3 _____
2S30	Nuts	3 _____
4S218	Washers	3 _____
7B1068	Bracket	1 _____
43A178	Spacer	2 _____

1. CENTURY III AUTOMATIC PILOT (CONTINUED)

Part No.	Description	Qnty.	
	GROUP VI		
1C407	Altitude Hold	1	_____
7B316	Bracket	1	_____
75S1	Shockmounts	2	_____
2S67	Rivnut 8-32	2	_____
2S92	Nut 8-32 Hex	2	_____
4S61	Lockwasher #8 Int.	2	_____
47A147-36	Hose	1	_____
58A11	Tee	1	_____
	GROUP VII		
1C404	Console	1	_____
64B125	Plate	1	_____
7A710	Bracket	2	_____
3S254	Screw 4-40 x 1/2 F.H.	4	_____
3S226	Screw 6-32 x 1/2 F.H.	4	_____
2S30	Nut 6-32 Esna	4	_____
2S40	Nut 4-40 Esna	4	_____
4S97	Washer, Finish	4	_____
	GROUP VIII		
1D395	Amplifier	1	_____
3S184	Screws 6-32 x 3/8 R.H.	4	_____
2S30	Nut 6-32 Esna	4	_____
	GROUP IX		
30D207-2	Cable Assembly	1	_____
30B235	Cable Assembly	1	_____
30C211-36R	Cable Assembly	1	_____
30C211-130P	Cable Assembly	1	_____
	GROUP X		
13A329-220	Placard	1	_____
13A132	Placard	1	_____
13A239-5	Placard	1	_____
13A753	Placard	1	_____

_____

PMA INSPECTOR

2. MITCHELL RADIO COUPLER OPTION

Part No.	Description	Qnty.
	GROUP I	
1C388-M	Coupler	1
3S376	Screw 6-32 x 5/8 F.H.	4
9S73	Receptacle	1

PMA INSPECTOR

3. MITCHELL AUTOMATIC PITCH TRIM OPTION

	GROUP I	
1C373-1-220	Pitch Trim Servo	1
7B380	Bracket, Mounting	1
3S237	Screw 8-32 x 1/2 R.H.	6
2S34	Nut 8-32 Esna	6
3S103	Screws 8-32 x 5/8 Fl. H.	4
4S106	Flat Washer 5/32 x 3/8	4
30A153	Cable Splice	1
	GROUP II	
1C365-152	Pitch Trim Sensor	1
3S464	Screw 8-32 x 1/2 R.H.	2
2S67	Rivnut 8-32	3
4S61	Lockwasher #8 Int.	3
3S188	Screw 8-32 x 1 1/2 H.H.	1
43A151	Spacer	1
7A528	Bracket	1
3S102	Screw	2
4S84	Lockwasher	2
	GROUP III	
30B192	Cable Assembly	1
30B193	Cable Assembly	1
30B195	Cable Assembly	1
30B194	Cable Assembly	1
5S72	Grommet	1

3. MITCHELL AUTOMATIC PITCH TRIM OPTION (continued)

Part No.	Description	Qnty.
	GROUP IV	
13A216	Placard	2 ____

PMA INSPECTOR

4. MITCHELL AUTOMATIC ROLL AXIS STABILIZER OPTION

	GROUP I	
1C359	Gyro-Amplifier	1 ____
7A566	Bracket	2 ____
3S92	Bolt 10-32 x 1/2 H.H.	4 ____
2S38	Nut 10-32 Esna	4 ____
4S31	Washer 3/16 x 11/16 x 1/32	4 ____
75S1	Shockmounts	4 ____
4S61	Lockwasher #8 Int.	8 ____
2S92	Nut 8-32 Hex	4 ____
2S93	Wing Nut 8-32	4 ____
	GROUP II	
1B405	Switch Box	1 ____
	GROUP III	
30B184	Cable Assembly	1 ____
30A188	Cable Assembly	1 ____
30A189	Cable Assembly	1 ____
30A205	Cable Assembly	1 ____
30A204	Cable Assembly	1 ____
7A738	Bracket	1 ____
3S27	Screws 4-40 x 1/4 B.H.	2 ____
4S40	Lockwasher #4 Int.	2 ____
30C211-36R	Cable Assembly	1 ____
	GROUP IV	
13A277	Placard	3 ____
13A239-5	Placard	1 ____
13A299	Placard	1 ____
13A279	Placard	1 ____
13A278	Placard	1 ____
13A343-220	Placard	1 ____
13A339	Placard	1 ____

PMA INSPECTOR

EDO-AIRE MITCHELL
PO BOX 610
MINERAL WELLS, TEXAS

BULLETIN No. 246
AUGUST 5, 1964

The Mitchell 1X314 Air Filter is F.A.A. approved for installation per the following instructions.

1. Filter Mounting - Attach the filter to the aircraft structure with (2) AN742D20C clamps. Clamps not furnished. Position clamps at each end of filter. The filter should be mounted as close as possible to the gyros that are using it. The element in the filter may be replaced by removing the thumb screws on the end and removing element.

2. Vacuum System Plumbing - Plumb vacuum system as shown on drawing 69A351. Hose and fittings not furnished. Hose must be routed clear of controls and clamped with cushion AN742 clamps as necessary to prevent damage and allow full freedom of controls. Adjust vacuum regulator if necessary to obtain rated vacuum.

