

CHAPTER

22

AUTO FLIGHT

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**CHAPTER 22 - AUTOFLIGHT
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AUTO FLIGHT - DESCRIPTION AND OPERATION

1. General

A. The Auto Flight chapter contains description and maintenance instructions related to those units and components which furnish a means of automatically controlling the flight of the aircraft. Includes those units and components which control direction, heading, attitude, altitude and speed.

2. Description (Refer to Fig. 1 and Fig. 2)

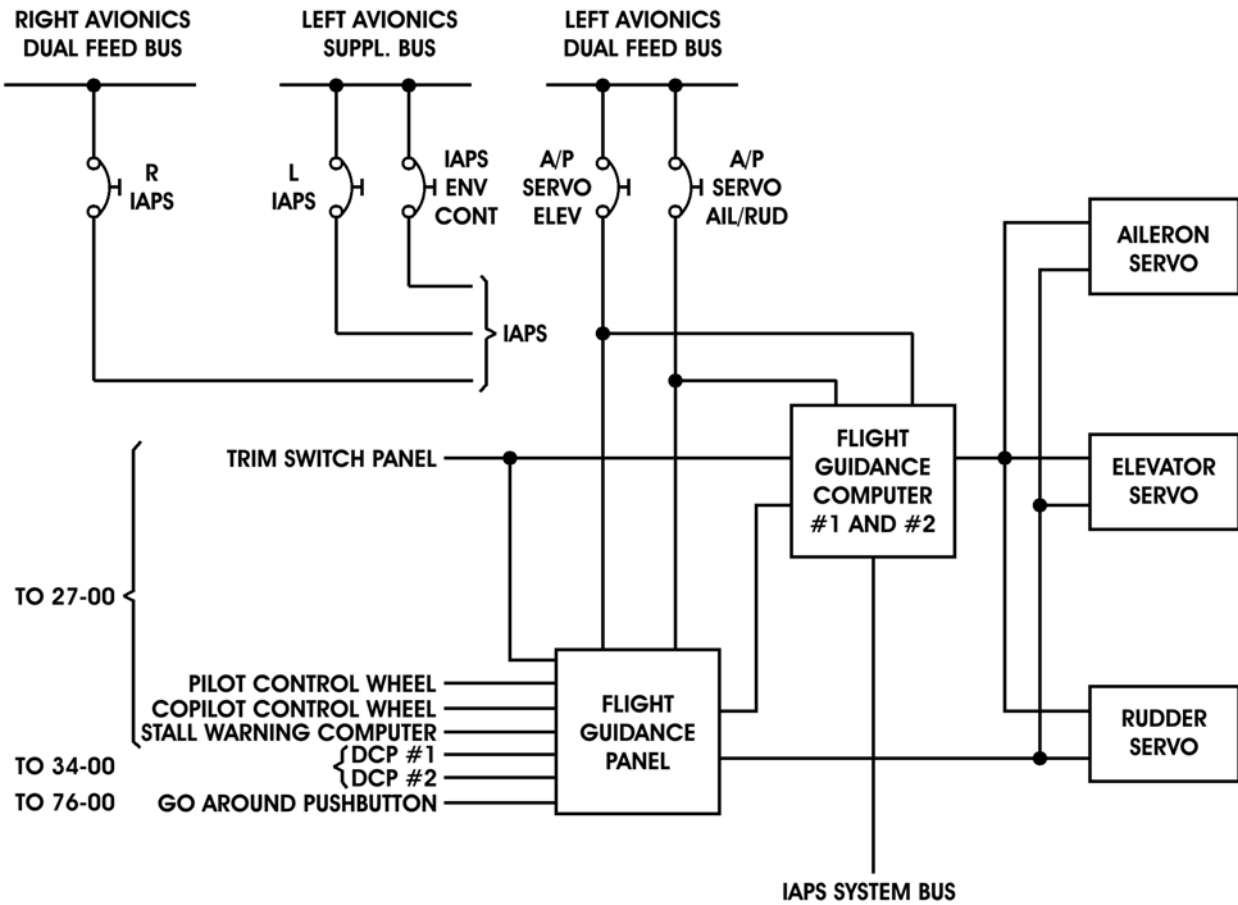
A. The Auto Flight chapter comprises the following sections:

(1) Autopilot, 22-10

1. Flight Guidance Computer Unit
2. Flight Guidance Panel Unit
3. Aileron Primary Servo and Servo Mount, 22-11
4. Elevator Primary Servo and Servo Mount, 22-12
5. Rudder Primary Servo and Servo Mount, 22-13

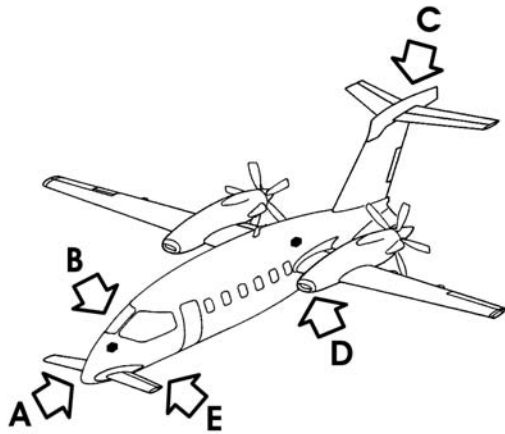
B. Autopilot. This section relates to the Flight Guidance Computer and Flight Guidance Panel Units; to the Aileron, Elevator and Rudder Primary Servos and Servo Mounts.

- (1) Flight Guidance Computer Unit. It is the main electronic unit of the Autopilot system and it is integrated in the IAPS (the electronic boards rack), located at about fuselage station -395.
- (2) Flight Guidance Panel Unit. It is the operating panel for the use of Autopilot system and it is located in the cockpit, in front of pilot and copilot, at about fuselage station 0.
- (3) Aileron Primary Servo and Servo Mount. It is the servomechanism for the adjustment of aileron position and it is located at about fuselage station 6,710.
- (4) Elevator Primary Servo and Servo Mount. It is the servomechanism for the adjustment of elevator position and it is located on the horizontal stabilizer upper surface, at about fuselage station 11,200.
- (5) Rudder Primary Servo and Servo Mount. It is the servomechanism for the adjustment of rudder position and it is located under the floor in the cockpit, at about fuselage station 1,086.

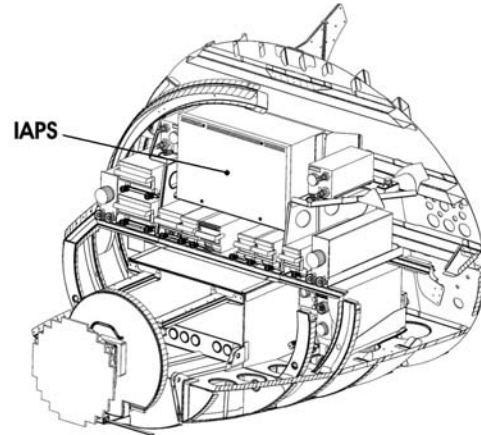


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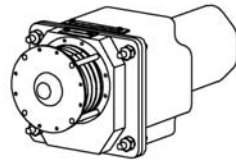
Fig. 1 - Auto Flight - Block Diagram



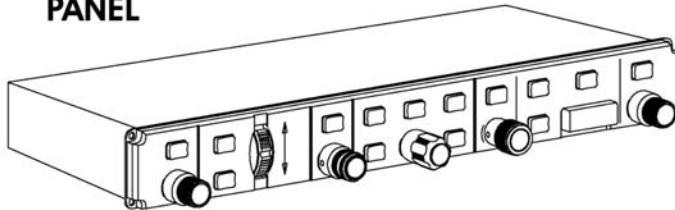
A NOSE BAY



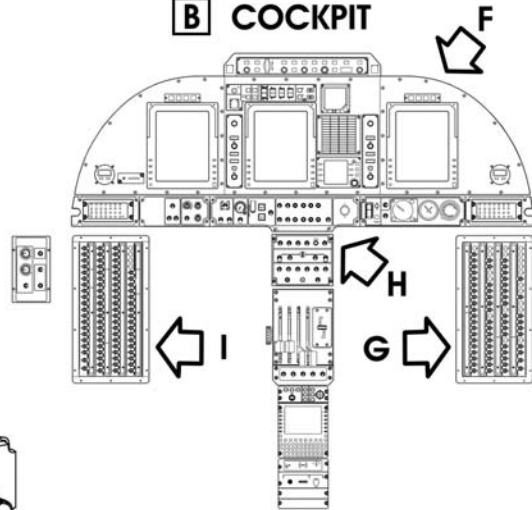
- C ELEVATOR SERVO**
- D AILERON SERVO**
- E RUDDER SERVO**



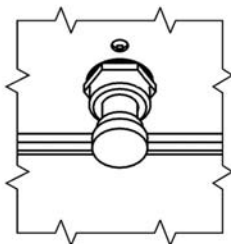
- F FLIGHT GUIDANCE PANEL**



B COCKPIT



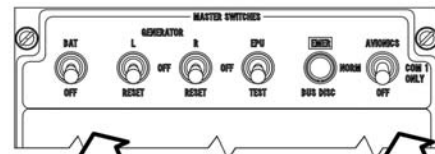
CIRCUIT BREAKERS



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- G R IAPS**
- I L IAPS**
- IAPS ENV CONT**
- A/P SERVO ELEV**
- A/P SERVO AIL/RUD**

H MASTER SWITCH PANEL



BATTERY SWITCH

AVIONICS MASTER SWITCH

Fig. 2 - Auto Flight - Location of Components

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AUTO FLIGHT - ADJUSTMENT/TEST

1. FGC 3000 - CAT II Inspection Ground Check

A. Procedure

- (1) Check that FGC 1 and FGC 2 on MFD in the Maintenance Section operate correctly.
- (2) Check A/P as per preflight check procedure.

2. FGP 3000 - CAT II Inspection Ground Check

A. Procedure

- (1) Check that FGP in the Maintenance Section operate correctly.
- (2) Check A/P as per preflight check procedure.

3. Autopilot Functional Check

WARNING: CHECK THAT THE ELECTRICAL GENERATION AND DISTRIBUTION FUNCTIONAL TEST, THE DEPENDENT POSITIONING DETERMINING FUNCTIONAL TEST AND THE FLIGHT MANAGEMENT COMPUTING FMS-3000 FUNCTIONAL TEST ARE PERFORMED.

A. Fixtures, Test and Support Equipment
Circuit Breaker safety clips and tags.

Pitot/Static System Test Unit P/N DMA MPS30

VHF NAV (VOR/ILS/MKR) Ramp Test Set IFR 4000 or equivalent.

B. Procedure

NOTE: Check actual and stored data status of the units on the check menu in the relevant FD/AP area.

- (1) Check that the following circuit breakers are closed (pilot side):

- L DCU
- R DCU
- PRI PITCH
- L PFD
- L PFD CONT
- L PFD HTR
- MFD
- MFD CONT
- MFD HTR
- A/P SERVO ELEV
- A/P SERVO AIL/RUD

- L IAPS
 - L IAPS ENV CONT
 - ADC 1
 - ADC 1 BACKUP
 - AHC 1 BACKUP
 - CDU
 - NAV 1
 - AUDIO 1
- (2) Check that the following circuit breakers are closed (copilot side):
- GPS
 - NAV 2
 - AHC 2
 - ADC 2
 - R IAPS
 - R PFD
 - R PFD CONT
 - R PFD HTR

NOTE: The abbreviations shown in the following procedures correspond to the following colours: (G) = Green, (W)= White, (Y) = Yellow, (R) = Red, (M) = Magenta, (C) = Cyan.

C. FCS Modes

- (1) Press the FD pilot and copilot push-button on autopilot panel (Flight Guidance Panel).
- (2) On L/R PFD check that:
 - V-bars are enabled
 - ROLL and PITCH modes are enabled
 - ROLL and PITCH indications (G) flash for 5 seconds and then remain steady in the dedicated area on L PFD
 - ALTS indication (W) is displayed
 - Arrow ← (W) is displayed on the center of FGS area.
- (3) Deselect the FD pilot and copilot push-button on autopilot panel (Flight Guidance Panel) .
- (4) On the L PFD check that:
 - V-bars are disabled
 - ROLL and PITCH modes are disabled
- (5) Press Heading SYNC on autopilot panel (Flight Guidance Panel).
- (6) On the L/R PFD check that:
 - Heading Bug is aligned with the aircraft longitudinal axis.

D. HEADING MODE

- (1) Press HDG on autopilot panel (Flight Guidance Panel).
- (2) On the L/R PFD check that:
 - V-bars are enabled

- HDG mode is enabled
 - HDG mode indication (G) flashes for 5 seconds and then remains steady in the relevant area
 - ALTS indication (W) is displayed
 - V-bars remains in horizontal position
- (3) Use the HGD knob on autopilot panel (Flight Guidance Panel) to select 10° Left with respect to the actual reference line.
 - (4) On L/R PFD check that the V-bars indicate a left turn.
 - (5) Use the HDG knob on autopilot panel (Flight Guidance Panel) to select 10° Right with respect to the actual reference line.
 - (6) On L/R PFD check that the V-bars indicate a right turn.
 - (7) Press Heading SYNC on autopilot panel (Flight Guidance Panel).
 - (8) On L/R PFD check that:
 - Heading bug is aligned with the aircraft longitudinal axis.
 - V-bars are aligned (level flight)
 - (9) On circuit breakers panel, pilot side, open the circuit breakers CB AHC1 and AHC 1 BACKUP.
 - (10) On L PFD check that:
 - V-bars are disabled after 4 seconds.

