

Elliott automatic flight control system



BAC

ONE-ELEVEN



## FOREWORD

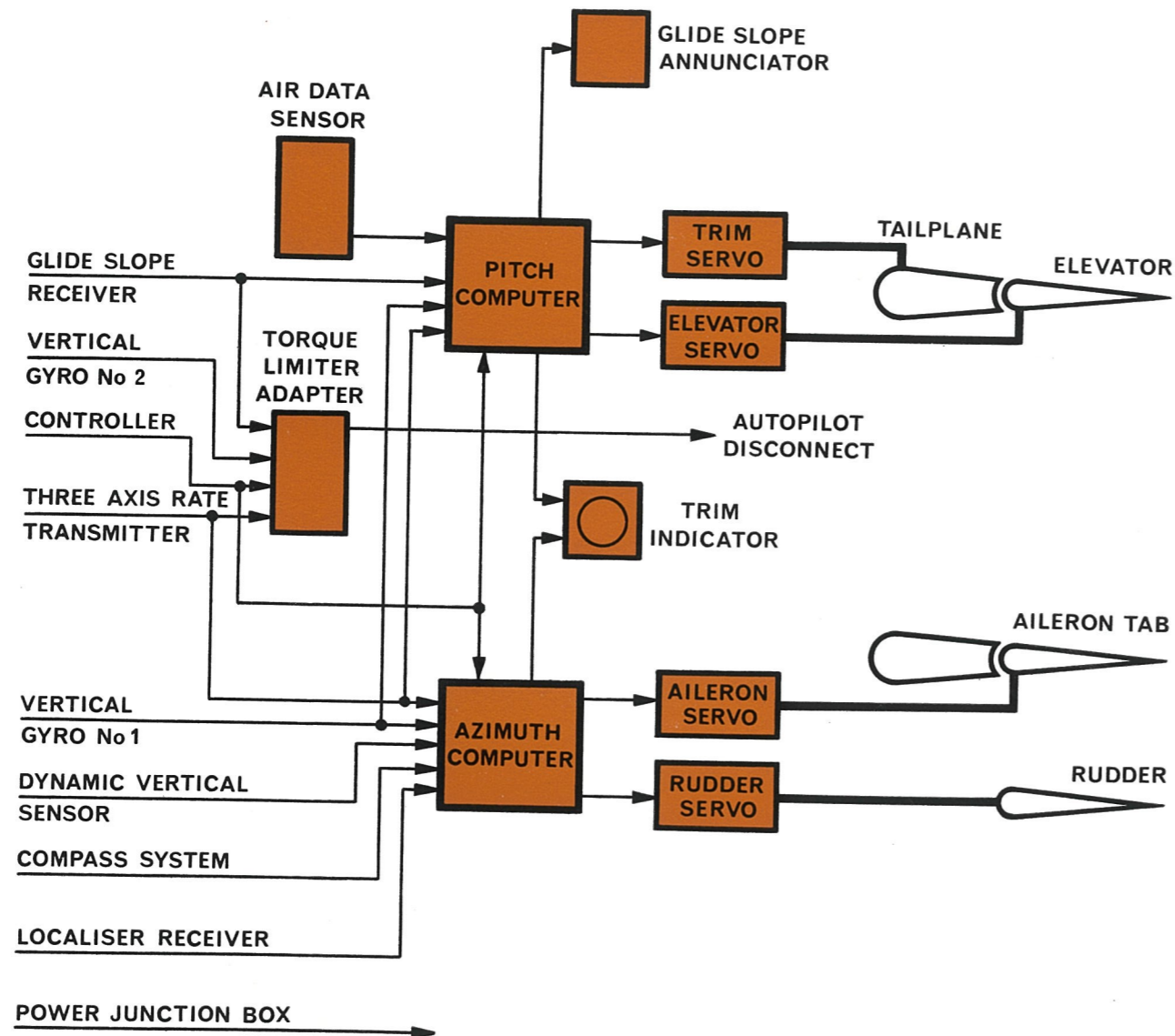
The BAC One-Eleven has been designed to meet the wide range of requirements of the world's airlines. In conjunction with the British Aircraft Corporation, Elliott Brothers has developed a compatible Automatic Flight Control System designated the Series 2000, and this publication sets out the full range of equipment available to cover various standards of operation up to and including, full failure-survival automatic landing.