SPECIFICATIONS

1. Capacity 4.0 cubic feet per minute.

2. Pressure drop 0.6 inches mercury.

3. Efficiency: 99.97% of 0.3 micron.

4. Element life: 400 hours nominal at 4.0 CFM.

5. Weight: 0.3 lbs.

6. Air outlet: (2) ¼" Pipe thread (1) 1/8" Pipe thread.

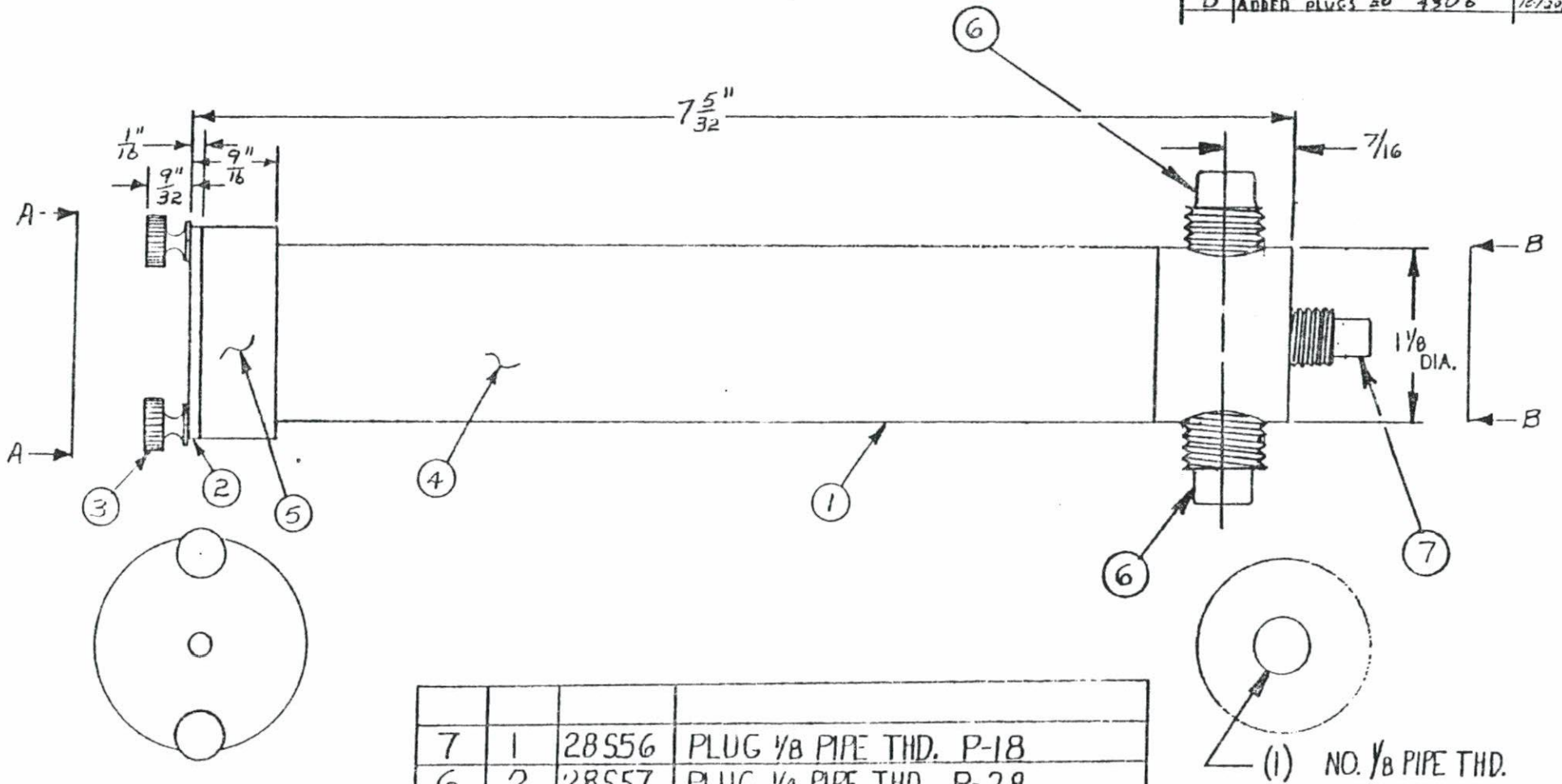
FAA Approved 8-17-64

MITCHELL [illegible]STRIES, INC.
MINERAL [illegible]LLS, TEXAS
DRAWN BY: JFR DATE: 4/29/64
MFG. APP.: DATE:
APPROVED: DATE:

PART NAME FILTER, AIR
USED ON GYRO INSTALLATIONS
SCALE 1/1
MATERIAL NOTED
FINISH N/A

PART NO. 1A314

ISSUE	CHANGES	MEMO.
A	ADDED NOTE JFK	7/7/64
B	REMOVED NOTE JFK	5/8/64
C	ADDED "ASSEMBLY" PER EO 3175	BJE 3-4566
D	ADDED PLUGS EO 4306	10/30/67



VIEW A-A

VIEW B-B

7	1	28556	PLUG 1/8 PIPE THD. P-18
6	2	28557	PLUG 1/4 PIPE THD. P-28
5	1	13A242	LABEL
4	1	51A5	FILTER
3	2	35232	SCREW
2	1	15A154	COVER
1	1	15A153	HOUSING ASSEMBLY
CODE NO.	NO. REQ'D	PART NO.	DESCRIPTION

"MICRO-FILA"

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS
FRACTIONAL DIMENSIONS
ANGULAR DIMENSIONS
DO NOT SCALE DIMENSIONS

A SAMPLE OF THE FINISHED PART MUST BE SUBMITTED TO MITCHELL INDUSTRIES ENGINEERING DEPARTMENT FOR APPROVAL BEFORE PROCEEDING WITH PRODUCTION ON INITIAL ORDER FROM EACH SUPPLIER.

4-08-70 Rev.
7-23-70 Rev.
3-23-71 Rev.
10-27-71 Rev.
7-11-72 Rev.
3-01-76 Rev.
5-21-76 Rev.

SECTION VI.

GROUND CHECKS AND FLIGHT ADJUSTMENT PROCEDURES

CENTURY III AUTOPILOTS

The Century III Autopilot is an "Open Loop" system which responds only to the dynamics of the aircraft in flight, thus the only ground checks that can be accomplished are functional checks as described in this bulletin.

Century III Autopilots may be equipped with any one of the following Amplifiers; 1D395, 1C515 or 1C515-1, depending upon the dynamic response required. Although these Amplifiers are physically interchangeable, only the Amplifier model called for in the installation data is approved for that installation.

If the aircraft installation calls for a 1C515-1 Amplifier, the aircraft should be loaded to or near its aft C. G. limit for the set-up flight test to obtain the most consistent results. Consult aircraft weight and balance data and assure that the fuel burn during test does not place the aircraft outside the C. G. envelope. Other Amplifier models do not require this loading and should be loaded with full fuel and two people.

For all models, fly aircraft to smooth air and adjust power and configuration for a 65% - 75% power cruise conditions, except where otherwise specified.

GROUND CHECKS

A. ROLL

1. Remove Console Face Plate by removing the roll knob and the three face plate retaining screws. After removing the face plate, reinstall the roll knob.

2. Start aircraft engine to obtain Gyro stability. Adjust vacuum regulator to obtain 4.5 to 5.0" vacuum.

3. Rotate aircraft control wheel to level flight (neutral) position. Center roll knob. Push ROLL ON/OFF switch ON. Override Servo by manually rotating control wheel right and left through full travel to determine that Servo is engaged and can be overridden.

4. Rotate roll knob right and left and observe that aircraft control wheel is moving in the correct direction.

   NOTE: Aircraft control wheel will not necessarily be in any particular position when the roll knob is centered, but will remain stationary at the position it is in at the time the roll knob is rotated to its zero electrical output position.

5. Center Course Selector of Directional Gyro and push HDG switch ON, if Radio Coupler is installed, place Coupler Selector Switch in HDG mode. With the HDG switch ON, turns and selected headings are commanded by the HDG knob of the Directional Gyro. The D. G. HDG knob functions by being pushed IN and rotated. With the HDG switch IN, the roll knob on the console is inoperative.

6. Rotate D. G. Course Selector right and left from center, and observe that control wheel rotates in correct direction. Return D. G. Course Selector to center.

7. If Radio Coupler is installed, proceed as follows, if Coupler is not installed, see paragraph 9. Turn on Radio and tune receiver to any available OMNI signal. Center OMNI indicator needle.

8. Place Radio Coupler in OMNI mode. Swing OMNI needle right and left slowly and observe that control wheel rotates in correct direction.

9. Push HDG switch OFF. Push ROLL ON/OFF switch OFF. Rotate control wheel right and left and observe that servo disengages.

10. If equipped with control wheel disconnect, re-engage autopilot and disengage with wheel switch.

B PITCH

1. If the Pitch Ground Check is being conducted independent of Roll, perform Roll steps 1 and 2.

2. Push ROLL ON/OFF switch ON and position roll knob to stop Roll Servo.

   NOTE: If Automatic Trim is installed, pull trim circuit breaker to cut off trim during ground checks.