E. 1/2 BANK MODE

- (1) Select a standard (STD) barometric pressure (29,92 in Hg) on pilot and copilot DCP.
- (2) Check that the STD barometric pressure (29,92 in Hg) is displayed on L/R PFD.
- (3) Select 1/2 BANK mode on autopilot panel.
- (4) On L/R PFD check that:
 - FD Command V-bar indication is activated
 - 1/2 BANK ARK (W) is displayed above the Roll scale.
- (5) Tune NAV 1 on the test set LOC frequency. Select LOC1 as NAV active source on R/PFD. Press APPR and cage the Localizer.
- (6) Check that the 1/2 BANK ARC indication (W) on R/L PFD is not displayed.

F. ALTITUDE PRESELECT MODE (Pilot side)

- (1) Press CPL (pilot side) on autopilot panel.
- (2) On L/R PFD check that:
 - FGC Arrow ← (W) is displayed on the center of FGS mode area.
 - V-bars remains displayed.
- (3) Set the ALTITUDE preselector to an altitude > 10000 ft (FL > 100).
- (4) Set 9000 ft with the Air Data Test Set (do not exceed 3000 ft/min of climb rate).
- (5) Select the HDG mode on autopilot panel.
- (6) On L/R PFD check that:
 - V-bars are active
 - HDG mode indication (G) flashes for 5 seconds, then remains steady.
 - ALTS indication (W) is steady.

- (4) Wait that the set altitude (9000 ft) is reached.
- (4) Select 8000 ft with the ALT knob on autopilot panel.
- (4) On L/R PFD check that:
 - 8000 ft indication (FL 80) is displayed in the preselected altitude area
 - ALTS indication (W) is steady.
- (4) Decrease the altitude to 8000 ft with the Air Data Test Set (do not exceed a descent rate of -1000 ft/min).
- (4) ALTS indicator (W) is not displayed.
- (4) ALTS CAP indicator (G) is displayed.
- (4) When the altitude is reached, ALTS indication (G) is displayed.
- (5) Increase the altitude above 8000 ft (8200 ft) with the Air Data Test Set (do not exceed a climb rate of 1000 ft/min).
- (6) On L/R PFD check that:
 - ALTS indicator (G) remains displayed
 - V-bars command indicates Pitch Down.
- (7) Decrease the altitude below 8000 ft (7800 ft) with the Air Data Test Set (do not exceed a descent rate of -1000 ft/min).
- (8) On L/R PFD check that:
 - ALTS indicator (G) remains displayed
 - V-bars command indicates Pitch Up.
- (9) Deselect all the vertical modes on autopilot panel (press two times ALT push-button).
- (10) ALTS indication (G) is not displayed.
- (11) Press the ALT push-button on autopilot panel and check that the ALT indication (G) is displayed.

NOTE: In the following steps the altitudes + 500 ft and - 500 ft are referred to the altitude set when the ALT mode is activated.

- (12) Increase the altitude of 500 ft above the current altitude with the Air Data Test Set (do not exceed a climb rate of 1000 ft/min). Set 8300 ft.
- (13) On L/R PFD check that:
 - ALT indicator (G) remains displayed
 - V-bars command indicates Pitch Down.
- (14) Decrease the altitude of 500 ft below the altitude set when ALT push-button was pressed, using the Air Data Test Set (do not exceed a descent rate of -1000 ft/min). Set 7800 ft.
- (15) On L/R PFD check that:
 - ALT indicator (G) remains displayed
 - V-bars command indicates Pitch Up.
- (16) Press and release the FD SYNC push-button on Cockpit Control Wheel.
- (17) On L/R PFD check that:
 - V-bars indicate a level flight.

G. VS MODE (Copilot side)

- (1) Press CPL (copilot side) on autopilot panel.

- (2) On L/R PFD check that:
 - FGC Arrow → (W) is displayed on the center of FGS mode area on L/R PFD
 - FD is in basic mode.
- (3) Set a climb rate of 1000 ft/min and an altitude of 12000 ft using the Air Data Test Set and check that the vertical speed shows a climb rate of + 1000 ft/min.
- (4) After approx. 30 seconds, select VS mode on autopilot panel and by means of Pitch Thumb Wheel, set a vertical velocity of 1000 ft ↑.
- (5) The indication (G) VS → 1000 ↑ (C) is displayed on FCS and the V-bars indicate a level flight.
- (6) Set a climb rate of 2000 ft/min with the Air Data Test Set. Check that the indication (G) VS → 1000 ↑ ± 100 ft (C) is displayed and that the V-bars indicates Pitch Down.
- (7) Press the SYNC push-button on Copilot Control Wheel.
- (8) Check that the indication (G) VS → 2000 (± 100 ft) is displayed on FGS and that the V-bars indicate a level flight.
- (9) Press CPL on autopilot panel.
- (10) On L/R PFD check that:
 - FGC Arrow ← (W) is displayed on the center of FGS mode area.
 - FD is in basic mode

H. FLC MODE (Pilot side)

- (1) Set the ALT selector to FL 14.
- (2) Set an altitude of 5000 ft with the Test Set Static Pitot. Do not exceed a VSI of 3000 ft/min and set a speed of 200 kts.
- (3) On L/R PFD check that:
 - a Baro Altitude of 5000 ft is displayed
 - the Airspeed scale indicates a speed of 200 kts.
- (4) Set the ALT knob on autopilot knob to ALT of 7000 ft (FL 70).
- (5) On L/R PFD check that:
 - the FL70 indication (C) is displayed.
- (6) Select the FLC mode on autopilot panel.
- (7) On L/R PFD check that:
 - the (G) Roll and (G) FLC < 200 (C) indications are displayed on vertical area.
- (8) Maintain the current altitude with the Test Set Static Pitot and increase the speed to 250 kts.
- (9) On L/R PFD check that:
 - V-bars indicate Pitch up
 - Airspeed indicator indicates 250 kts.
- (10) Press the FD SYNC push-button on Copilot Control Wheel.
- (11) On L/R PFD check that:
 - SYNC is displayed till the SYNC push-button is pressed
 - FLC < 250 is displayed on the relevant FCS area
 - V-bars indicate a level flight.

- (12) Set the preselected altitude to 0 ft (FL 0).
- (13) On L/R PFD check that (C) FL 0 indication is displayed.
- (14) Use the SPEED knob on autopilot panel and set a speed of 258 kts.
- (15) Set a speed of 270 kts on Test Set.
- (16) On L/R PFD check that:
 - when in overspeed mode, the V-bars perform a Pitch up and the FLC OSPD (Y) is displayed
 - The overspeed aural warning is activated.
- (17) Set a speed of 200 kts with the Test Set Static Pitot.
- (18) Press the two FD push-buttons on autopilot panel to clear the display.
- (19) Check that all the vertical, lateral and FD modes are deselected.
- (20) Press the IAS/MACH pushbutton (SPEED knob) on autopilot panel.
- (21) On L/R PFD check that:
 - IAS speed bug change the value in MACH.
- (22) .Press CPL (copilot side) on autopilot panel.

I. NAV MODE (Copilot side)

NOTE: Set the FMS as active NAV source with an active flight plan (on RPF) to perform the following check.

- (1) Set an altitude of 4000 ft with the Test Set Static Pitot and maintain a speed of 0 kts.
- (2) On L/R PFD check that:
 - altimeter shows an altitude of 4000 ft.
- (3) Press VNAV.
- (4) On L/R PFD check that:
 - V-bars indicate a neutral condition
 - (G) Roll indication is displayed
 - (G) VPITCH indication is displayed
 - (W) ALTS indication is displayed.
- (5) Set FL 20 on autopilot panel.
- (6) Set an altitude of 2000 ft with a climb rate of 2000 ft on Test Set.
- (7) On L/R PFD check that:
 - (W) ALTS indication is not displayed
 - (G) VPITCH indication changes in (G) VALTS CAP (at approx. 2400 ft)
 - (C) FL 20 indication flashes
 - V-bars perform a Pitch up.
- (8) On L/R PFD check that:
 - (G) VALTS CAP indication change in (G) VALTS when 2000 ft are reached
 - V-bars are in neutral condition.
- (9) Set an altitude of 1750 ft with the Test Set Static Pitot.
- (10) On L/R PFD check that:
 - (C) FL 20 indication flashes again and changes in colour (Y) (at approx. 1800 ft)

- V-bars perform a Pitch up.
- (11) Press CPL (pilot side) on autopilot panel.
- (12) Press Vent on Test Set Pitot Static.

J. AP ENGAGEMENT

NOTE: .Check that the following circuit breakers are closed: PRIPITCH / SEC PITCH / YAW / ROLL / AIP SERVO ELEV / AIP SERVO AIL / RUD and check that the PITCH TRIM selector on TRIM control panel is on PRI.

K. AP/YD AND COPILOT ENGAGEMENT AND SERVO TEST

NOTE: Aural warning is activated when the autopilot is disengaged.

NOTE: Every time Autopilot is "engaged", check that the following indications remains displayed on the L/R PFD: (G) AP and YD, the basic mode FD and the V-Bars.

- (1) Set the AP/YD DISC on autopilot panel in down position (disengaged).
- (2) Check that the autopilot is in FD mode.
- (3) Press the AP push-button to engage the autopilot.
- (4) On L/R PFD check that:
 - FGC Arrow ← (W) is displayed on the center of FGS mode area
 - The autopilot is not engaged.
- (5) Set the AP/YD DISC in up position on the autopilot panel
- (6) Press the AP push-button to engage the autopilot.
- (7) On L/R PFD check that:
 - The (G) AP and YD indications are displayed.
 - The (G) ROLL indication is displayed.
 - The (G) PITCH indication is displayed.
 - The (W) ALTS indication is displayed.
- (8) Once press the MSW push-button on the Pilot Control Wheel.
- (9) The autopilot is disengaged.
- (10) On L/R PFD check that:
 - The (R) AP indication flashes, followed by flashing of (Y) YD indication and then lights off
 - The V-Bars are displayed.
- (11) Engage the autopilot on the autopilot panel.
- (12) Press the YD push-button on the autopilot panel.
- (13) On L/R PFD check that:
 - The (Y) YD indication flashes and then lights off.
 - The V-Bars are displayed.
- (14) Press the AP push-button on the autopilot panel.
- (15) The autopilot is disengaged.
- (16) Engage the autopilot on the autopilot panel.

- (17) Press the APPR push-button on the autopilot panel and then the GA push-button on the left throttle lever.
- (18) On L/R PFD check that:
 - The (G) GA mode replaces the (G) ROLL and PITCH modes
 - The (W) ALTS indication lights off
 - The V-Bars perform a Pitch up.
- (19) Press the FD SYNC switch on the Pilot Control Wheel.
- (20) On L/R PFD check that:
 - The (G) GA mode is replaced by the (G) ROLL and PITCH modes
 - The (W) ALTS indication is displayed again
 - The V-Bars are levelled.
- (21) Push the MSW button on the Pilot Control Wheel.
- (22) The autopilot is disengaged.
- (23) Engage the autopilot on the autopilot panel.
- (24) Simulate a stall condition (rotate the cone).
- (25) The autopilot is disengaged.
- (26) Check on the L/R PFD that the (R) AP and (Y) YD indications flash and then remain steady.
- (27) Remove the stall condition.
- (28) Engage the autopilot on the autopilot panel.
- (29) Press the MSW push-button on the Copilot Control Wheel.
- (30) The autopilot is disengaged.
- (31) Engage the autopilot.
- (32) Set the PITCH TRIM switch to NOSE DOWN position or to NOSE UP/LWD/RWD position on the Pilot Control Wheel.
- (33) The autopilot is disengaged.
- (34) On L/R PFD check that:
 - The (R) AP indication flashes and then lights off
 - The (G) YD indication remains steady
 - The V-Bars and the basic FD modes are displayed.
- (35) Press the CPL push-button on the autopilot panel.
- (36) On L/R PFD check that:
 - FGC Arrow → (W) is displayed on the center of FGS mode area
 - The autopilot is not engaged.
- (37) Set the AP/YD DISC in down position (disengaged) on the autopilot panel.
- (38) Press the AP push-button to engage the autopilot.
- (39) On the L/R PFD check that the autopilot is engaged.
- (40) Check that the autopilot is not engaged on L/R PFD.
- (41) Set the AP/YD DISC in up position (engaged) on the autopilot panel.
- (42) Press the AP push-button to engage the autopilot.
- (43) On the L/R PFD check that the AP and YD are engaged.
- (44) Once press the MSW push-button to disengage the autopilot on the Copilot Control Wheel.
- (45) Engage the autopilot on the autopilot panel.