The Elliott design philosophy and confirmed experience with the VC.10 system has been used where applicable to the One-Eleven system and, by virtue of manufacturing and licensing agreements with the Bendix Corporation, the best experience of both companies has been included.

The system is designed to allow a progressive build-up from a basic cruise autopilot with low approach characteristics, up to full automatic landing, and this is achieved by the incorporation of additional units to whatever stage the user may require. In this way it is possible for an airline to choose a particular initial system and progressively to introduce further stages as later requirements may demand. Additions necessary to convert from one system stage to the next are described in the following pages.

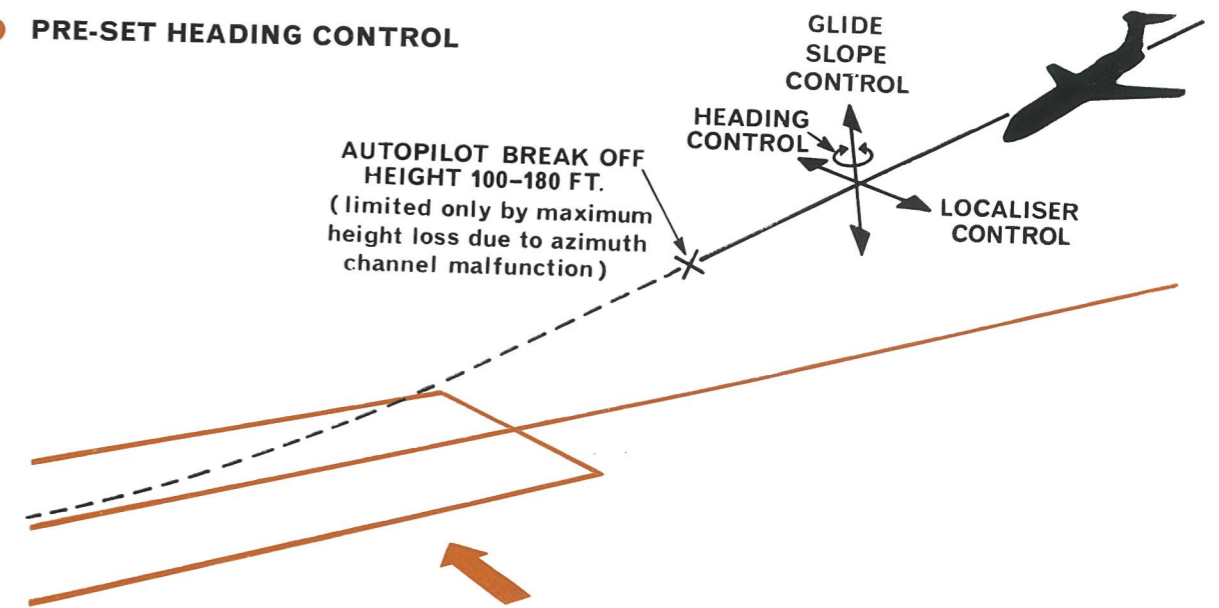


# SERIES 2000 BASIC SYSTEM



## SYSTEM HAS THE FOLLOWING OPERATING MODES

- **AUTOMATIC APPROACH ON ILS LOCALISER AND GLIDESLOPE BEAM**
- **VARIABLE ANGLE BEAM CAPTURE OF VOR LOCALISER**  
Capture angle can be controlled via the Pre-set Heading knob or as a clutched heading facility.
- **MANUAL** (pitch and roll command and heading hold)
- **ALTITUDE HOLD**
- **PRE-SET HEADING CONTROL**