3. Observe pitch effort meter and center meter by rotating Pitch Command Knob.

4. Push PITCH ON/OFF switch ON. Override Servo by manually moving control wheel full forward and full aft to determine that Servo is engaged and can be overridden. Rotate Pitch Command Knob full up and observe that control column moves aft.

   NOTE: During ground operation, it may be necessary to manually assist control column movement as Servo clutch may not be capable of moving control column with its static friction.

5. Rotate Pitch Command Knob full down and observe that control column moves forward.

6. Center Pitch Command Knob.

   NOTE: Control column will not necessarily move to or maintain neutral position when Pitch Command Knob is centered, but will cease movement anytime pitch axis is at its electrical center as indicated by a centered trim needle.

7. Push ROLL ON/OFF switch OFF. Move control column fore and aft and observe that Pitch Servo disengaged satisfactorily.

C. GROUND CHECKS AND ADJUSTMENT - AUTOMATIC PITCH TRIM

After installation is complete, the automatic trim sensor must be adjusted for centering. The trim sensor point gap (overall) determines the sensitivity of the trim sensor and is factory set. If an adjustment for trim sensitivity is deemed necessary, consult the applicable section of the EDO-AIRE MITCHELL Service Manual.

Centering Adjustments

1. Support the aircraft elevator at the control surface, in approximately the neutral position to simulate flight conditions.

2. Lightly apply pressure to control yoke fore and aft to remove all influence of the static friction in the control system.

3. Point Adjustment - Cam Type

   a. Loosen the contact point bracket attaching screws at both ends.
   b. One end has the attaching screw centered on a hex nut adjusting Cam-Turn the Cam Clockwise or Counterclockwise as necessary to center the contact points on either side of the contact block. Tighten the attaching screws.
   c. Make preliminary test by touching top of elevator cables alternately with sufficient pressure to close the contact point. The points are "centered" where the pressure required to close the points is approximately equal on either elevator cable. When the pressure is equal the physical point gap in inches might or might not be equal.
   d. Ground Check by energizing system and depressing control wheel switch. Pull back gently on control wheel, trim should begin to drive up. Relax pressure and then apply pressure forward, trim should begin to drive down. The force required to cause the trim to operate will be approximately 10 lbs., and should be approximately equal for up and down.
   e. Repeat a - d above until adjustment is satisfactory.

4. Point Adjustment - Set Screw Type

   a. This type contact point bracket does not have the eccentric cam type adjuster. The contact points are moved by loosening the attaching screws at both ends and sliding the point bracket as required to obtain a proper adjustment per c and d above. After adjustment, tighten two lock screws.

5. Point Adjustment - Dual Contact

   a. The dual contact trim sensor may be equipped with either the cam type or the set screw type adjustable contact points.
   b. For Center Adjustment, loosen or remove one contact set from the sensor base plate to keep the two sets from interfering with one another.
   c. Perform Center Adjustment on the remaining contact set per items 1 through 3C above, using the instructions applicable to the type of adjustment employed. Dual contact sensors can be equipped with either the cam type or set screw type contact adjustment.
   d. Reinstall the first contact set and perform Center Adjustment as described in Sections 1 through 3 and/or step 4 as applicable.
   e. After both sets have been approximately centered, the final centering adjustments can usually be performed on one set of points.

D. AUTOMATIC PITCH TRIM SYSTEMS (AUTOTRIM)

Edo-Aire Mitchell manufactures several different type trim systems. These systems vary in method of operation and in detail design and certification requirements. Some models utilize the fail safe concept of malfunction or runaway protection. In this type trim installation the system can withstand any type single failure, anywhere, without uncontrolled operation resulting. These trim systems often employ high trim rates that are operationally better suited to the aircraft model than could be used with a conventional electric trim system. It is very important to never use a substitute trim system component part for an original design part because the fail safe characteristics of the system might be sacrificed. It is also very important to conduct a thorough trim system check, both "ON" autopilot and "OFF" autopilot prior to the first flight, to assure that servo direction is correct in both modes. A trim system running the wrong direction is the same as a runaway. In some cases it is possible to obtain pilot stick forces in excess of 100 pounds in 3-4 seconds under these conditions, therefore always check the system thoroughly for proper function and direction prior to the first set-up flight.

All current Edo-Aire Mitchell trim systems function identically during autotrim mode, however, when operating "OFF" autopilot, two basic methods of operation are used. One method employs the single push button on the control wheel. This system utilizes the trim sensor for direction sensing. The other type uses either a two section rocker switch or a double toggle switch. The rocker switch has a center bar that must be depressed in conjunction with rocking the switch fore and aft for trim operation to occur. All of the above systems can employ the fail safe system design.

Proceed as follows for system check-out.

Command Type Control Wheel Switch - Rocker Type

1. When the command switch is used on the control wheel then the following functions apply:

   a. When top bar is depressed and released, it disconnects the autopilot.

   b. When top bar is depressed and switch is moved aft, will command an up trim.

   c. When top bar is depressed and switch is moved forward, will command a down trim.

   NOTE: If system is operating correctly, no trim action will occur unless both actions are performed.

2. Pitch Trim is automatically accomplished when the autopilot is engaged. To check the automatic trim proceed with number D.6 below.

Push Button Automatic Trim Control Wheel Switch

3. The push button on the top left hand portion of the pilot's control wheel has three functions:

   a. When pressed and released, it disconnects the autopilot.
   b. When held down, it engages the automatic trim to trim off control pressures.
   c. When held down, it disengages roll servo, if optional stabilizer back-up is installed.

4. Engage trim push button and move yoke to aft limit - Trim should trim UP. Push yoke to forward stop - Trim should trim DOWN.

5. With trim button engaged, move trim wheel to determine that the servo can be manually overridden. Release trim button - check manual trim to see that trim servo disengaged.

6. Pitch Trim is automatically accomplished when the autopilot is engaged. To check automatic trim proceed as follows:

   a. Engage autopilot and rotate pitch command disc to the full down position, and note that trim system trims nose down.
   b. Rotate pitch command disc to full up position, and note that trim system trims nose up. (It might be necessary to supply additional control wheel pressure on the ground due to low autopilot authority.)
   c. Momentarily depress trim switch on control wheel to turn off autopilot.

      NOTE: In autopilot mode there will be approximately a three (3) second trim delay between the pitch command and the operation of the trim during the ground check.

Command Type Control Wheel Switch - Double Toggle

7. This switch assembly uses two separate center off toggle switches. The switch toggles are connected by a specially designed, loose fitting, knob. To check system operation, proceed as follows:

   a. Trim circuit breaker - check IN.
   b. Push switch knob full forward - check nose down trim operation.
   c. With switch full forward - check manual override at crank.
   d. Pull switch knob full aft - check nose up trim.
   e. With switch full aft - check manual override at crank.
   f. Release switch - check that trim disengages.

8. To check autotrim operation proceed as in D.6 above.

FLIGHT ADJUSTMENTS

The Flight Adjustments required by the Century III Automatic Flight Control System vary sligh. depending upon the Amplifier utilized and the options employed.

The 1C515-1 model Amplifier requires two adjustments NOT required on systems equipped with the 1D395 or 1C515 Amplifiers.

INITIAL ADJUSTMENT - 1C515-1 ONLY

For these adjustments the amplifier must be inside the cockpit. Remove the amplifier portion of the harness, as necessary to place the amplifier inside for this adjustment, or use a suitable extensio harness.