- (46) Press the APPR push-button on the autopilot panel and then press the GA push-button on the left throttle lever.
- (47) On L/R PFD check that:
 - The (G) GA mode replaces the (G) ROLL and PITCH modes
 - The (W) ALTS indication lights off
 - The V-Bars perform a pitch-up.
- (48) Press the SYNC switch on the Copilot Control Wheel.
- (49) On L/R PFD check that:
 - The (G) GA mode is replaced by the (G) ROLL and PITCH modes
 - The (W) ALTS indication is displayed again
 - The V-Bars are levelled.
- (50) Set the PITCH TRIM switch to NOSE DOWN position or to NOSE UP/LWD/RWD position on the Copilot Control Wheel.
- (51) The autopilot is disengaged.
- (52) The YD remains active.
- (53) Engage the autopilot.
- (54) Set the TRIM selector to OFF position.
- (55) Check that the autopilot is disengaged.
- (56) Set the TRIM selector to SEC position and try to engage the autopilot.
- (57) Check that the autopilot is not engaged.
- (58) Set the TRIM selector to PRI position and then engage the autopilot.
- (59) Tip the AHC1 or AHC2 with an angle greater than 6° or 8°(Roll).
- (60) The autopilot is disengaged.
- (61) Level off the AHC1 or the AHC2 and align the Heading below the longitudinal axis on the EHSI.
- (62) Engage the autopilot.
- (63) Tip the AHC1 or AHC2 with an angle greater than 6° or 8°(Pitch).
- (64) The autopilot is disengaged.
- (65) Level off the AHC1 or the AHC2 and align the Heading below the longitudinal axis on the EHSI.
- (66) Engage the autopilot.
- (67) Push the CPL Arrow ← on the pilot side.
- (68) Press HDG on the autopilot panel.
- (69) On L/R PFD check that:
 - The (G) AP and YD indications are displayed
 - The V-Bars and the basic FD modes are displayed.
- (70) Rotate the AHC1 to simulate a right turn and then a left turn.
- (71) The Control Wheel and the V-bars rotate clockwise and counterclockwise.
- (72) Level off the AHC1.
- (73) The V-Bars return to levelled position.
- (74) Rotate the AHC1 to simulate a nose up and then a nose down.
- (75) The control stick moves forward while the V-Bars go down, then the control stick moves after and the V-bars go up.
- (76) Level off the AHC1.

- (77) The V-Bars return to levelled position.
- (78) Use the pedals to move the rudder all to left and then all to right.
- (79) Check that there is YAW drag during the rudder movement.
- (80) Press the MSW push-button on the Copilot Control Wheel.
- (81) The autopilot is disengaged.
- (82) Use the pedals to move the rudder all to left and then all to right.
- (83) Check that there is YAW drag during the rudder movement.
- (84) Engage the autopilot.
- (85) Move the control stick forward and hold it in this position.
- (86) The Trim system moves after 3 seconds and a red icon ↑ E is displayed.
- (87) Move the control stick after and hold it in this position.
- (88) The TRIM system moves after 3 seconds and a red icon ↑ E is displayed.
- (89) Put the control stick in neutral position (center position).
- (90) Press and move the Trim manual switch on the control wheel (UP or DOWN).
- (91) The autopilot is automatically disengaged and the trim elevator surface moves according to the control stick movement.
- (92) The (R) AP indication flashes for 5 seconds and then lights off.

4. Autopilot - Operational Test

The system perform its built in test function at power on (Avionics Switch ON). In case of failure, a red boxed FD is displayed on the upper side of both PFDs.

AUTOPILOT - DESCRIPTION AND OPERATION

1. General

- A. The Autopilot system is based on two Flight Guidance Computer unit, integrated in the electronic boards rack (IAPS).

It receives, as input, several signals from external controls device and communicates with the IAPS system bus. Other inputs from the system are those of the Flight Guidance Panel, located in the cockpit (a single panel, common for pilot and copilot).

The output of the system is constituted by the movements of the three servomechanism (Aileron, Elevator and Rudder).

2. Description (Refer to Fig. 1)

- A. The Autopilot system is based on two Flight Guidance Computer units FGC-3003 (#1 and #2), integrated in the electronic boards rack (IAPS), located in the nose bay.

The system receives:

- The inputs from the Trim Switch Panel
- The inputs from the Pilot and Copilot Control Wheels
- The inputs from the Stall Warning Computer

(Refer to Chapter 27).

- The inputs from the DCP panels (#1 and #2)

(Refer to Chapter 34)

- The input from the Go Around Pushbutton

(Refer to Chapter 76).

- B. It also communicates with the whole on-board avionics by means of the IAPS system bus. On this bus it receives and transmits data from/to all the apparatus involved in the navigation (PFD, MFD, Reversionary Panel, GPS, ADC, AHC, NAV, RTU, CDU, other IAPS electronic boards).

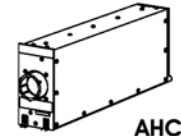
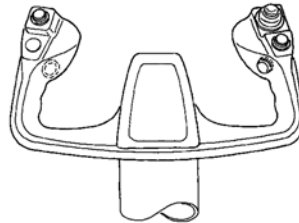
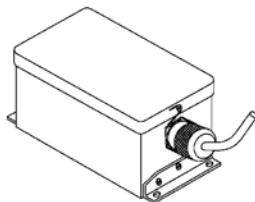
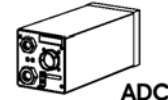
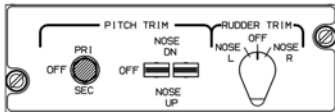
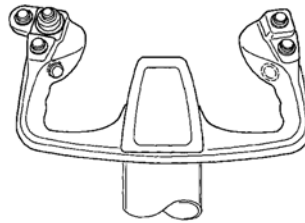
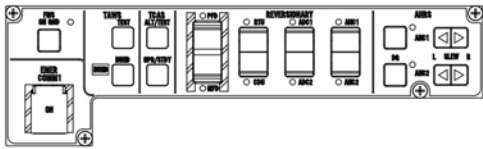
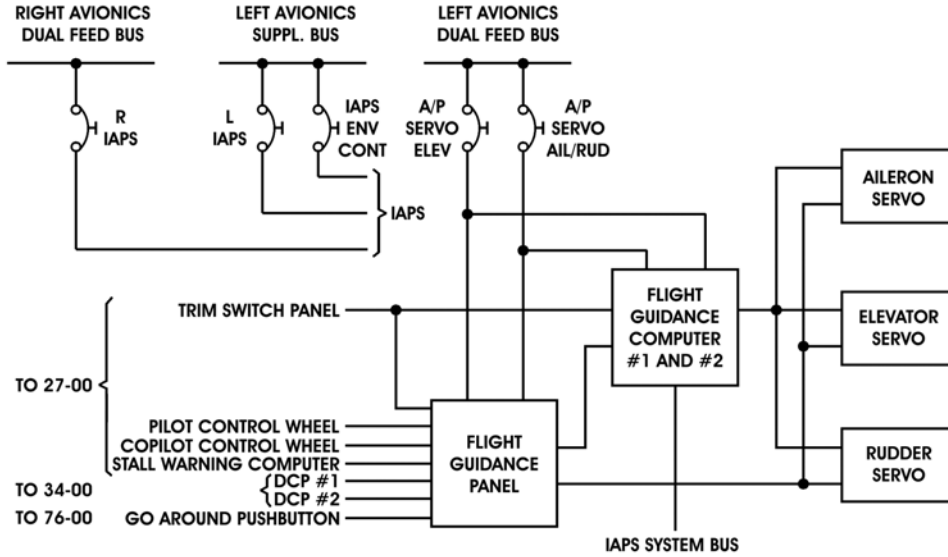
(Refer to Chapter 34).

- C. Other inputs from the system are those of the Flight Guidance Panel FGP-3000, located in the cockpit (a single panel, common for pilot and copilot).

- D. The output of the system is constituted by the movements of the three servomechanisms Aileron (Roll), Elevator (Pitch) and Rudder (Yaw). They are three units SVO-3000.

- E. Power is obtained by the +28 Vdc left avionics dual feed bus, via circuit breakers AP/SERVO ELEV and A/P SERVO AIL/RUD.

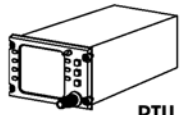
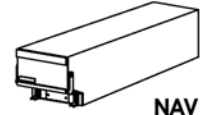
Other power voltages (+5 Vdc) are generated internally to the IAPS. The IAPS power supply depends on circuit breakers L IAPS, R IAPS and IAPS ENV CONT.



GO AROUND
 PUSHBUTTON

STALL WARNING
 COMPUTER

PILOT/COPILOT
 CONTROL WHEEL



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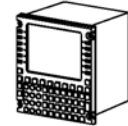
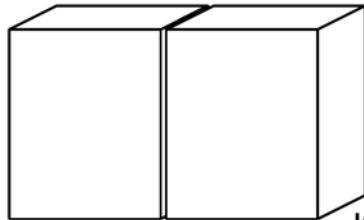
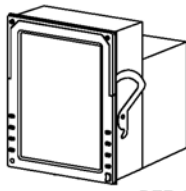
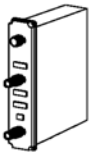


Fig. 1 - Autopilot

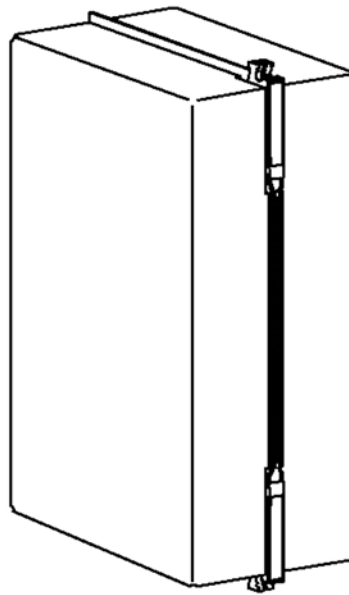
3. Controls and Indicators

The system has the following controls and indicators:

- Flight Guidance Computer FGC-3003
- Flight Guidance Panel FGP-3000

A. Flight Guidance Computer (Refer to Fig. 2)

Two identical FGC modules contain the flight guidance, Autopilot, Yaw Damper, and elevator trim control functions. The FGCs use inputs from the AHS, ADS, navigation receivers, FGP, FMS, and Autopilot servos to generate lateral and vertical steering commands. The steering commands are supplied to the Flight Directors when selected by the pilot. When the Autopilot is engaged, each FGC also supplies motor drive to one side of each pitch, roll, and yaw servo, and processes feedback from each servo. The elevator trim control function applies arm and command logic to the aircraft pitch trim system.



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Fig. 2 - Flight Guidance Computer FGC-3003

B. Flight Guidance Panel (Refer to Fig. 3)

(1) The FGP contains most of the controls for operation of the flight guiding system. Controls for the Autopilot, Yaw Damper, Flight Directors, and the lateral and vertical modes are located on the FGP. The main functions of the panel are:

1. Flight Director Select and Course

The Flight Director select button (FD) and course selection knob (CRS1) for the pilot-side is located on the far left of the FGP. The Flight Director select button and course selection knob (CRS2) for the copilot is located on the far right of the FGP.

2. Vertical Mode Controls

The vertical mode controls are located on the lefthand side of the FGP. The vertical mode controls include the Vertical Speed (VS) button, Vertical Navigation (VNAV) button, and the pitch UP/DOWN wheel.

3. Flight Level Change and Speed Control

The Flight Level Change button and SPEED knob are located to the right of the Vertical mode controls. FLC is a vertical mode that requires the use of the SPEED knob.

4. Lateral Mode Controls.

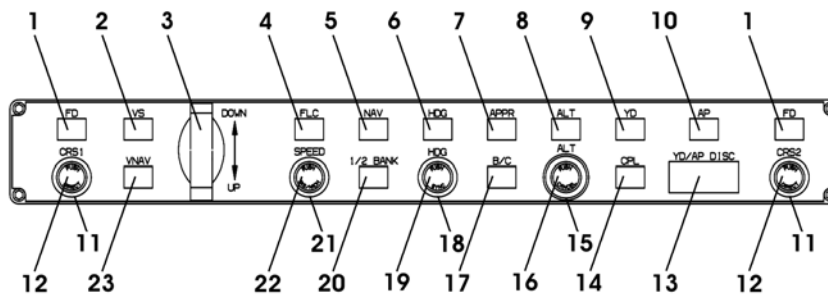
The lateral mode controls are located in the center of the FGP. The lateral mode controls include the Navigation mode button (NAV), one-half Bank button (1/2 BANK), Approach mode (APPR) button, Back-course button (B/C), heading mode (HDG) button, and heading (HDG) knob.

5. Altitude Select and Altitude Hold

The Altitude (ALT) hold button and Altitude preselect knob are located to the right of the lateral mode controls. Altitude hold mode is a vertical mode. The altitude preselect mode is a vertical mode that requires the use of the Altitude preselect knob.

6. Autopilot and Yaw Damper

The Autopilot and Yaw Damper controls are located on the righthand side of the FGP. The Autopilot and Yaw Damper controls include the Autopilot on/off button, Yaw Damper on/off button, Couple button, and the YD/AP Disconnect (AP/YD DISC) bar.