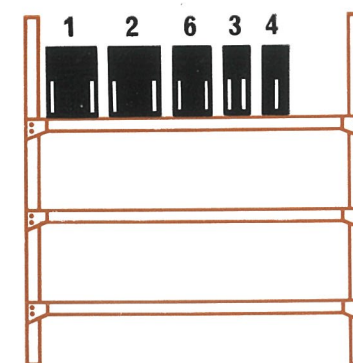
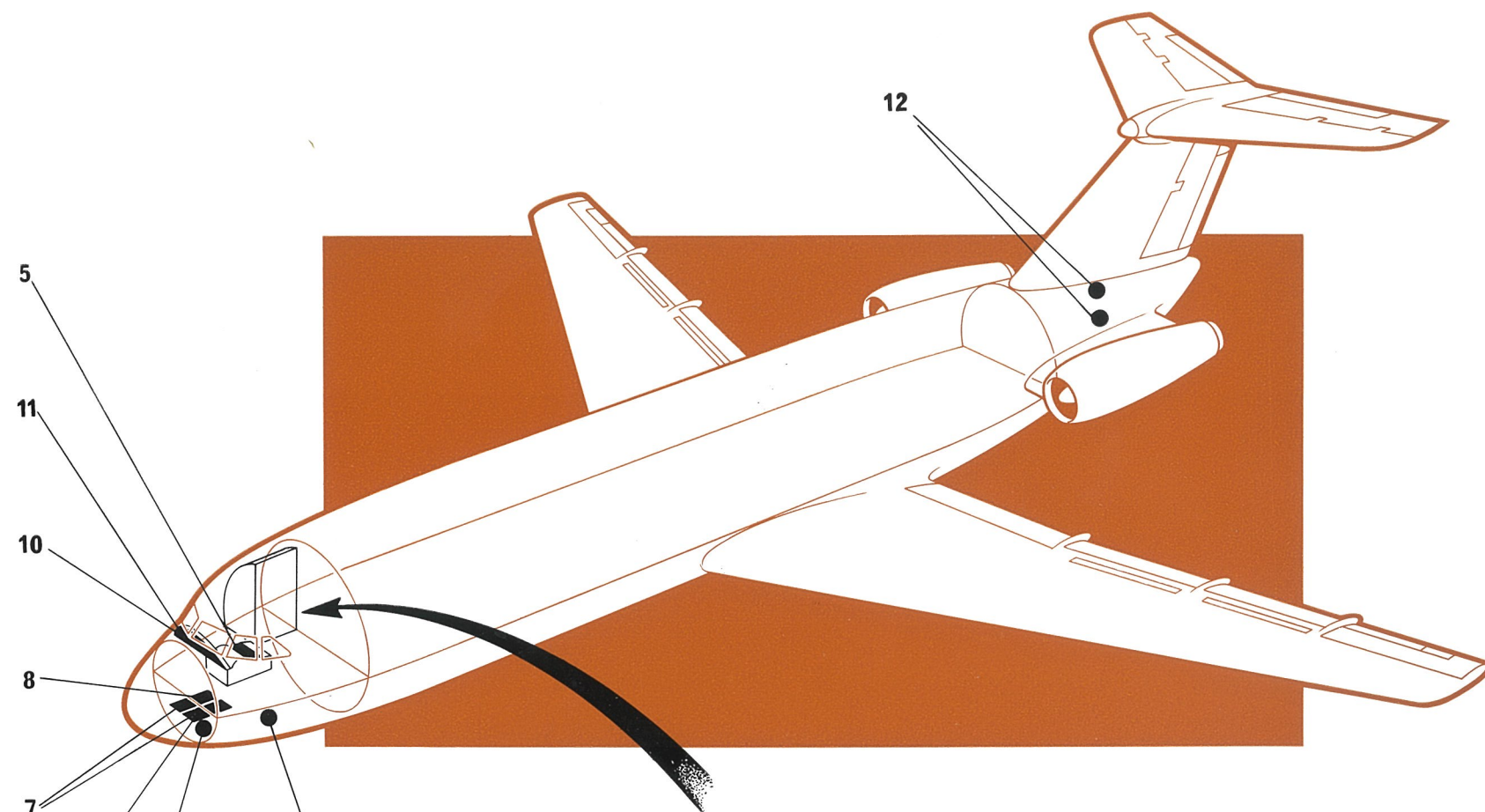