A. ROLL THRESHOLD ADJUSTMENT (Rth) - The Roll Threshold potentiometer is attached to the circuit board of the 1C515-1 amplifier and is accessible from the bottom of the amplifier with the base plate removed.

CAUTION: During autopilot operation, care must be exercised to assure that the larger power transistors on the side heat sinks do not become grounded to the airframe or interna damage to the amplifier will result.

1. With the aircraft in smooth air and trimmed for level flight, engage the Roll and HDG section of the autopilot and center the HDG indice.

2. Adjust the roll threshold potentiometer clockwise until a noticeable roll oscillation develops, (clockwise rotation increases the sensitivity).

3. Rotate potentiometer counterclockwise until lateral oscillation is eliminated.

NOTE: Counterclockwise rotation past the desired adjustment will cause long term lateral oscillation and possible wandering on established headings.

4. Grasp control wheel and displace aircraft in roll. If no oscillation develops, proceed to pitch adjustment. If roll oscillation develops, turn roll pot counterclockwise until oscillation stops. Repeat until no oscillation is detectable.

B. PITCH THRESHOLD ADJUSTMENT (Pth) - The Pitch Threshold potentiometer is attached to the circuit board of the 1C515-1 amplifier, and is accessible for adjustment by removal of the cover pla on top of the amplifier.

1. With the aircraft in smooth air, engage the roll, HDG and ALT HOLD sections of the autopilo

2. Turn the pitch threshold pot clockwise until the control wheel begins a noticeable oscillation i pitch, then gradually turn the pot counterclockwise until the oscillation is undetectable.

NOTE: This oscillation might show up as an actual oscillation of the aircraft in pitch attitud or simply as "choppy" control action. If no oscillation is obtained, turn pot 1 - 2 turns counterclockwise and proceed with 3.

3. Using the pitch command disc, command a climb attitude and observe that the aircraft changes attitude smoothly without a "stair step" type action. If the attitude change is smooth, proceed with C. If "stair stepping" occurs during the attitude change, turn the pitch counterclockwise in one turn increments, changing attitude between adjustments, until attitude changes can be made smoothly.

C. Engage altitude hold mode and allow aircraft to stabilize. If an oscillation can be felt, turn pitch threshold pot counterclockwise in one turn increments, until oscillation is eliminated or can no longer be felt.

This completes the threshold adjustments. Proceed with the standard Century III Set - up.

FLIGHT ADJUSTMENTS - ALL CENTURY III

A. ROLL - NO RADIO COUPLER

1. Fly aircraft to smooth air and trim for level flight, using 75% power.

   NOTE: Check for correct rudder trim. If rudder is incorrectly trimmed, the Century III will fly the aircraft with a wing low to compensate for the rudder out of trim condition.

2. With roll knob centered, push ROLL ON/OFF switch ON set D. G. Course Selector to D. G. heading.

3. Push HDG switch ON. If aircraft does not maintain selected heading, adjust as necessary to center adjustment screw (B) on console (Ref. Dwg. 69A585).

4. Rotate D. G. Course Selector 90° to 150° left and observe aircraft bank angle. Adjust left bank screw (A) of console to obtain 20° bank. (Ref. Dwg. 69A585). Rotate adjustment screw clockwise to increase bank angle.

   CAUTION: Keep D. G. Course Selector at least 25° left of D. G. heading until adjustment is completed.

5. Rotate D. G. Course Selector 90° to 150° right and observe aircraft bank angle. Adjust right bank screw (C) of console to obtain 20° bank. (Ref. Dwg. 69A585). Rotate adjustment screw clockwise to increase bank angle.

   CAUTION: Keep D. G. Course Selector at least 25° right of D. G. heading until adjustment is completed.

6. Allow aircraft to return to selected heading and level flight. Observe that Autopilot maintains selected heading ± 2°. If not, repeat steps 2 and 3 until selected heading is maintained.

7. Push OFF HDG switch and with roll knob centered, observe that aircraft flys wings level ± 2°.

8. Turn roll knob full left and observe that aircraft banks left 28° ± 3°.

9. Repeat step 8 to the right.

B. ROLL - WITH RADIO COUPLER

1. Fly aircraft to smooth air and trim for level flight.

   NOTE: Check for correct rudder trim. If rudder is incorrectly trimmed, the Century III will fly the aircraft with a wing low to compensate for the rudder out of trim condition.

2. Set Coupler Selector switch to OMNI. Match D. G. Course Selector to D. G. heading.

3. Set D. G. Course Selector to match D. G. heading (centered).

4. Push ROLL ON/OFF switch ON. Depressing switch on rear of coupler and hold switch IN until adjustment is completed. Push HDG switch ON.

5. Allow aircraft Roll Attitude to stabilize and if necessary adjust for straight and level flight (wings level and ball centered) with center adjustment screw (B) in console (Ref. Dwg. 69A585). After each adjustment, allow aircraft attitude to stabilize and observe it for two minutes to ensure aircraft is maintaining level flight. Release coupler adjustment switch.

6. Place Coupler Selector Switch in the HDG mode and observe that aircraft maintains selected heading $\pm 2^{o}$.

7. Rotate D. G. Course Selector 90^{o} to 150^{o} left and observe aircraft bank angle. Adjust left bank screw (A) of console (Ref. Dwg. 69A585) to obtain 20^{o} bank. Rotate adjustment screw clockwise to increase bank angle.

   CAUTION: Keep D. G. Course Selector at least 25^{o} left of D. G. heading until adjustment is completed.

8. Repeat step 7 to the right.

9. Turn on Radio and set OMNI Bearing Selector to obtain full left deflection.

   NOTE: Full left needle deflection must be maintained until adjustment is completed. This can best be accomplished by being at least 20 miles from the OMNI station and flying approximately to or from the station.

10. Push HDG switch OFF and set D. G. Course Selector 45^{o} right of center indica.
11. Select OMNI mode on the radio coupler and push HDG switch ON. Allow aircraft heading to stabilize.

12. Adjust left intercept screw on side of Radio Coupler as necessary to stabilize Course Selector 45^{o} right of center indica. Turn adjustment screw clockwise to increase intercept angle.

13. To adjust right intercept angle, repeat steps 9 through 12 with OMNI needle deflected full right and Course Selector 45^{o} to left of center indica.

14. Center OMNI needle on a "TO" bearing, and set Course Selector to match OMNI bearing. Allow aircraft to fly to the OMNI station and observe that OMNI needle stays "Centered". If OMNI needle does not maintain center, repeat steps 2 through 5.

    NOTE: If aircraft flys straight and level with adjustment switch depressed, but does not fly OMNI needle centered, reject the 1C388-M Coupler.

C. PITCH

1. With aircraft loaded with full fuel and two people, fly aircraft to smooth air. Trim aircraft for level flight, using 75% power.

2. Push ROLL ON/OFF switch ON, adjust Roll Command Knob for wings level. Center Pitch effort meter by rotating Pitch Command Knob.

3. Observe aircraft's indicated altitude and push ALT switch ON. Allow aircraft to stabilize and observe that aircraft is holding the same altitude at which the ALT switch is pushed ON. If aircraft does not hold engage altitude, adjust Pitch centering screw "E". Ref. Dwg. 69A585 until aircraft does hold engage altitude.