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- | | |
|---------------------------------------|----------------------------|
| 1. FD buttons | 13. YD/AP DISC switch bar |
| 2. VS button | 14. CPL button |
| 3. DOWN UP wheel | 15. ALT knob |
| 4. FLC button | 16. ALT PUSH CANCEL button |
| 5. NAV button | 17. B/C button |
| 6. HDG button | 18. HDG knob |
| 7. APPR button | 19. HDG PUSH SYNC button |
| 8. ALT button | 20. 1/2 BANK button |
| 9. YD button | 21. SPEED knob |
| 10. AP button | 22. IAS/MACH button |
| 11. CRS1 and CRS2 knobs | 23. VNAV button |
| 12. CRS1 and CRS2 PUSH DIRECT buttons | |

Fig. 3 - Flight Guidance Panel Unit (FGP-3000)

The following table lists the functions of the Flight Guidance Panel controls.

Control	Function
AP button	Push the AP engage button to engage the autopilot. The autopilot will engage if the AP DISC switch-bar is raised, no unusual attitudes/rates exist, and if FCC monitoring does not detect any autopilot faults.
YD button	Push the YD engage button to engage or disengage the yaw damper. The yaw damper may be engaged without engaging the autopilot.
CPL button	The CPL button selects the master FCC computer. Push the CPL button to transfer to the other FCC.
YD/AP DISC switch bar	Manually lower the AP DISC switch-bar to disengage the autopilot. Manually raise the AP DISC switch-bar to enable the autopilot to be engaged.
FD buttons	Two FD buttons are installed. The left side button applies to the left side (PFD) flight director; the right side button applies to the right side (PFD) flight director. These buttons can turn a flight director on and off. At power-up, both flight directors are off.
DOWN UP wheel	Turn the VS/pitch wheel to change the vertical reference value used by vertical speed and pitch modes. This wheel is not functional when glideslope is captured.
HDG button	Push the HDG button to alternately select or deselect heading mode. HDG annunciates on the PFD.
HDG knob	Turn the HDG knob to change the selected heading (shown on the large display). This knob simultaneously controls the heading bug on both left and right side displays.
HDG PUSH SYNC button	Push the (center) HDG PUSH SYNC button to synchronize the heading bug to the current aircraft heading (read under the lubber line). This button syncs the heading bug on the left and right side displays.
1/2 BANK button	Push the 1/2 BANK button to alternately select or deselect half-bank mode. The 1/2 BANK mode draws a white arc above the roll scale representing ± 15 degrees.
APPR button	Push the APPR button to alternately select or deselect approach mode. The type of approach is determined by the active navigation source and annunciates on the PFD (APPR. LNV, APPR, VOR1, APPR LOC2, etc.).
B/C button	Push the B/C button to alternately select or deselect back course mode. A localizer must be selected as the active navigation source.
NAV button	Push the NAV button alternately selects or deselects navigation mode. The FCC/FMC generates lateral commands to fly the active navigation course.

Control	Function
CRS1 and CRS2 knobs	Two course knobs are installed. Turn the CRS1 knob to change the left side active navigation course displayed on the pilot PFD. Turn the CRS2 knob to change the right side active course (copilot PFD). Clockwise rotation increases the selected course angle.
CRS1 and CRS2 PUSH DIRECT buttons	Push a (center) PUSH DIRECT button to zero course deviation and automatically select a course directly to the tuned NAV station.
VS button	Push the VS button alternately select or deselect vertical speed mode. VS and the vertical speed reference value annunciate on the PFD.
VNAV button	Push the VNAV button to alternately arm or clear vertical navigation mode. VNV annunciates in the PFD.
FLC button	Push the FLC (flight level change) button to capture and track an IAS or Mach reference airspeed. The mode takes into account the need to climb or descend to bring the airplane to the preselected altitude or VNAV altitude, depending which is active and the airplanes ability (i.e., thrust level) to accomplish the manoeuvre.
SPEED knob	Turn the SPEED knob to change the IAS or Mach reference value. This value displays by the IAS or MACH mode annunciation on the PFD.
IAS/MACH button	Push the (center) IAS/MACH button to select Mach mode from IAS mode, or select IAS mode from Mach mode.
ALT button	Push the ALT button to alternately select or deselect altitude hold mode. ALT annunciates on the PFD.
ALT knob	Turn the ALT knob to change the preselect altitude (displayed on PFD). Clockwise rotation increases the preselected altitude.
ALT PUSH CANCEL button	Push the (center) PUSH CANCEL button to cancel aural and visual altitude alerts.

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AUTOPILOT - MAINTENANCE PRACTICES

1. General

- A. This section describes the maintenance procedures related to the following equipment:
- Flight Guidance Computer
 - Flight Guidance Panel.

2. Flight Guidance Panel - Removal - Installation

- A. Refer to Chapter 31.

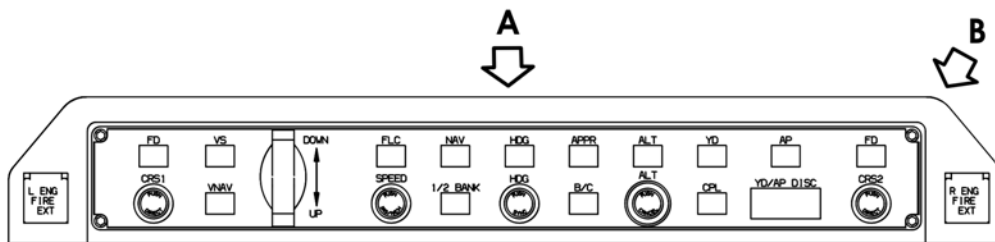
3. Flight Guidance Panel - Removal (Refer to [22-00-00](#), Fig. [2](#) and to Fig. [201](#))

- A. Fixtures, Test and Support Equipment
Circuit Breaker safety clips and tags.

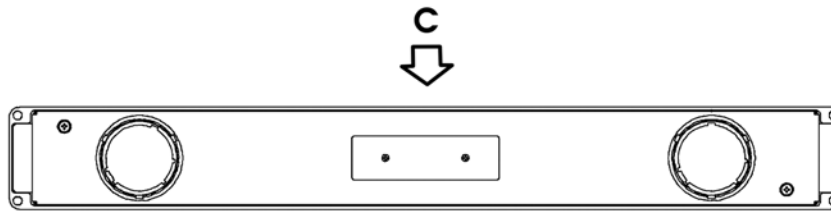
Blanking caps	Not specified
---------------	---------------

B. Procedure

- (1) Set the battery switch to OFF
- (2) Set the avionics master switch to OFF
- (3) Open, tag and safety the following circuit breakers:
 - R IAPS
 - L IAPS
 - IAPS ENV CONT
 - A/P SERVO ELEV
 - A/P SERVO AIL/RUD.
- (4) Unscrew the four fixing screws of the Flight Guidance Panel.
- (5) Extract (pull towards the operator) the unit and disengage the rear cables and connectors.
- (6) Put caps on the electrical connectors.



- A** FLIGHT GUIDANCE PANEL
- B** FIXING SCREWS (4)



- C** FLIGHT GUIDANCE PANEL (REAR VIEW)
- D** POLARIZED CONNECTORS

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Fig. 201 - Flight Guidance Panel

4. Flight Guidance Panel - Installation (Refer to 22-00-00, Fig. 2 and to Fig. 201)

A. Procedure

- (1) Remove the cap from electrical connector, if present (Refer to Para. 3, item 6).
- (2) Connect the cables to the panel rear connectors.

NOTE: The two rear connectors have a polarization key each one to guarantee the right cables connection.

- (3) Insert the panel in its housing and screw in the four fixing screws.
- (4) Remove the safety tags and close the previously opened circuit breakers:
 - R IAPS
 - L IAPS
 - IAPS ENV CONT
 - A/P SERVO ELEV
 - A/P SERVO AIL/RUD.
- (5) Set the avionics master switch to AVIONICS.
- (6) Set the battery switch to BAT.

5. DCU Aural Warning - Check

A. Procedure

- (1) Set the Battery Switch to ON.
- (2) Set the Master Switch Avionic to ON.
- (3) Engage the Autopilot.
- (4) On the CB Panel pull out CB5007 "DCU".
- (5) Operate the MSW switch on Pilot Control Wheel and check:
 - Autopilot disengages
 - AP Disconnect Aural warning is triggered.
- (6) Push-in CB5007 "L CDU".
- (7) Engage the Autopilot.
- (8) On Pilot CB Panel pull out CB5008 "R DCU".
- (9) Operate the MSW switch on Pilot Control Wheel and check:
 - Autopilot disengages
 - AP Disconnect Aural warning is triggered.

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AILERON PRIMARY SERVO AND SERVO MOUNT - MAINTENANCE PRACTICES

1. General

A. This topic gives the maintenance practices for the components which follow:

- the aileron primary servo
- the aileron servo mount

2. Aileron Primary Servo - Removal (Refer to [22-00-00](#), Fig. 2 and to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking Caps

Not Specified

Warning Notices

B. Referenced Information

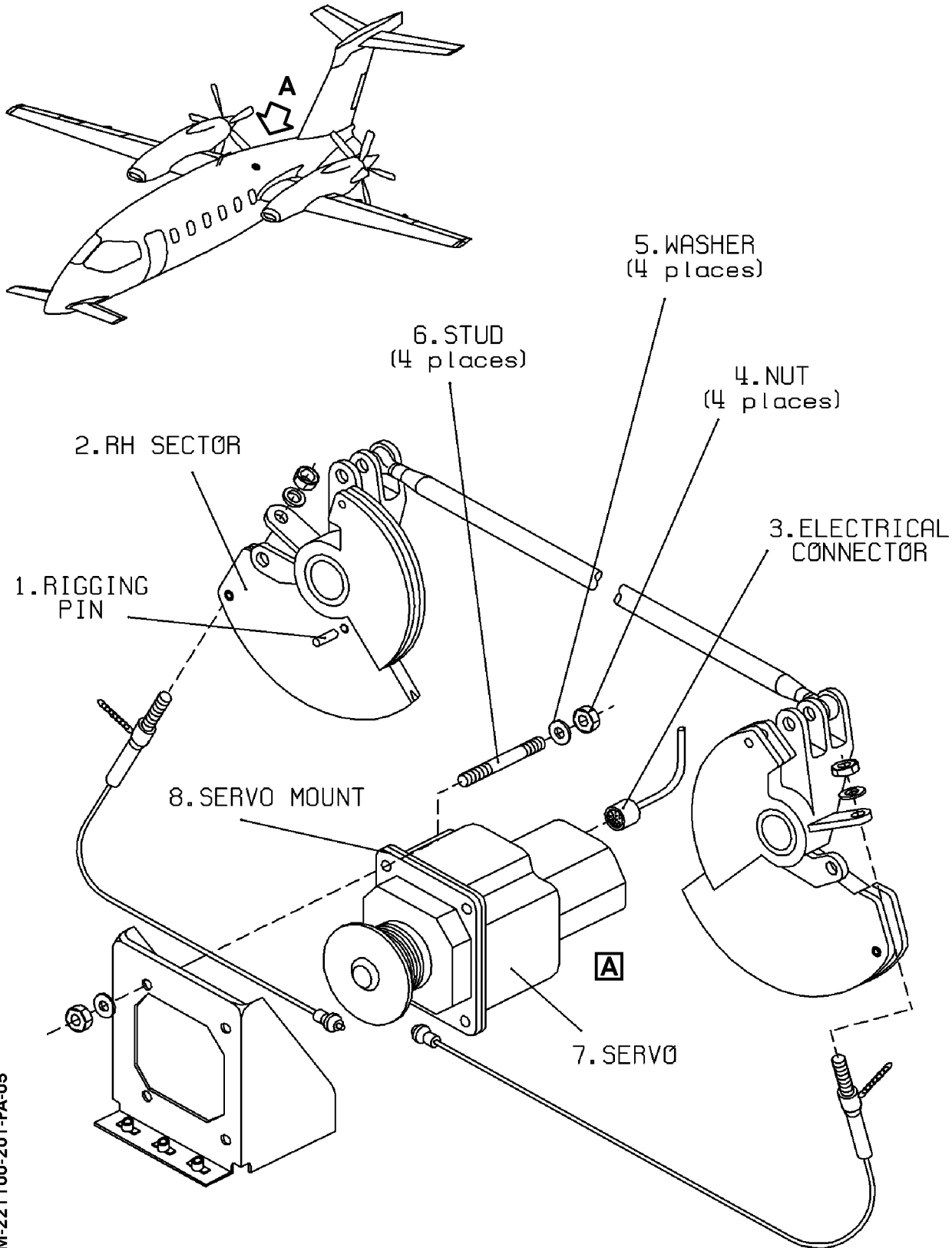
Maintenance Manual Chapter [27-10-00](#)

Maintenance Manual Chapter [52-82-00](#)

C. Procedure

NOTE: It is possible to remove the servomotor without removing the servo mount.

- (1) Set the battery switch to OFF.
- (2) Set the avionics master switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO AIL/RUD
- (4) Disconnect the LH main landing gear rear door (Refer to [52-82-00](#)).
- (5) Install a rigging pin (1) in the RH aileron control sector (2) to lock system in the neutral position (Refer to [27-10-00](#)).
- (6) Put a notice near the ailerons to tell persons that work is in progress.
- (7) Attach identification tags and untie and remove the electrical cabling obstructing the access to the servo.
- (8) Disconnect the electrical connector from the servo (3).
- (9) Fit blanking caps to the electrical connector.
- (10) Remove the four nuts (4) and four washers (5) from the four studs (6).
- (11) Remove the primary servo (7) from the servo mount (8).
- (12) Fit protective covers to the unit.



