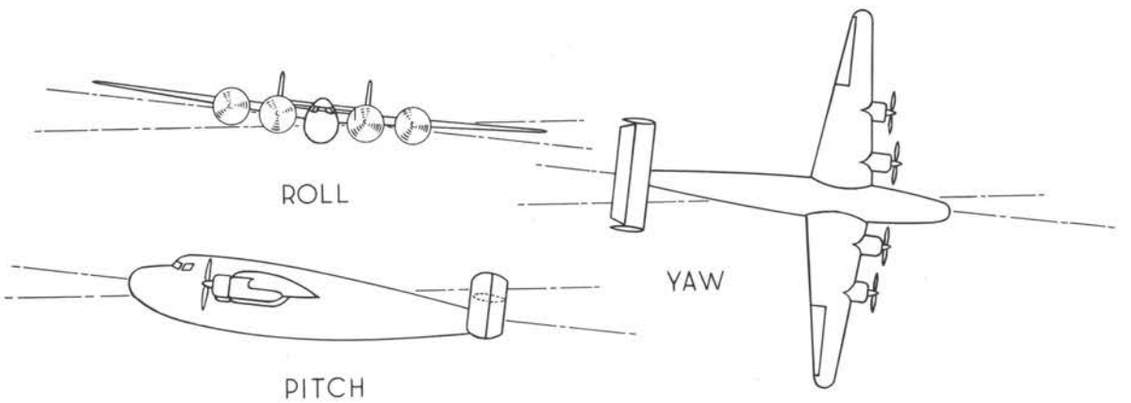
AUTOMATIC PILOTS

An automatic pilot is a mechanism which automatically controls the established flight attitude of an airplane. Through its use, the human pilot is relieved of the strain and fatigue which may result from flights of long duration. It also allows the human pilot to direct his attention to navigation, tactical problems, engine operation or other flight factors.

In addition to maintaining mechanical control, some types also provide visual indication of the attitude of the airplane in yaw, pitch, and roll similar to the indications of the flight and turn indicators.



While the automatic pilot is normally used to maintain straight and level flight, it may also be used with greater precision for normal flight maneuvers, such as climb, descent, turns, spirals, etc., than is possible through manual control. Where required, remote controls for some automatic pilots are installed in such locations that the bombardier or navigator may direct the flight.

The basic principle of the automatic pilot is that the axis of a rapidly spinning gyroscope will remain fixed, or rigid, in space. Any movement of the airplane around the spinning axis sets up an impulse which is transmitted to a device for correcting the deviation.

Corrections for bank and climb in horizontal flight are obtained by reference to a vertically spinning gyro, the axis of which points to the earth's center, while directional control is provided by a gyro spinning horizontally.

The automatic pilot is therefore a combination of two gyroscopes, together with the equipment for transmitting signals, the necessary correcting mechanisms, and a set of controls. When their functions are coordinated, they simulate the operation of the human brain, nerves and muscles. Gyroscopes may be either electrically powered or pneumatically operated.

ELECTRIC AUTOMATIC PILOT

In the electric pilot, the vertical gyroscope consists of an electric rotor turning at 24,000 R.P.M. pivoted in a horizontal, or gimbal ring, which in turn is pivoted in a vertical, or bail ring suspended in the case of the instrument. This type of suspension permits the gyro to remain fixed in space, while the associated equipment is free to move around it. The horizontal gyroscope is mounted in similar fashion.

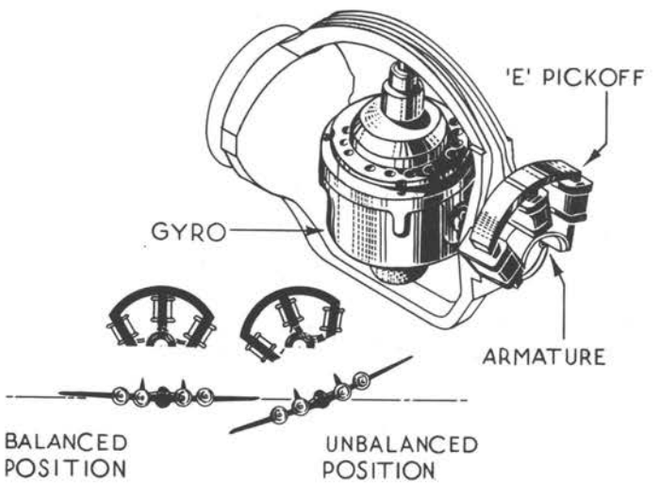
(Continued on Page 167)

AUTOMATIC PILOTS

(*Continued from Page 166*)

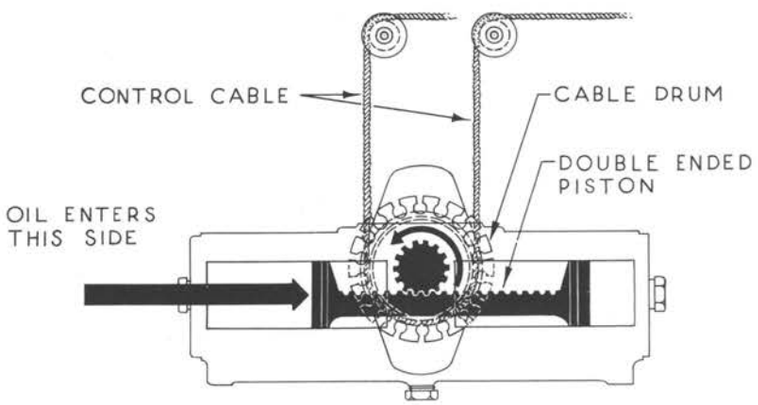
A pick-off is an E-shaped electromagnet having a center primary coil and secondary coils at both ends. When equally spaced about an armature attached to the gyroscope, equal lines of force are set up on either side of the center coil. This is the neutral or balanced condition. Any movement of the airplane from its established course moves the pick-offs, but not the armature, upsetting the balance of forces and creating a voltage differential.