   NOTE: Turn screw clockwise to increase altitude.

4. Push PITCH ON/OFF switch OFF, again note indicated altitude and push ALT switch ON and allow aircraft to stabilize and observe that aircraft is holding engage altitude. Repeat steps 3 and 4 until correct results are obtained on two consecutive steps.

5. Center Pitch Command Knob, and push ALT switch OFF.

6. Rotate Pitch Command Knob if necessary to maintain level flight. After aircraft is stabilized level, observe that Pitch Command Knob is centered ± 1/8".

7. Rotate Pitch Command full up and adjust pitch up limit screw "F". Ref. Dwg. 69A585 to obtain a climb airspeed of approximately 1.2% of stall speed. Turn screw clockwise to increase climb angle.

8. Rotate Pitch Command Knob full down and reduce power to 18" - 20" h.g. After aircraft has stabilized, adjust pitch down limit screw "D". Ref. Dwg. 69A585 to obtain aircraft Vc speed (end of green arc).

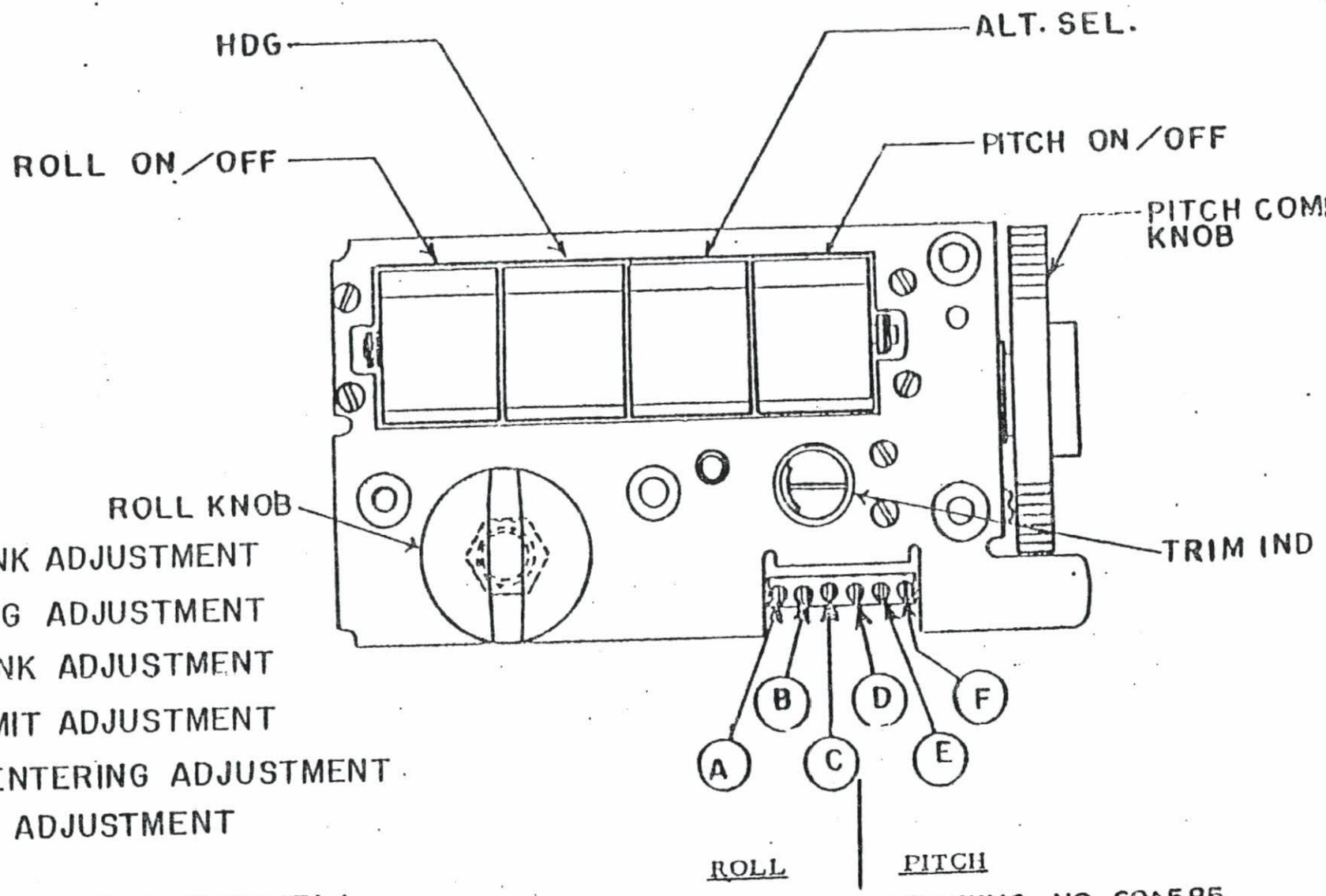
   CAUTION: It may be necessary to reduce power to prevent excessive speed.

9. Slow aircraft to approach speed and configure aircraft as required for normal ILS approach. (Consult A.F.M. Supplement). Check the down range of adjustment available for adequacy in this configuration. Increase the down limit if necessary by readjusting Pot. "D".

   NOTE: Climb and descent speed may be adjusted to any desired speed that is within the approved airspeed range.

D. GLIDE SLOPE COUPLER

Refer to the G/S Coupler Section of this Installation Manual for G/S Coupler adjustment, procedure and test box hook-up.



(A) LEFT BANK ADJUSTMENT
(B) CENTERING ADJUSTMENT
(C) RIGHT BANK ADJUSTMENT
(D) DOWN LIMIT ADJUSTMENT
(E) PITCH CENTERING ADJUSTMENT
(F) UP LIMIT ADJUSTMENT

EDO AIRE MITCHELL
MUNICIPAL AIRPORT
MINERAL WELLS, TEXAS

DRAWING NO. 69A585
CENTURY III
ADJUSTMENT DRAWING

6-10

68S83

SECTION IX.

APPENDIX

1. Drawing Package (Refer to Master Drawing List for contents)

2. S.T.C. Certificate

3. A.F.M. Supplement, Supplemental Flight Manual, Placard, or Pilot's Operating Handbook Supplement

4. R.F.I. Instructions

☐ If A.F.M. Supplement is required, remove and place in the Airplane Flight Manual.

☐ If Supplemental Flight Manual is required, remove and place with aircraft records.

☒ If Placard is required, place on instrument panel in full view of the pilot.

☐ If Pilot's Operating Handbook Supplement is required, remove and place with Pilot's Operating Handbook.

United States of America

Department of Transportation — Federal Aviation Administration

Supplemental Type Certificate

Number SA662SW

This certificate issued to Mitchell Industries, Inc. dba
EDO-AIRE MITCHELL
P. O. Box 610
Mineral Wells, Texas 76067

certifies that the change in the type design for the following product with the limitations and conditions thereof as specified hereon meets the airworthiness requirements of Part 3 of the Civil Air Regulations.

Original Product — Type Certificate Number: 1A15 and A1EA
Make: Piper
Model: PA-24-250, PA-24-260, and PA-30

Description of Type Design Change: Installation of Mitchell Automatic Flight System Model AK220 consisting of Century III Autopilot with optional automatic Pitch Trim, Automatic Aileron stabilizer and radio Coupler in accordance with Bulletin No. 322 Revision 3, dated 12-18-69. Installation of Glide Slope Coupler in accordance with Bulletin No. 366, dated 9-18-67. Installation of Mitchell Radio Coupler Model 1C388-3 per Bulletin No. 611, Revision 1, dated 4-16-74 and Master Drawing List No. 87A708, Revision A, dated 4-16-74.