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Fig. 201 - Aileron Primary Servo

3. Aileron Primary Servo - Installation (Refer to [22-00-00](#), Fig. 2 and to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter [27-00-00](#)

Maintenance Manual Chapter [52-82-00](#)

B. Procedure

- (1) Make sure, as necessary that:
 - the system is safe
 - the warning notices are in position
 - access is available.
- (2) Install the aileron primary servo mount if previously removed (Refer Para. 5).
- (3) Remove the protective covers and blanking caps from the servo (7).
- (4) Make sure that the mating surfaces are clean.

CAUTION: BE CAREFUL NOT TO DAMAGE THE PRIMARY SERVO GEARS WHEN SLIDING THE SERVO INTO THE SERVO MOUNT.

- (5) Slide the primary servo onto the four studs (6) attached to the servo mount (8).
- (6) Install the washers (5) and nuts (4) onto the studs and tighten.
- (7) Connect the primary servo electrical connector (3).
- (8) Remove the rigging pin (1) from the RH sector (2) (Refer to [27-00-00](#)).
- (9) Install the electrical cabling removed to get access to the servo, and make necessary connections.
- (10) Remove cable identification tags.
- (11) Remove the warning notice.
- (12) Remove the safety tags and close this circuit breaker:
 - A/P SERVO AIL/RUD
- (13) Connect the LH main landing gear rear door (Refer to [52-82-00](#)).
- (14) Set the avionics master switch to AVIONICS.
- (15) Set the battery switch to BAT.

4. Aileron Servo Mount - Removal (Refer to [22-00-00](#), Fig. 2 and to Fig. 202)

A. Fixtures, Test and Support Equipment

Warning notices
 Flameproof light source

B. Expendable Parts

Lockwire 04-008

C. Referenced Information

Maintenance Manual Chapter [27-10-00](#)
 Maintenance Manual Chapter [52-82-00](#)

D. Procedure

- (1) Set the aileron trim to neutral (Refer to [27-10-00](#)).
- (2) Set the battery switch to OFF.
- (3) Set the avionics master switch to OFF.
- (4) Open, safety and tag the following circuit breaker:
 - A/P SERVO AIL/RUD
- (5) Put a warning notice near the ailerons to tell persons to keep clear of the ailerons.
- (6) Put a warning notice in the flight compartment to tell persons not to move the flight controls.
- (7) Disconnect the LH main landing gear rear door (Refer to [52-82-00](#)).
- (8) Install a rigging pin (1) in the RH aileron control sector (2) to lock system in the neutral position (Refer to [27-10-00](#)).
- (9) Attach identification tags and untie and remove the electrical cabling obstructing the access to the aileron primary servo.
- (10) Remove the aileron primary servo (Refer to Para. 2).
- (11) Disconnect the cables from the sectors:
 - (a) Turn the control wheel to full aileron deflection and clamp the ailerons to prevent any movement when the control wheel is released.
 - (b) On the accessible sector, remove and discard the cotter pin (3).
 - (c) Remove and discard the lockwire from the threaded cable terminal end (4).
 - (d) Remove the drilled jamnut (5) and the flat jamnut (6) from cable terminal end (12).
 - (e) Repeat (a) thru (d) to disconnect the other cable.
- (12) Remove and discard the lockwire from both stopscrews (7) on the servo capstan.
- (13) Remove the stopscrews (7) and lock washers.
- (14) Remove the two cables (8).

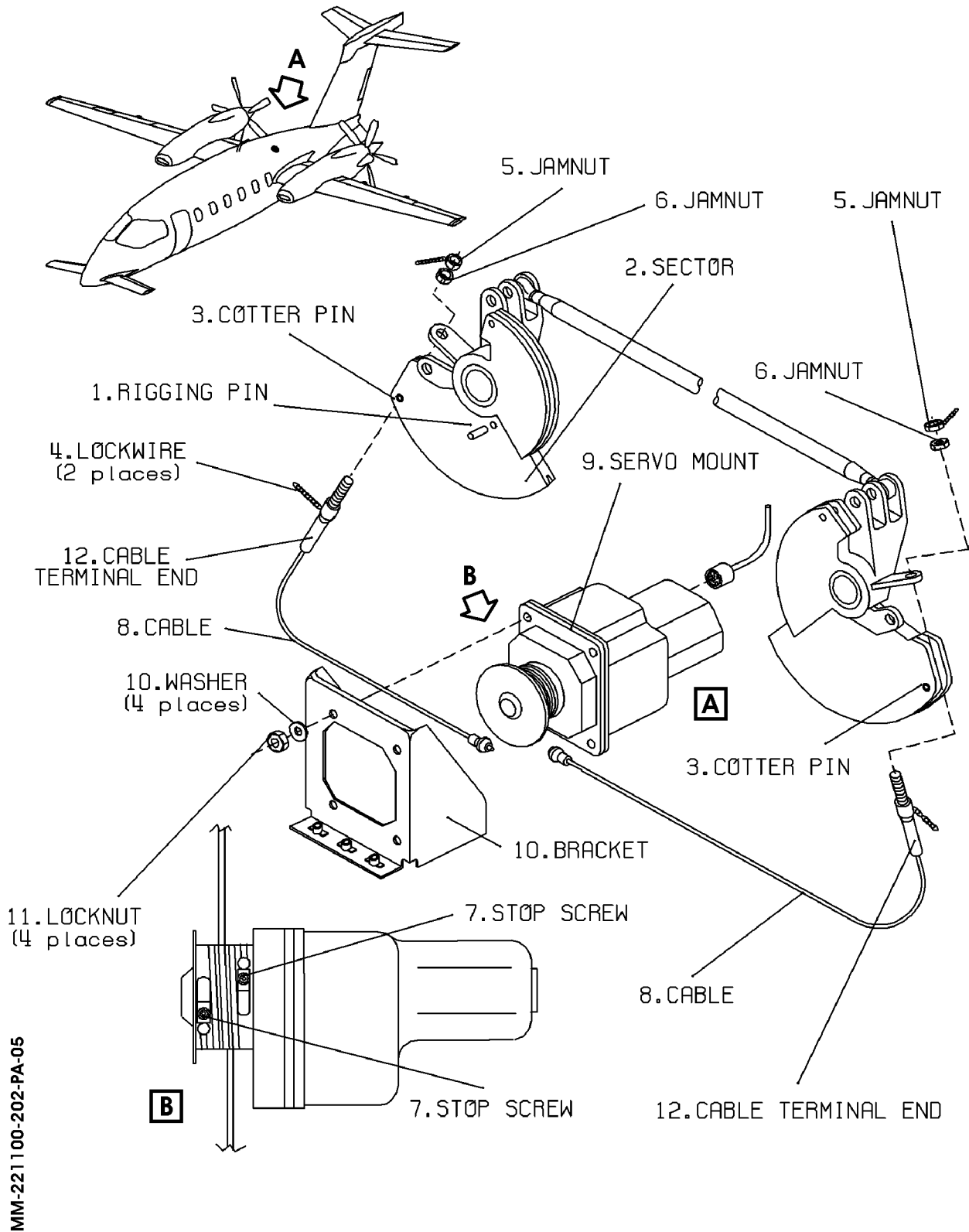


Fig. 202 - Aileron Servo Mount

5. Aileron Servo Mount - Installation (Refer to [22-00-00](#), Fig. 2 and to Fig. 202)

A. Fixtures, Test and Support Equipment

Cable ties
Cable tensiometer

B. Referenced Information

Maintenance Manual Chapter [27-00-00](#)
Maintenance Manual Chapter [52-82-00](#)

C. Procedure

WARNING: THE CLUTCH ADJUSTMENT PROCEDURE MUST BE DONE BEFORE INSTALLATION OF THE SERVO MOUNT IN THE AIRPLANE. FAILURE TO DO THIS ADJUSTMENT PROCEDURE CAN RESULT IN HAZARDOUS OPERATION OF THE AIRPLANE.

- (1) Refer to para. 6 and do the clutch adjustment procedures.
- (2) Make sure as necessary that:
 - the system is safe
 - the warning notices are in position
 - access is available.
- (3) Position the servo mount (9) on the bracket (10).
- (4) Install the primary servo (Refer to Para. 3), do not remove the safety tags or close the circuit breakers.
- (5) Secure the servo mount in position using the four washers (10) and four locknuts (11).
- (6) Position the capstan so that the stopscrews are centered and at the top of the capstan.
- (7) Wrap the LH cable 1½ turns around the capstan so that the cable leaves the capstan from the bottom.
- (8) Insert the LH cable ball end into the capstan and make safe with the stopscrews (7).
- (9) Use lockwire to safety the stopscrews.
- (10) Repeat (7) thru (9) for the RH cable.
- (11) With aileron control unlocked turn the control wheel left for full aileron deflection and secure aileron to prevent any movement when the control wheel is released.
- (12) Put a notice in the flight compartment to tell persons not to move the control wheel.
- (13) Lead the rearward cable from the capstan around the aileron sector (2).
- (14) Insert the threaded cable terminal end (12) to the sector (2).
- (15) Install the flat faced jamnut (6) and loosely tighten.
- (16) Install the jamnut (5) and loosely tighten.
- (17) Hold the cable around the sector and install the new cotter pin (3).
- (18) Turn the control wheel right for full aileron deflection and secure ailerons to prevent any movement when the control wheel is released.

- (19) Put a notice in the flight compartment to tell persons not to move the control wheel.
- (20) Lead the capstan forward cable around the RH aileron sector (2).
- (21) Insert the threaded cable terminal end (12) to the sector (2).
- (22) Install the flat faced jamnut (6) and loosely tighten.
- (23) Install the jamnut (5) and loosely tighten.
- (24) Hold the cable around the sector and install the new cotter pin (3).
- (25) Check the cables for run-in by operating the ailerons from limit to limit.
- (26) Lock the aileron control system (Refer to [27-10-00](#)).

NOTE: Before the servo cables can be rigged, the aileron control system cable must have been rigged (Refer to [27-10-00](#)).

- (27) Tension the aileron servo cables (Refer to Fig. [203](#)):
 - (a) Lock the aileron sectors in the rigging position (Refer to [27-10-00](#)).
 - (b) Tighten the LH and RH flat jamnut on the LH and RH threaded cable terminal ends to take up cable slack.
 - (c) Tension both cables equally (Refer to Fig. [203](#)) while making sure the capstan cable stopscrews remain centered.

NOTE: All cable rigging procedures should be performed in the temperature stabilized condition of a hangar.

NOTE: Allow the temperature of the airplane structure to stabilize.

- (28) Clamp the cable terminal ends with jamnut (5) and wirelock the drilled jamnut.
- (29) Remove the safety tags and close this circuit breaker:
 - A/P SERVO AIL/RUD
- (26) Unlock the aileron control system (Refer to [27-10-00](#)).
- (27) Install the electrical cable and tie in the original position.
- (28) Connect the main landing gear rear door (Refer to [52-82-00](#)).
- (29) Set the avionics master switch to AVIONICS.
- (30) Set the battery switch to BAT.

6. Aileron Servo Mount - Clutch Adjustment

NOTE: The clutch adjustment procedure must be performed prior to installing the servo mount.

A. Referenced Information

Rockwell Collins Instruction Book SVO65 Primary Servo and SMT65 Servo Mount" (doc.523-0771890-00411A)

B. Procedure

- (1) Remove aileron servo mount (Refer to para. 4).
- (2) Do the rudder servo mount clutch adjustment "Refer to Rockwell Collins Instruction Book SVO65 Primary Servo and SMT65 Servo Mount" (doc.523-0771890-00411A) and check that the clutch value is 49,5 (± 2,5) in-lbs.

- (3) Install the aileron servo mount (Refer to para. 5).