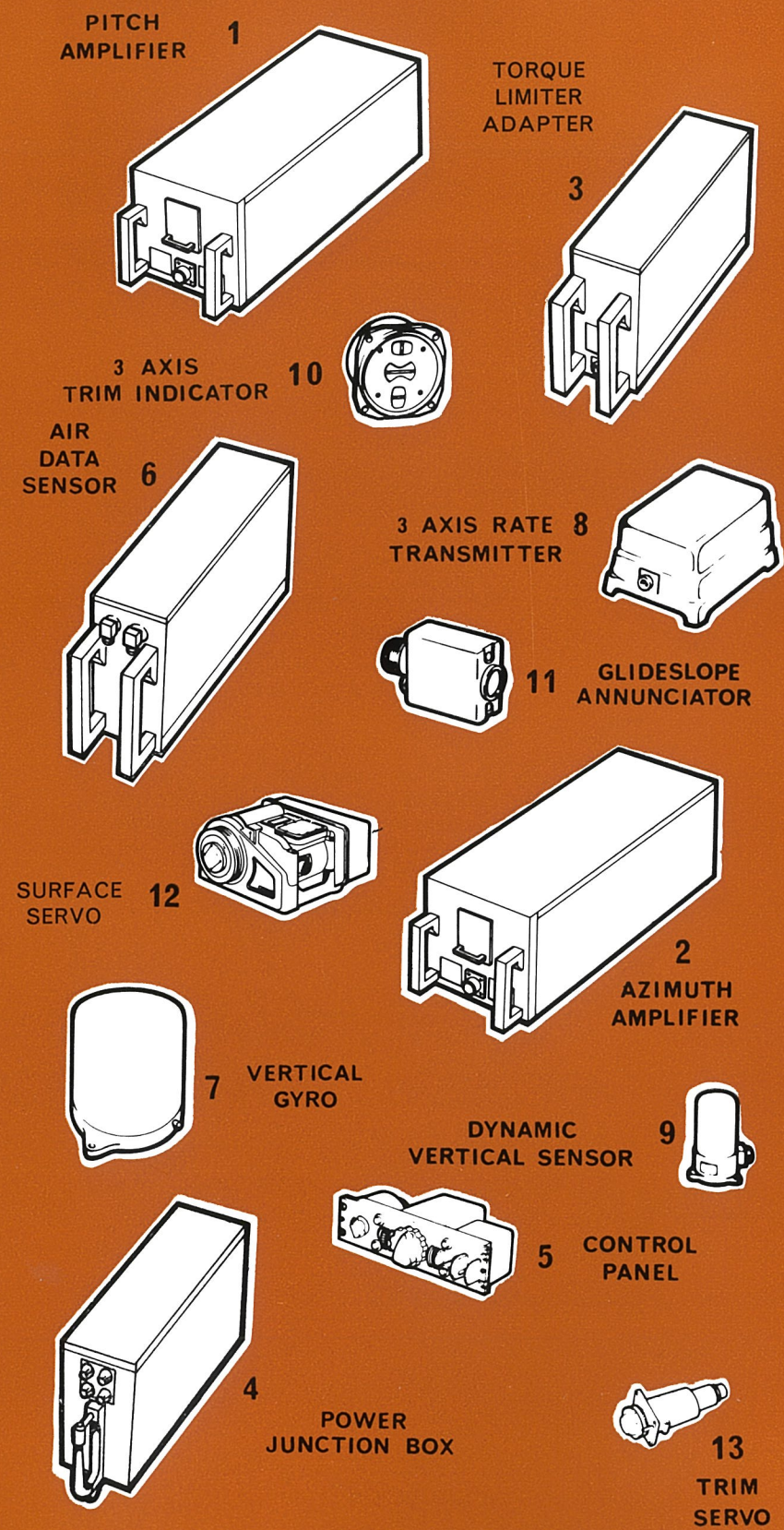