Limitations and Conditions:

1. Mitchell Industries, Inc. FAA Approved Placard 13A329-220 required with Century III installation.
2. Mitchell Industries, Inc. FAA Approved Placard 13A343-220 required with Stabilizer installation.
3. FAA Approved Autopilot Flight Manual Supplement dated 4-16-74, PN68S168, is required for Mitchell Radio Coupler Model 1C388-3.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: May 27, 1966

Date of issuance: June 24, 1966

Date reissued: 9/7/66; 2/7/69; 1/26/70; 4/16/74 Revision 4

Date amended:

By direction of the Administrator

Don P. Watson
(Signature)

Don P. Watson
Acting Chief, Engineering and Manufacturing Branch
(Title)

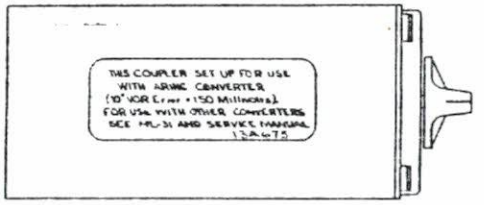
Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

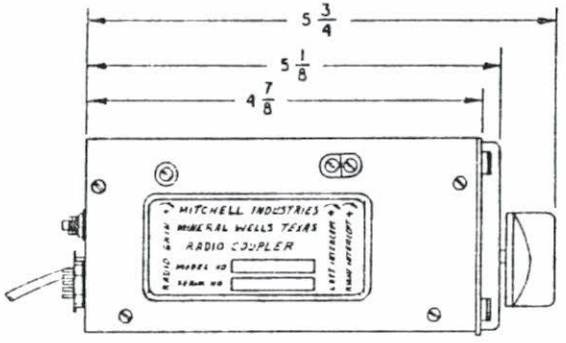
This certificate may be transferred in accordance with FAR 21.47.

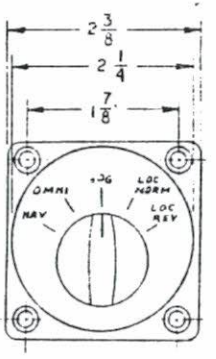
FAA Form 8110-2 (10-68)

MDE CHG.	SERIAL NO	E.O. NUMBER	DATE
G	6000	294	2-28-71

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
—	RELEASED PER E.O.		
G	[illegible]	[illegible]	
H	ADD 13A675 PLACARD E.O. # 6307	2-[illegible]	C. ELL

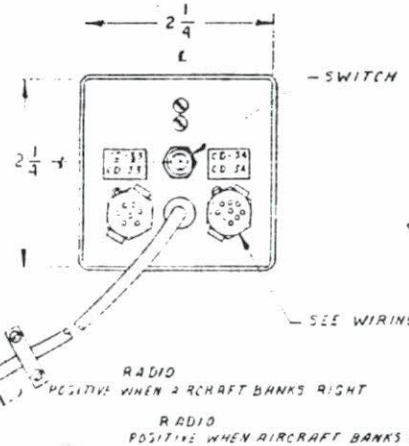




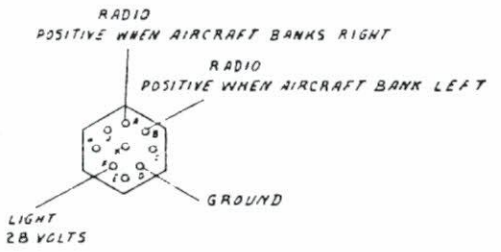


CAUTION
DO NOT USE MOUNTING SCREWS LONGER THAN 5/8

PLACARD 13A254
INSTALL CENTERED ON RIGHT SIDE OF COUPLER



CD-34 14 VOLT HOOK-UP
9 SOCKET MATING CONNECTOR P/N 9573



CD-34 28 VOLT HOOK-UP
9 SOCKET MATING CONNECTOR P/N 9573

NOTES:
1. WEIGHT: 1.0 LBS.
2. REFER TO SPEC. NO. 12A213 FOR ENGINEERING SPECIFICATIONS.

REFER TO 79C189 FOR FINAL ASSEMBLY

QTY	ITEM	PART NUMBER	DESCRIPTION

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

MATERIAL N/A
FINISH N/A

DRAWN C. WILTON 7-16-70
CHECKED SM 8-3-70
ENGINEER [illegible]
APPROVED [illegible]

MITCHELL INDUSTRIES, INC.
MINERAL WELLS, TEXAS

TITLE
RADIO COUPLER
OUTLINE DRAWING
SERIAL NUMBER 5000 AND ABOVE

SIZE | DWG NO IC 388 M | REV
SCALE FULL | SHEET

EDO-AIRE MITCHELL
P.O. Box 610
Mineral Wells, Texas 76067

FAA APPROVED
AUTOPILOT FLIGHT MANUAL SUPPLEMENT
FOR
OPERATION OF AUTOPILOT RADIO COUPLER MODEL 1C388-3

Reg. No. _____
Ser. No. _____

This supplement must be attached to the FAA Approved Autopilot Flight Manual when Radio Coupler Model 1C388-3 is installed in accordance with FAA Approved Bulletin No. 611 dated 3-25-74. The information contained herein is FAA Approved material which along with the FAA Approved pilot's check list, placards, instrument markings and Autopilot Flight Manual is applicable to the operation of the airplane when modified by the installation of Radio Coupler Model 1C388-3.

I. LIMITATIONS:

A. Refer to the limitations section of the Autopilot Flight Manual or Limitations Placard for Autopilot System Operating Limitations.

II. PROCEDURES:

A. Normal Operation.

Preflight

1. Tune and identify VOR-VOT Station and conduct standard VOR receiver check.

2. Engaged roll and HDG modes of the autopilot and select OMNI mode on the radio coupler. Move the OMNI bearing selector (O.B.S.) to cause a right needle deflection - note the control wheel moves right. Move the O.B.S. to cause a left needle deflection - note the control wheel moves left.

3. Conduct autopilot and trim preflight check in accordance with Autopilot Flight Manual or Operations Manual, as appropriate.

VOR INTERCEPT AND TRACKING.

1. Select desired OMNI bearing with the O.B.S. Set HDG bug on present course. Engage autopilot roll and HDG modes and select OMNI mode on radio coupler. If selected course causes a full scale left-right radio needle (C.D.I.) deflection, the radio coupler will cause the autopilot to turn to a 45° intercept heading. With initial deflections less than full scale the intercept angle will be less than 45° and will vary with the radio off set. Interception and tracking will be automatic. When the radio coupler is in any radio mode the HDG bug on the compass indicator is not in use and may be positioned as desired.

2. For cross-country VOR tracking in areas of poor VOR reception, NAV mode may be selected. NAV mode is a lower sensitivity VOR mode that will reduce autopilot reactions to erratic VOR signals. Because of lower sensitivity this mode should not be utilized where accurate short term tracking is required.

ILS INTERCEPT AND TRACKING.

1. Always select the <u>inbound</u> ILS front course magnetic bearing on the O.B.S. for both front and back ILS course tracking.