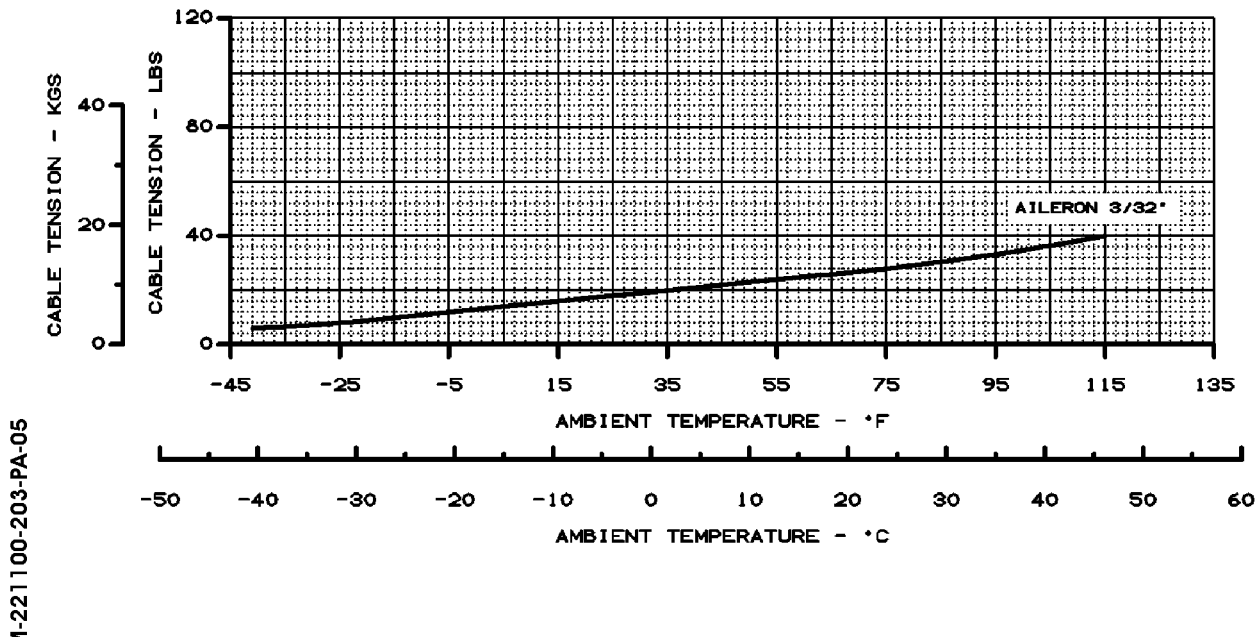


Fig. 203 - Aileron Servo Cable Tension Graph

7. Aileron Primary Servo and Servo Mount - Inspection/Check

A. Roll Servo Actuator and Mount

- (1) Set the battery switch to OFF.
- (2) Set the avionics master switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO AIL/RUD
- (4) Disconnect the LH main landing gear rear door (Refer to 52-82-00).
- (5) Inspect the servo actuator and servo mount:
 - (a) Check for loose or worn mounting hardware and make sure that the servo and servo mount are securely mounted to the airframe.
 - (b) Visually inspect for capstan or cable wear, contamination, and proper cable spool-off angle.
 - (c) Operate each control system through its entire range and make sure the servo mount has not unusual noise, binding, backlash, or other mechanical irregularities.
- (6) Connect the LH main landing gear rear door (Refer to 52-82-00).
- (7) Remove the safety tags and close the following circuit breaker:
 - A/P servo AIL/RUD
- (8) Set the avionics master switch to AVIONICS and the battery switch to BAT.

ELEVATOR PRIMARY SERVO AND SERVO MOUNT - MAINTENANCE PRACTICES

1. General

This topic gives the Maintenance Practices for the components which follow:

- the elevator primary servo
- the elevator servo mount.

2. Elevator Primary Servo - Removal (Refer to [22-00-00](#), Fig. [2](#) and to Fig. [201](#))

A. Fixtures, Test and Support Equipment

Blanking Caps	Not Specified
Warning notices	

B. Referenced Information

Maintenance Manual Chapter [55-30-00](#)

C. Procedure

NOTE: It is possible to remove the elevator primary servo without removing the servo mount.

- (1) Set the avionics master switch to OFF.
- (2) Set the battery switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO ELEV
- (4) Remove the rear fairing from the top of the vertical stabilizer (Refer to [55-30-00](#)).
- (5) Install rigging pin (1) in the control sector (2) to lock system in the neutral position.
- (6) Disconnect the electrical connector (3) from the primary servo.
- (7) Fit blanking caps to the electrical connector.
- (8) Remove the four locknuts (4) and four washers (5) from the four studs (6).
- (9) Remove the primary servo (7) from the servo mount (8).
- (10) Fit protective covers to the unit.

3. Elevator Primary Servo - Installation (Refer to [22-00-00](#), Fig. 2 and to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter [55-30-00](#)

B. Procedure

(1) Make sure, as necessary that:

- the system is safe
- the warning notices are in position
- access is available.

(2) Check that the avionics and battery switches are OFF.

(3) Check that the A/P SERVO ELEV circuit breaker is open and tagged.

(4) Install the servo mount if previously removed (Refer to Para. 9).

(5) Remove protective cover from the servo.

(6) Make sure that the mating surfaces are clean.

**CAUTION: USE CARE TO AVOID DAMAGING THE SERVO GEARS
WHEN SLIDING THE SERVO INTO THE SERVO MOUNT.**

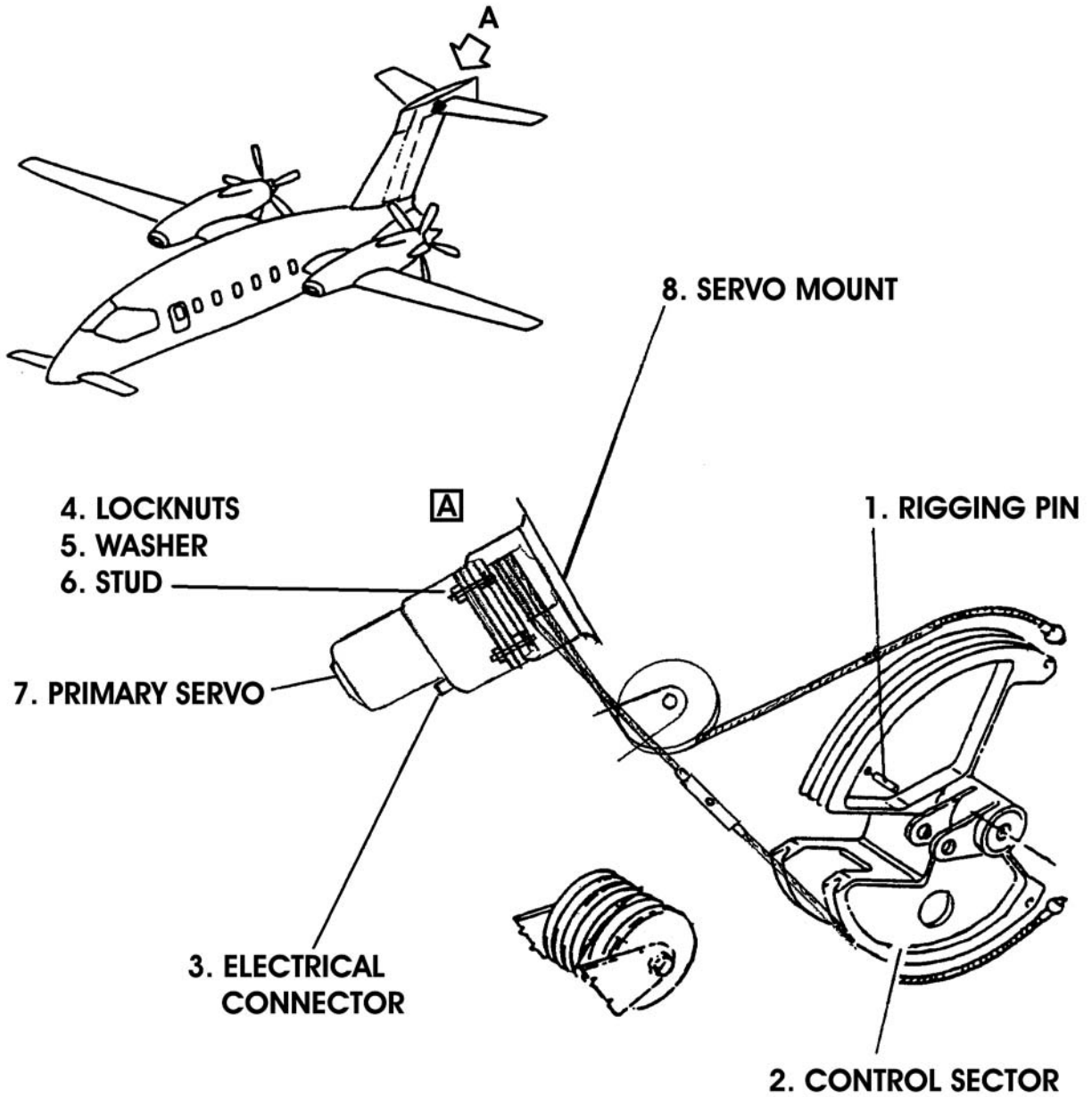
(7) Slide the servo into the servo mount and secure with four washers (5) and four locknuts (4).

(8) Connect the electrical connector (3) to the servo.

(9) Remove the rigging pin (1) from the control sector (2).

(10) Make a check (Refer to Para. 7).

(11) Install the rear fairing on the top of the vertical stabilizer (Refer to [55-30-00](#)).



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Fig. 201 - Elevator Primary Servo

4. Elevator Servo Mount - Removal (Refer to [22-00-00](#), Fig. 2 and to Fig. 202)

A. Fixtures, Test and Support Equipment

Access platform, height 12 feet

Blanking caps

Not specified

Warning notices

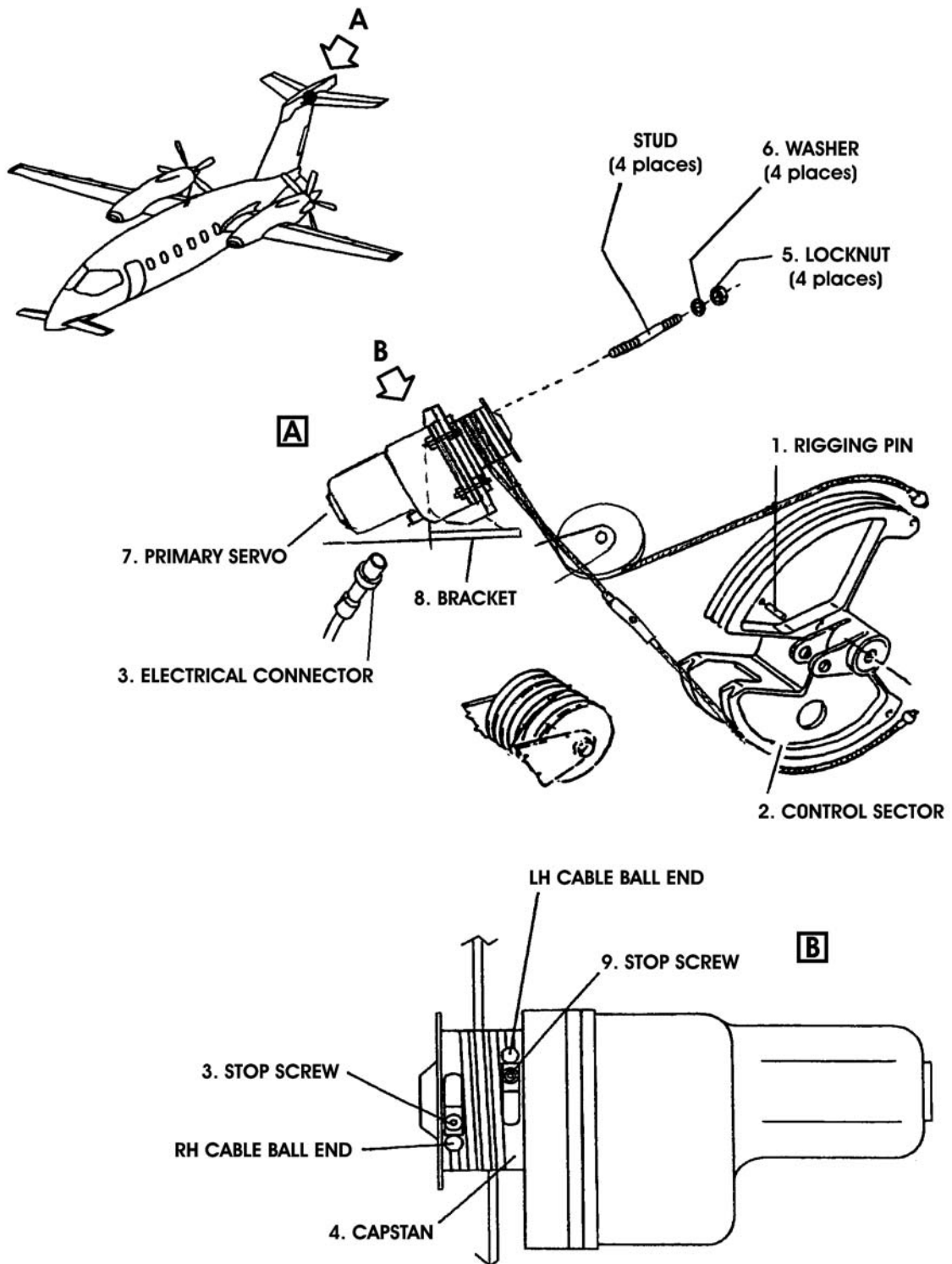
Not specified

B. Referenced Information

Maintenance Manual Chapter [55-30-00](#)

C. Procedure

- (1) Set the avionics master switch to OFF.
- (2) Set the battery switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO ELEV
- (4) Remove tip fin fairings (Refer to [55-30-00](#)).
- (5) Remove the rear fairing from the top of the vertical stabilizer (Refer to [55-30-00](#)).
- (6) Install rigging pin (1) in the control sector (2) to lock system in the neutral position.
- (7) Put a warning notice in the flight compartment to tell persons not to move the rudder pedals.
- (8) Set and hold the rudder in the fully left or right deflected position.
- (9) Remove the safety clip from the turbuckle located forward of the rudder horn, and loosen the servo cable turnbuckle.
- (10) Remove the servo (Refer to Para. 2).
- (11) Attach identity tags to autopilot cables so that cables can be installed in the correct positions.
- (12) Remove and discard the lockwire from the stopscrews (3, 9) on the servo capstan (4).
- (13) Remove the stopscrews (3, 9) and lock washers.
- (14) Unwind the LH and RH cables from the capstan.
- (15) Remove the four locknuts (5) and washers (6).
- (16) Remove the servo mount (7) from the bracket (8).