- **GLIDESLOPE DESENSITISATION** independent of the altitude at glideslope capture
- **FAIL-SOFT PITCH AXIS CHARACTERISTICS** due to torque limiter adapter
- **LOCALISER STABILISATION CIRCUITS** give superior localiser holding
- **COMMAND SOFTENING** in both pitch and roll

Optional extras      **MACH No. HOLD**      **AIRSPED HOLD**  
    **RATE OF CLIMB**      **PRESELECT HEIGHT**



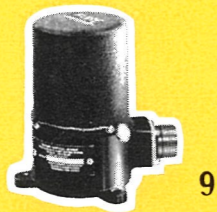
# LOCATION



MAIN RACK



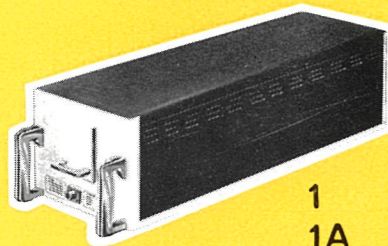
## DETAILS OF EQUIPMENT



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### DYNAMIC VERTICAL SENSOR

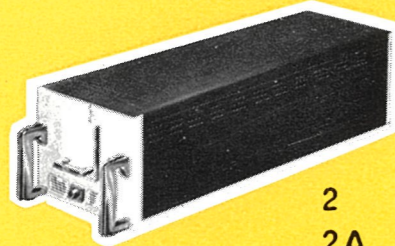
The Dynamic Vertical Sensor contains a viscous-damped pendulum which detects lateral accelerations and provides signals to the autopilot computer to remove side slip and to assist in automatic control of the aircraft in the event of engine failure.



1  
1A

### PITCH AMPLIFIER AND COMPUTER

A self-contained unit, in a 3/4 long ATR case which houses all the electronics necessary to compute and process autopilot pitch commands. A plug in adapter unit at the front of the unit allows the system parameters to be adjusted.



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2A

### AZIMUTH AMPLIFIER AND COMPUTER

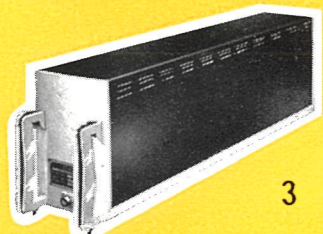
Contained in a 3/4 long ATR case, this accommodates all the electronics necessary to compute command signals associated with the aircraft azimuth control and contains an adapter unit similar to the pitch computer.



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### AUTOTHROTTLE ACTUATOR

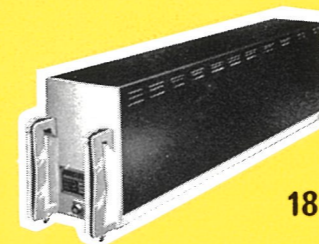
The Autothrottle Actuator is a servo motor gearbox and is designed for easy removal and installation. The actuator output is connected to the aircraft throttle system by means of an Autothrottle Actuator Mount which is designed to be integral with the control linkages—hence the actuator can be removed without disturbance to the throttle system. The actuator mount can accommodate a single or a dual Actuator. Modification from a single to a dual actuator is relatively straightforward.



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### TORQUE LIMITER ADAPTER

This unit limits the effect of autopilot malfunctions or produces an autopilot disconnect following a malfunction, thereby allowing the autopilot to be used at low altitudes.



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### MONITORED AUTOFLARE COMPUTER

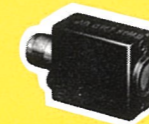
This unit processes the radio altimeter signals and provides output signals to the autopilot elevator channel in accordance with the pre-determined control law. The unit incorporates its own power supply. Continuous self-checking facilities for fail-soft operation. The computer is housed in a 1/2 ATR box.



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### POWER JUNCTION BOX

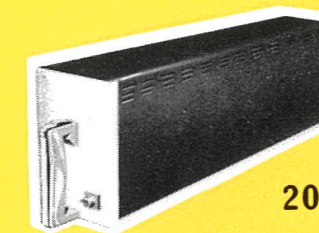
A 3/8 ATR unit, which converts the aircraft's three-phase 400 c/s 4-wired power supply into alternating and direct current at various levels and phases for the system.



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### GLIDESLOPE ANNUNCIATOR

This unit is mounted on the main instrument panel and indicates when glideslope control is automatically engaged and also when glideslope mode is selected. It indicates ARM prior to glideslope engagement. ON is indicated when glideslope is engaged. When completely unenergised, OFF is indicated.