2. For front course tracking <u>inbound</u> or back course tracking <u>outbound</u>, select <u>LOC Normal</u> mode. LOC normal provides automatic 45° intercept and tracking. Select roll and HDG modes on the autopilot mode selector.

3. For front course tracking outbound to procedure turn area or back course tracking inbound for back course ILS approach, select LOC Reverse on radio coupler. Select Roll and HDG modes on the autopilot mode selector.

NOTE: The radio coupler will provide automatic cross wind correction up to approximately a 15° wind correction angle (W.C.A.). In navigation situations that require more than a 15° W.C.A. heading mode and the HDG bug should be used for tracking.

HDG HOLD

1. To use the HDG bug on the compass indicator (H.S.I.) the radio coupler must be positioned to HDG and the autopilot must have both roll and HDG modes engaged. If the Radio Coupler is positioned in any radio mode, the HDG bug will not function with the autopilot.

B. EMERGENCY OPERATION

1. If VOR signal is not reliable the radio coupler should not be utilized. Return to HDG mode.

2. Any time a radio tracking problem is suspected return the radio coupler mode selector to HDG and manually control radio course intercepts and tracking, using the autopilot heading bug.

III. PERFORMANCE:

No Change.

FAA APPROVED:

for Glen W. Welsh
Chief

ENGINEERING AND MANUFACTURING BRANCH
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SOUTHWEST REGION, FORT WORTH, TEXAS

FAA APPROVED
DATE: 4-16-74
PN 68S168

AUTOPILOT R.F.I. INTERFERENCE

Due to the variety and hi-power of radio equipment often found in today's General Aviation Aircraft, there exists a potential radio transmission interference problem with other equipment in the aircraft. Because of this potential, the autopilot system is designed and constructed with R.F. shielding to prevent interference however, installation combinations can occur wherein minor interference is possible.

R.F.I. interference from radio transmissions usually are manifest in one of two ways, either by interference with the VOR deviation needle display or by causing the autopilot flight path to be displaced during transmissions.

The most common interference causes the VOR deviation needle to jump or swing while the transmitter is being keyed. This type of interference affects the autopilot only in radio coupled modes as the autopilot is coupled to the VOR indicator meter movement and therefore, sees any needle movement as a command. VOR needle interference is sometimes found to be wholly within the NAV - COM set, that is, radiation of conduction of transmission energy from the transmitter to the VOR receiver internally. When this is the case, there is little the installation technician can do to overcome the condition other than contact the field representative of the company involved for advice.

A much less common interference type is one in which radio transmissions affects the roll of pitch axis of the autopilot directly. This occurence is caused by R.F. energy being radiated into the autopilot system and there being detected and fed as a signal to one or more of the autopilot command channels.

This problem is usually found only in aircraft equipped with high output power transmitters and varies with antenna types and mounting locations. The reflected power or standing waves on the antenna cable is probaly the greatest single source of this trouble, however, an antenna located so it radiates into the cabin can also cause the problem. The effect of this interference on the aircraft flight path is usually an initial displacement and then resumption of the programmed flight path. The response is similar in both roll and pitch.

Often, due to the wave form of radio frequency energy and the wave length, (frequency) an interference problem will only be found on one or two isolated frequencies. In these cases simply moving the autopilot component suspected or the radio source by a few inches will correct the problem.

Occasionally a new autopilot installation will cause a deterioration in A.D.F. receiver operation quality. This is reverse of the previous problem wherein "noise" from the autopilot is transmitted to the radio. One source of "noise" in the autopilot is the 5KHZ oscillator in the amplifier. Oscillator noise can get into the A.D.F. system by both induction and radiation. A power buss common to both the autopilot and A.D.F. receiver is a good path for this type interference. If

a separate power source corrects the problem then a filter, such as Edo Avionics part number 1A479, in one or both A+ leads will usually eliminate the interference. Radiation from the autopilot cable and terminal ends, although very weak, can sometimes interfere with the A.D.F. receiver by radiation into the sense antenna, or loop, or both. Cable routing providing additional distance between these items and additional shielding of the autopilot leads is uaually best in these cases. Since the autopilot leads are already shielded, the most productive solution is usually routing.

An important area, often overlooked, is the ground and ground path. It has been found in many aircraft that a considerable resistance builds up between adjacent sections of skin paneling and structure due to paint, primer, etc. This increases the resistance in the ground path for some equipment, which lowers the equipment tolerance to R.F.I. Sometimes it is adviseable to add a braided ground strap to the equipment to assure a good ground.

Ground loops developing in cable shielding and the aircraft due to the existance of a ground potential difference can also cause problems. In some cases it might be necessary to connect only one end of a shielded cable to ground or even to isolate the autopilot amplifier from ground.

In summary, if an interference between the autopilot system and one or more of the radios is determined to exist, then one or more of the following cures should be tried in an effort to eliminate the interference.

1. Install a filter in one or all involved A+ leads.
2. Reroute antenna leads.
3. Reroute autopilot leads and cabling.
4. Relocate antenna.
5. Relocate autopilot component- Consult GADO office concerning approval of installation deviation.
6. Add ground straps to affected component (s).
7. Eliminate ground from one end of the long ground shielded leads.
8. Isolate autopilot amplifier from ground.