MM-221200-202-PA-05

Fig. 202 - Elevator Servo Mount

5. Elevator Servo Mount - Installation (Refer to 22-00-00, Fig. 2 and to Fig. 202)

A. Fixtures, Test and Support Equipment

Tensiometer	T5-2002-104-00 (Pacific Scientific) or equivalent
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B. Referenced Information

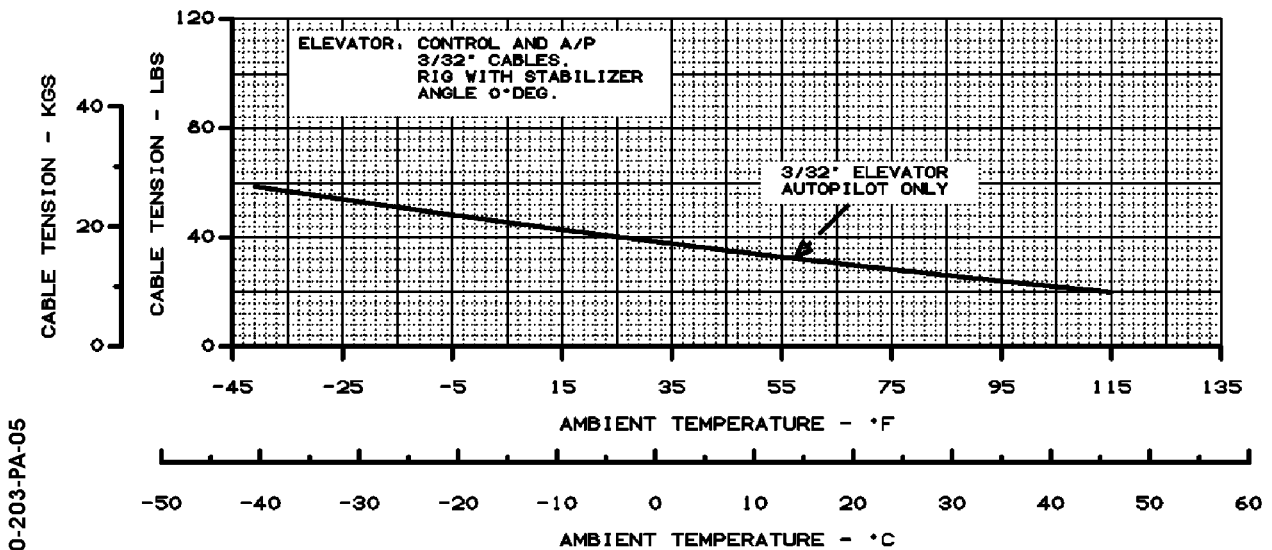
Maintenance Manual Chapter [27-20-00](#)
 Maintenance Manual Chapter [55-30-00](#)

C. Procedure

WARNING: THE CLUTCH ADJUSTMENT PROCEDURE MUST BE DONE BEFORE INSTALLATION OF THE SERVO MOUNT. FAILURE TO DO THIS ADJUSTMENT WILL AFFECT THE AIRPLANE FLIGHT SAFETY.

- (1) Make sure as necessary that:
 - the system is safe
 - the warning notices are in position
 - access is available.
- (2) Check that the avionics and battery switches are OFF.
- (3) Check that the A/P SERVO ELEV circuit breaker is open and tagged.
- (4) Set the horizontal stabilizer in the neutral position (0°).
- (5) Install rigging pin (1) in the control sector (2) to lock the system in the neutral position.
- (6) Position the servo mount (7) on the bracket (8).
- (7) Secure the servo mount in position using the four washers (6) and four locknuts (5).
- (8) Position the capstan so that the stopscrew holes are centered and at the top of the capstan.
- (9) Identify the RH cable and wind the cable 1½ turns around the capstan so that the cable end finishes at the forward stopscrew hole.
- (10) Insert the RH cable ball end into the capstan and make safe with the stopscrew (3).
- (11) Use lockwire to safety the stopscrew.
- (12) Identify the LH cable and wrap the cable 1½ turns around the capstan so that the cable end finishes at the aft stopscrew hole.
- (13) Insert the LH cable ball end into the capstan and make safe with the stopscrew (9).
- (14) Use lockwire to safety the stopscrew.
- (15) Remove rigging pin and check cables for run-in by operating the elevator from limit to limit.
- (16) Install rigging pin to lock the system in neutral.

NOTE: Before autopilot servo cables can be rigged, the primary flight control cables must have been rigged (Refer to [27-20-00](#)).



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Fig. 203 - Elevator Servo Cable Tension Graph

(17) Tension the elevator servo cables (Refer to Fig. 203):

NOTE: All cable rigging procedures should be done in the temperature stabilized condition of a hangar.

NOTE: Allow the temperature of the airplane structure to stabilize.

- (a) Set the horizontal stabilizer to 0°.
- (b) Adjust the turnbuckle (10) to get the correct cable tension. Use a tensiometer to make sure the cable tension is correct.
- (c) Safety the turnbuckle.
- (d) Remove the rigging pin.

NOTE: The system should be operated and the cable tension rechecked to make sure the cable tension is evened out.

- (18) Make a check (Refer to Para. 7).
- (19) Install the servo motor (Refer to Para. 3).
- (20) Remove the safety tags and close this circuit breaker:
 - A/P SERVO ELEV
- (21) Remove the access platform.
- (22) Install tip fin fairings (Refer to 55-30-00).
- (23) Remove the warning notices.

6. Elevator Servo Mount - Clutch Adjustment

NOTE: The clutch adjustment procedure should be performed before installing the servo mount.

A. Referenced Information

Rockwell Collins Instruction Book SVO65 Primary Servo and SMT65 Servo Mount" (doc.523-0771890-00411A)

B. Procedure

- (1) Remove the elevator servo mount (Refer to Para. 4).
- (2) Do the rudder servo mount clutch adjustment "Refer to Rockwell Collins Instruction Book SVO65 Primary Servo and SMT65 Servo Mount" (doc.523-0771890-00411A) and check that the clutch value is 90,5 (\pm 2,5) in-lbs.
- (3) Install the elevator servo mount (Refer to Para. 5).

7. Elevator Primary Servo and Servo Mount - Inspection/Check

A. Fixtures, Test and Support Equipment

Tensiometer	T5-2002-104-00 (Pacific Scientific) or equivalent
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B. Procedure

- (1) Set the avionics master switch to OFF.
- (2) Set the battery switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO ELEV
- (4) Remove tip fin fairings (Refer to [55-30-00](#)).
- (5) Inspect the elevator servo and servo mount:
 - (a) Examine for loose or worn mounting hardware and make sure that the servo and servo mount are securely mounted to the airframe.
 - (b) Examine the capstan for capstan or cable wear, contamination, and proper spool-off angle.
 - (c) Operate the elevator primary control system through its entire range and make sure that the servo mount has no backlash, binding or other mechanical irregularities; check for any unusual noise.
 - (d) Use the tensiometer and check that the cable tension is within the limits (Refer to Fig. [203](#)).
- (6) Install tip fin fairings (Refer to [55-30-00](#)).
- (7) Remove the safety tags and close this circuit breaker:
 - A/P SERVO ELEV

RUDDER PRIMARY SERVO AND SERVO MOUNT - MAINTENANCE PRACTICES

1. General

A. This topic gives the Maintenance Practices for the components which follow:

- the rudder primary servo
- the rudder servo mount

2. Rudder Primary Servo - Removal (Refer to [22-00-00](#), Fig. 1 and to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps

Not specified

Warning notices

B. Referenced Information

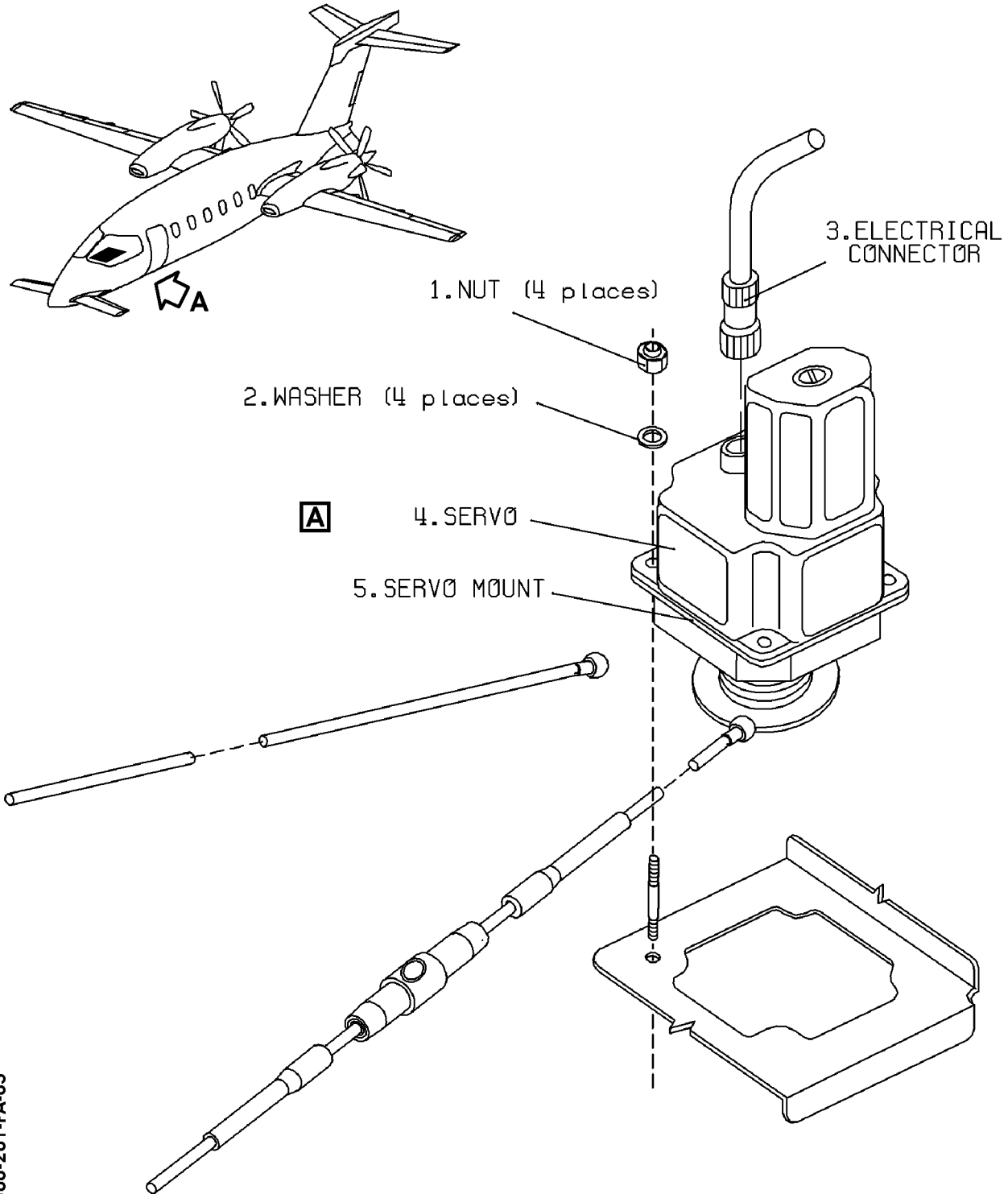
Maintenance Manual Chapter [25-10-00](#)

Maintenance Manual Chapter [27-20-00](#)

C. Procedure

NOTE: It is possible to remove the servo without removing the servo mount.

- (1) Set the battery switch to OFF.
- (2) Set the avionics master switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO AIL/RUD
- (4) Put a warning notice in the flight compartment to tell persons not to move the control wheel.
- (5) Put a notice at the rudder to tell persons that work is in progress.
- (6) Lock the rudder control circuit in the neutral position (Refer to [27-20-00](#)).
- (7) Remove the pilot seat (Refer to [25-10-00](#)).
- (8) Remove floor panel 211CLF.
- (9) Untie electrical cables and move to one side.
- (10) Disconnect the electrical connector (3) from the servo and put blanking caps on the electrical connectors.
- (11) Remove the nuts (1) and washers (2) securing the servo (4) to the servo mount (5).
- (12) Fit protective covers to the unit.



MM-221300-201-PA-05

Fig. 201 - Rudder Primary Servo

EFFECTIVITY:

22-13-00

3. Rudder Primary Servo - Installation (Refer to [22-00-00](#), Fig. 2 and to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter [25-00-00](#)

Maintenance Manual Chapter [27-20-00](#)

B. Procedure

- (1) Install the servo mount if previously removed (Refer to para. 5).
- (2) Make sure, as necessary that:
 - the system is safe
 - the warning notices are in position.
- (3) Remove protective cover from servo.
- (4) Make sure that the mating surfaces are clean.

CAUTION: BE CAREFUL WHEN SLIDING THE SERVO INTO THE SERVO MOUNT NOT TO DAMAGE THE SERVO GEARS.