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### AZIMUTH LANDING COMPUTER

This is packaged in a 3/8 ATR box. The Azimuth Landing Computer is a self-monitored unit which provides processed demands for removing crab angle just prior to touchdown.



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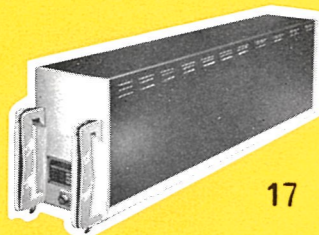
### CONTROL PANEL

Consists of a manoeuvring controller, a rotary mode selector switch, a three-position AUTOPILOT/DAMPER engage switch and a two-position toggle switch for engagement of height locks. The mode selector switch has five positions: MANUAL; HDG; LOC/VOR; GS AUTO and GS MANUAL.





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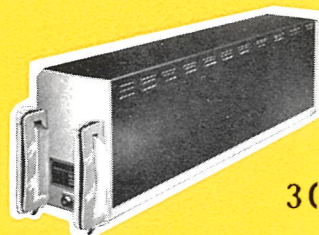
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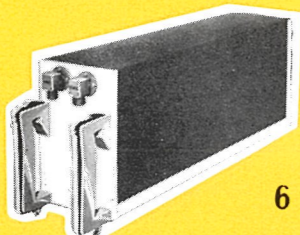
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3(m)



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### AUTO-CHANGEOVER UNIT

The Auto-changeover Unit is employed to transfer control authority to the standby system in the event of failure of the first system.

### AZIMUTH MONITOR

This unit is a 1/2 ATR box containing plug-in modules which monitors the autopilot azimuth axis and will cause disconnect in the event of an autopilot failure.

### THREE AXIS RATE TRANSMITTER

The Three-Axis Rate Transmitter senses angular rate of movement in each of the three axis.

### TRIM SERVO AND MOUNT

The Trim Servo is an electric motor gearbox and clutch assembly which is used to drive the pilot's pitch trim wheel. The servo mount incorporates a friction clutch which allows the pilot to override the servo in an emergency.

### PITCH MONITOR

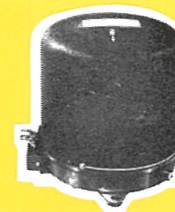
This unit (coded 3m) is a modified version of the Torque Limiter Adapter which detects all failures of the autopilot pitch channel and produces an automatic disconnect of the autopilot, thereby allowing fail-soft autopilot operation in the pitch channel.

### AIR DATA SENSOR

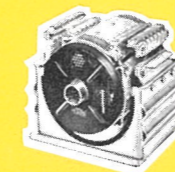
Contains all the necessary modular mechanisms and electronics necessary for producing height hold output and gearing adjustment as a function of airspeed and height. The Modified Air Data Sensor (6m) provides an output for autothrottle with provision for a monitor.



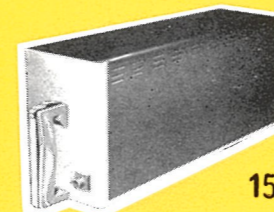
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### SURFACE SERVO AND PULLEY AND SERVO MOUNT

The servo is mounted on the control runs and positions the control surfaces of the aircraft by moving the runs.

### VERTICAL GYRO

The Vertical Gyro (No. 7) is a self-erecting electrically driven gyro that provides the vertical reference for the Automatic Flight Control System. It also provides pitch and bank attitude information for the flight instruments radar stabilisation, etc.

A Second Vertical Gyro (No. 21) is used to monitor autopilot outputs from the main gyro.

### AUTOTHROTTLE COMPUTER

Comprising a 3/8 short ATR box this unit accommodates all the electronics necessary for computing autothrottle demands.

### SERVO-DRIVEN AIRSPEED INDICATOR

This unit provides a synchronised airspeed control signal thus permitting smooth engagement of the autothrottle system.

The servo amplifier and power supplies are packaged within the instrument.

### THREE AXIS TRIM INDICATOR

A visual monitor of autopilot out-of-trim which is installed on the main instrument panel. It comprises three separate meter movements, one for each control axis.



## **transport aircraft controls division**

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