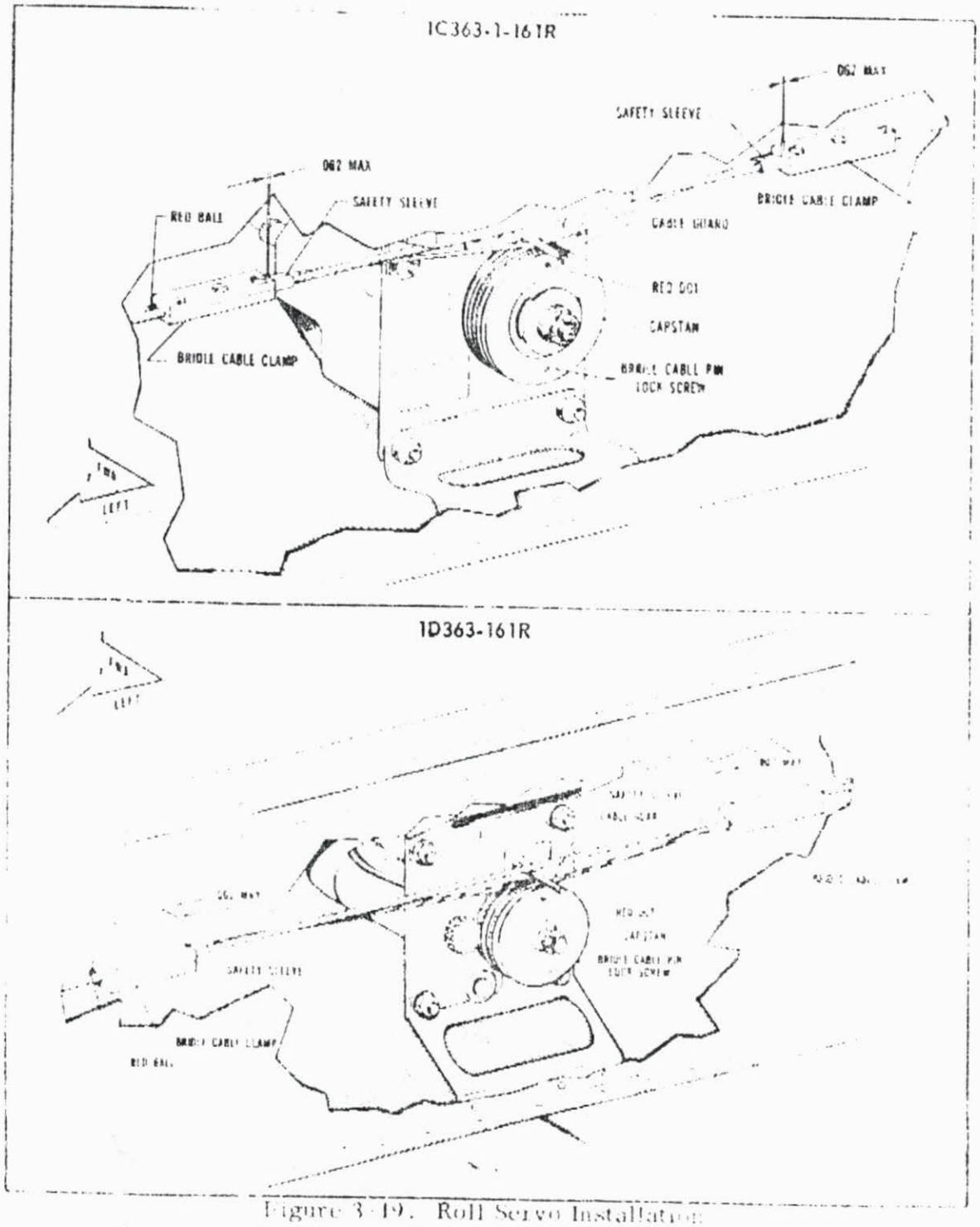


Figure 3-19. Roll Servo Installation
PA-24-260, Serial Nos. 24-4567 and up, PA-30, Serial Nos. 30-1255 and up and PA-39, Serial Nos. 39-1 and up

Century III Autopilot

As of January 1, 2001 the Century III Autopilot System is no longer in production.

Weight:	19.5 - 24 lbs.				
Power:	4.5 amps @ 14 or 28 VDC				
Panel Size:	DG and AG - 3-ATI				
Control Console:	5.00"W x 2.25"H x 2.50"L				

The Century III is a two axis roll/heading/pitch autopilot consisting of the lighted directional and attitude gyros, control console, computer/amplifier and servos. Standard features include separate roll and pitch engagement, altitude hold, roll and pitch command, and automatic and manual electronic pitch trim. The optional radio navigational coupler is identical to the Century IIB's coupler.

The Century III is the preferred altitude hold autopilot for dealer-installed, retrofit installations in a wide range of single- and multi-engine aircraft. Its fingertip control of roll command of constant bank angles up to 30&#176, smooth pitch command for exact climb and descent attitudes, and outstanding altitude hold performance has given the Century III an enviable reputation for excellence. Unlike many competitive systems, the custom-manufactured cable harness is included to reduce installation time and expense.

Options: Either square or round gyros may be chosen to accommodate your cockpit panel. The Century NSD slaved or non-slaved HSI system or other compatible HSIs may be substituted for the directional gyro. The optional glideslope coupler is armed and locked when the autopilot is programmed for an approach and the radio is set up to the localizer.

Wing Rocks in the CIIB & CIII

The most common complaint received in technical service is wing rocks. Although several factors can cause these problems, it is necessary to start somewhere in order to eliminate those factors. The autopilot is designed so that with a given amount of error signal input to the autopilot, it will output a certain amount of drive voltage to the servo motor. In turn, the servo will move the aircraft control with a certain amount of voltage applied to it. The servo is mechanically coupled to the aircraft control through a push rod or bridle cable - so we have electrical and mechanical factors to consider. Given the shop's test equipment capabilities, if they cannot fix the problem, they can at least rule out certain things. Checking for proper cable tension on the main cable and the bridle cable should be the first thing. Normally the bridle cable is set a 17 +/- 2 lbs. For push rods, check for rod end bearing friction and play. The entire aircraft control should be checked for excessive binding.

For the electrical portion, check the servo motor for correct start-up voltage. Century servos will normally start to run between 1.5 and 1.8 VDC when power is applied. The only way to do this is with a variable power supply and volt meter. A nominal cutoff voltage is 2.5 VDC. Needless to say that some aircraft will perform OK at 2.5 VDC while some will not. So the lower we can get the servo to operate, the better. For autopilot operation we have to make sure it outputs the proper voltage for a known error signal. The amplifier would need to be bench checked for this operation. An in-aircraft check can be verified by giving a 10° heading error signal into the system, using the 66D141-1 gyro substitution test box and inputting a horizon signal to stop control wheel movement. We should have 10° -1 +2 roll horizon to cancel the 10° heading signal. Some CIIB installations will have a 1B440 rate filter in line from the attitude horizon - don't forget to bench check this item.

If no success so far, check for low threshold adjustment. On older CIIB & CIII amplifiers there is not a potentiometer for this adjustment. It is developed from special three-junction diodes located in the feedback circuit from the roll motor. To increase threshold voltage it is possible to add no more than two pairs of 48S33 diodes in series with the three-junction diodes already in the PC board. For newer CIIB & CIII system, a potentiometer is provided for threshold adjustment. In the CIIB system this is located behind the console/amp faceplate, in the bottom right corner of the unit. In the CIII system it is located on the PC board of the autopilot amplifier.

The last remaining possibility, if no other problems are found, would be to have the attitude gyro checked by a qualified instrument repair shop.

Supplemental Type Certificate

STC Number:
SA576SW

This certificate issued to:
Century Flight Systems, Inc

STC Holder's Address:
3003 F.M. 1195 P.O. Box 610
Mineral Wells TX 76067
United States

Description of the Type Design Change:
Installation of Mitchell automatic flight system model AK186 consisting of Piper altimatic IIIB autopilot radio coupler, and automatic aileron stabilizer model AK179.

Application Date:

Status:
Reissued, 06/25/1984

Responsible Office:
ASW-190 Ft. Worth Special Certification Office Tel: (817) 222-5190

TC Number -- Make -- Model:
1A15 -- Piper Aircraft, Inc., The New -- PA-24-250
1A15 -- Piper Aircraft, Inc., The New -- PA-24-260
A1EA -- Piper Aircraft, Inc., The New -- PA-30

Full Text of STC:

Comments

Comments:

Supplemental Type Certificate

STC Number:
SA662SW

This certificate issued to:
Century Flight Systems, Inc

STC Holder's Address:
3003 F.M. 1195 P.O. Box 610
Mineral Wells TX 76067
United States

Description of the Type Design Change:
Installation of Mitchell automatic flight system model AK220 consisting of Century III autopilot with option automatic pitch trim, automatic aileron stabilizer and radio coupler.

Application Date:

Status:
Issued, 06/25/1984

Responsible Office:
ASW-190 Ft. Worth Special Certification Office Tel: (817) 222-5190

TC Number -- Make -- Model:
1A15 -- Piper Aircraft, Inc., The New -- PA-24-260
1A15 -- Piper Aircraft, Inc., The New -- PA-24-250
A1EA -- Piper Aircraft, Inc., The New -- PA-30

Full Text of STC:

Comments

Comments:

x 5354