- (5) Install the servo onto the servo mount and secure with the nuts (1) and washers (2).
- (6) Connect the electrical connector (3) to the servo (4).
- (7) Tie the electrical cables in position.
- (8) Unlock the rudder control circuit (Refer to [27-20-00](#)).
- (9) Make a check (Refer to Para. 7).
- (10) Install panel 211 CLF.
- (11) Install the pilot seat (Refer to [25-00-00](#)).
- (12) Remove the warning notices.

4. Rudder Servo Mount - Removal (Refer to [22-00-00](#), Fig. 2 and to Fig. 202)

A. Fixtures, Test and Support Equipment

Blanking caps

Not Specified

Warning Notices

B. Referenced Information

Maintenance Manual Chapter [27-20-00](#)

C. Procedure

- (1) Set the battery switch to OFF.
- (2) Set the avionics master switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO AIL/RUD
- (4) Put a warning notice in the flight compartment to tell persons not to move the control wheel.
- (5) Put a warning notice at the rudder to tell persons that work is in progress.
- (6) Lock the rudder control circuit in the neutral position (Refer to [27-20-00](#)).
- (7) Remove panels 211CLF and 211DLF.
- (8) Untie electrical cables and move to one side.
- (9) Remove the rudder primary servo (Refer to Para. 3).
- (10) Remove the clips from the turnbuckle (1) and release the tension on the sector cables.
- (11) Remove the support bracket (2) with the servo mount (3) attached.
- (12) Tag the cables and remove the stopscrews from the capstan.
- (13) Remove the cables from the capstan.
- (14) Remove the nuts (4) and washers (5) and remove the servo mount from the bracket.
- (15) Unlock the rudder control circuit (Refer to [27-20-00](#)).
- (16) Remove rudder autopilot control cables:
 - (a) Remove cotter pins (6) from rudder front sector (7).
 - (b) Remove LH (8) and RH (9) control cables.

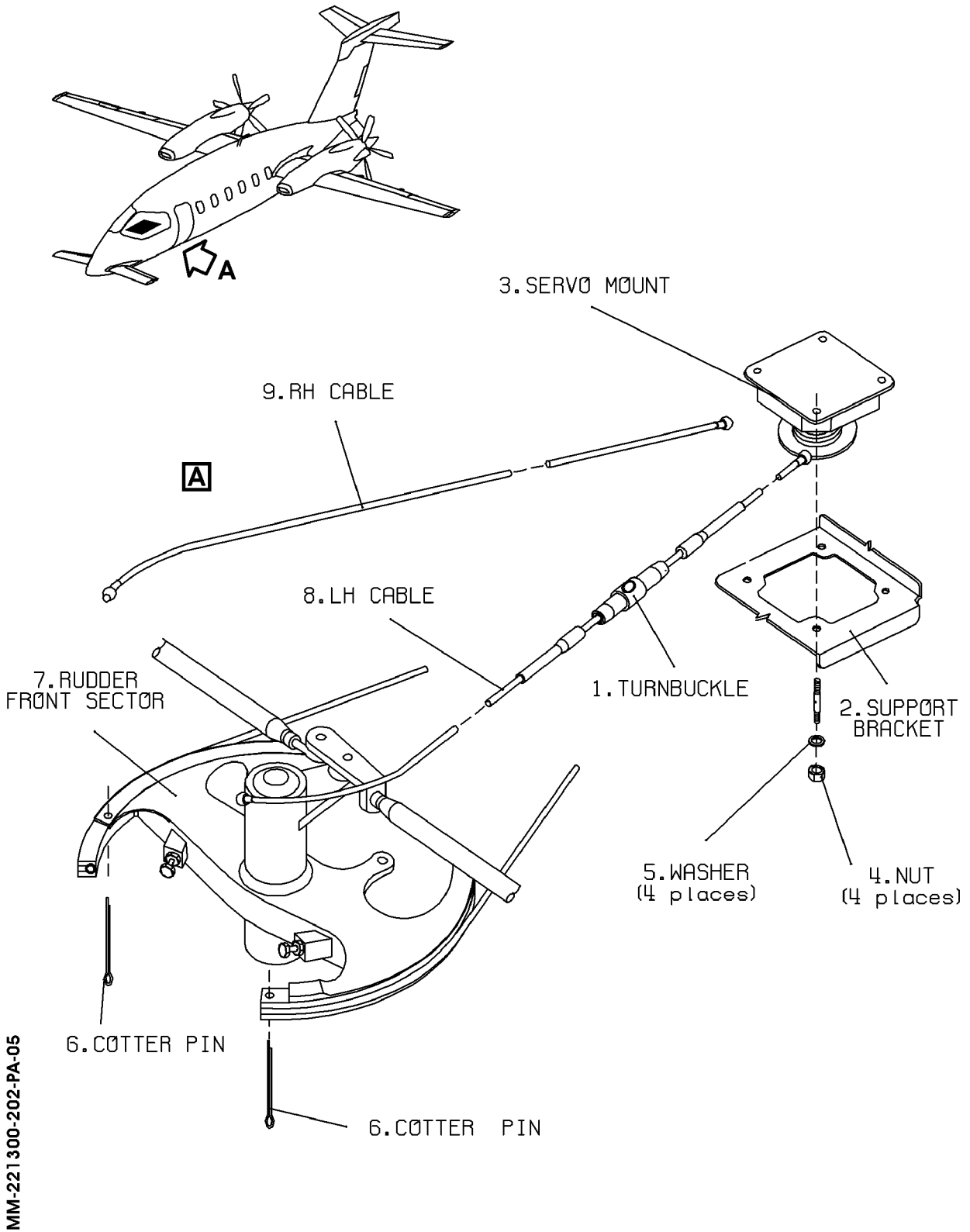


Fig. 202 - Rudder Servo Mount

5. Rudder Servo Mount - Installation (Refer to 22-00-00, Fig. 2 and to Fig. 202)

A. Referenced Information

Maintenance Manual Chapter 25-00-00

Maintenance Manual Chapter 27-20-00

Maintenance Manual Chapter 27-30-00

B. Procedure

WARNING: THE CLUTCH ADJUSTMENT PROCEDURE MUST BE DONE BEFORE INSTALLATION OF THE SERVO MOUNT. FAILURE TO DO THIS ADJUSTMENT WILL AFFECT THE AIRPLANE FLIGHT SAFETY.

(1) Make sure as necessary that:

- the system is safe
- the warning notices are in position
- access is available
- the elevator control circuit is locked in the neutral position
- the rudder control system is free.

(2) Install the servo mount (3) on the support bracket (2) using the nuts (4) and washers (5).

NOTE: Connect the LH and RH cables to the capstan before installing the servo mount attached to the support bracket.

(3) Identify the RH cable (9) and wind the cable approximately 1½ turns around the capstan and insert the cable ball end in the uppermost (when the servo mount is installed) ball retaining hole.

(4) Insert the RH cable ball end stopscrew, and safety with lockwire.

(5) Wind the LH cable (8) approximately 1½ turns around the capstan and insert the cable ball end in the ball retaining hole.

(6) Insert the LH cable ball end stopscrew, and safety with lockwire.

(7) Do not tighten but take up any slack in the cables with the turnbuckle (1).

(8) Check the cable run-in by operating the rudder from limit to limit.

(9) Lock the rudder control system (Refer to 27-20-00).

NOTE: Before the servo cables can be rigged, the primary control cables must have been rigged (Refer to 27-20-00).

(10) Adjust the turnbuckle to tension the cables (Refer to Fig. 203 for correct cable tension).

NOTE: All cable rigging procedures should be done in the temperature stabilized conditions of a hangar.

NOTE: Allow the temperature of the airplane to stabilize.

(11) After completing the cable tensioning safety the turnbuckle with the clips.

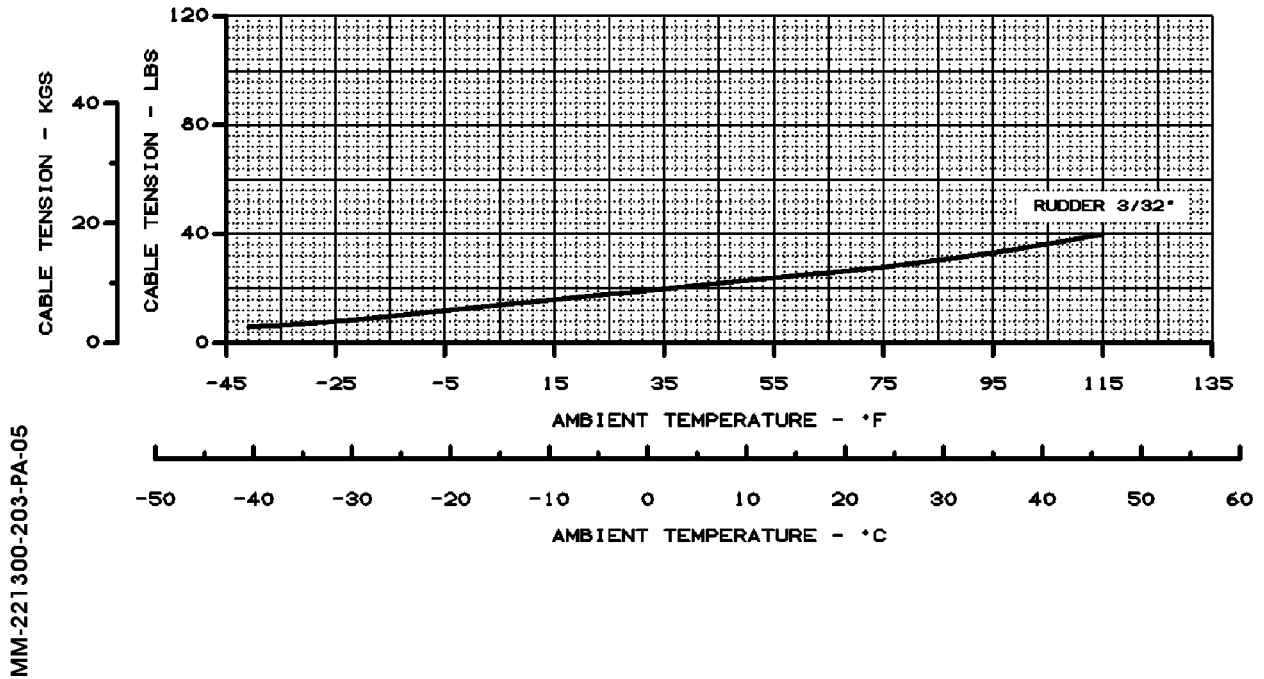


Fig. 203 - Rudder Servo Cable Tension Graph

- (12) Remove the identity tags from the cables.
- (13) Install the servo (Refer to Para. 3).
- (14) Tie the electric cables in position.
- (15) Unlock the rudder control system (Refer to [27-20-00](#)).
- (16) Unlock the elevator control circuit (Refer to [27-30-00](#)).
- (17) Remove the safety tags and close this circuit breaker:
 - A/P SERVO AIL/RUD
- (18) Install the floor panels 211CLF and 211DLF.
- (19) Install the pilot seat (Refer to [25-00-00](#)).
- (20) Remove the warning notices.
- (21) Set the avionics master switch to AVIONICS.
- (22) Set the battery switch to BAT.

6. Rudder Servo Mount - Clutch Adjustment

NOTE: The clutch adjustment procedure should be performed before installing the servo mount.

A. Referenced Information

Rockwell Collins Instruction Book SVO65 Primary Servo and SMT65 Servo Mount" (doc.523-0771890-00411A)

B. Procedure

- (1) Remove rudder servo mount (Refer to Para. 4).
- (2) Do the rudder servo mount clutch adjustment "Refer to Rockwell Collins Instruction Book SVO65 Primary Servo and SMT65 Servo Mount" (doc.523-0771890-00411A) and check that the clutch value is 81,5 (\pm 2,5) in-lbs.
- (3) Install the rudder servo mount (Refer to Para. 5).

7. Rudder Servo and Servo Mount - Inspection/Check

A. Referenced Information

Maintenance Manual Chapter [25-00-00](#)

B. Procedure

- (1) Set the battery switch to OFF.
- (2) Set the avionics master switch to OFF.
- (3) Open, safety and tag the following circuit breaker:
 - A/P SERVO AIL/RUD
- (4) Remove the pilot seat (Refer to [25-00-00](#)).
- (5) Remove panels 211CLF and 211DLF.
- (6) Inspect the rudder servo and servo mount:
 - (a) Examine for loose and worn mounting hardware and make sure that the servo and servo mount are securely mounted to the airframe.
 - (b) Examine the capstan for capstan or cable wear, contamination, and proper spool-off angle.
 - (c) Operate the rudder primary control system through its entire range and make sure the servo mount has not unusual noise, binding, backlash, or other mechanical irregularities.
 - (d) Use the tensiometer and check that the cable tension is within the limits (\pm 5%) (Refer to Fig. [203](#)).
- (7) Install panels 211CLF and 211DLF.
- (8) Install the pilot seat (Refer to [25-00-00](#)).
- (9) Remove the safety tags and close this circuit breaker:
 - A/P SERVO AIL/RUD
- (10) Set the avionics master switch to AVIONICS.
- (11) Set the battery switch to BAT.