GYRO AND 'E' PICKOFF



This displacement causes a weak electrical signal which is strengthened by thermionic (radio) tubes in an amplifier. The amplified impulse is transmitted to a servo, which is the correcting mechanism. A servo is essentially an hydraulic barrel containing a double-ended piston which, in the balanced condition, is centrally located. The displacement signal energizes one of two solenoid valves in the servo unit, admitting hydraulic fluid and increasing the hydraulic pressure on one side of the piston to move it from its neutral position. The piston is geared to a cable drum which is directly connected by cables to either the ailerons, elevators, or rudder.

The pick-offs are located on the instrument case, which moves with the airplane.



SERVO

(*Continued on Page 168*)

AUTOMATIC PILOTS

(*Continued from Page 167*)

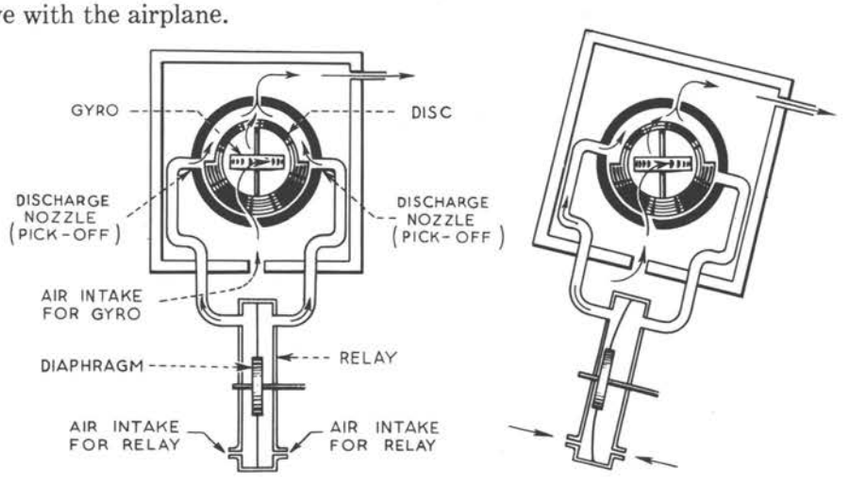
Electric pilots are controlled from the control unit in the cabin or cockpit of the airplane. The control unit contains a switch for turning on or disconnecting the pilot. It also indicates the position of the pick-offs with relation to the plane's attitude.

The panel is equipped with a set of controls for executing maneuvers while the automatic pilot is in operation. The controls are designed to change the location of the pick-offs, to accomplish these maneuvers. The resultant corrections provide the required changes in the flight course.

PNEUMATIC AUTOMATIC PILOT

The gyroscopes in the pneumatic pilot are driven by a continuous jet of air supplied by the engine-driven air pumps. A stream of air also passes through an air relay, which consists of a box divided internally by a diaphragm. An air intake and a nozzle, located on each side of the diaphragm, discharge air to the gyro system.

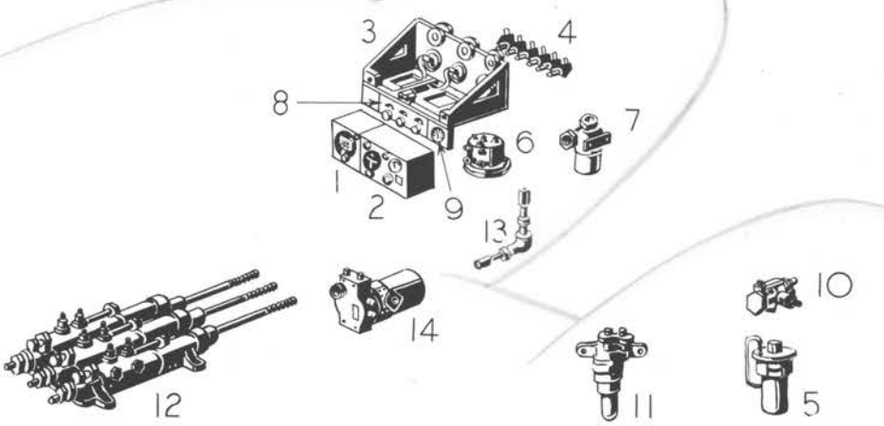
These two discharge nozzles, which are the pick-off in the pneumatic pilot, are partially covered by a disc attached to the gyro ring. The disc, therefore, is fixed in space, while the air nozzles move with the airplane.



BALANCED POSITION UNBALANCED POSITION

When the airplane is in its desired flight attitude, the knife edge of the disc cuts half the air supply equally at both nozzles, and the air passing on the two sides of the diaphragm exerts equal pressure. This is the neutral condition. Movement of the airplane around the gyro changes the position of the nozzles so that one nozzle is covered by the disc and the other remains exposed. Increased air pressure on one side of the diaphragm moves it to the side where there is less or no pressure. The diaphragm moves a rod which uncovers one of two oil ports, admitting hydraulic fluid to one side of the servo or the other. The resultant change in the position of the piston within the servo hydraulically adjusts the airplane control surfaces to which it is connected.

Regulation is obtained by two control units mounted on the instrument panel. One is the bank and climb gyro control; the other is the directional gyro control. These are actually instruments indicating the attitude of the airplane, to which pick-offs have been attached to provide automatic control. The control units are also equipped with the means for changing the flight course while the automatic pilot is in operation.



AUTOMATIC PILOTS

COMPONENT ITEMS

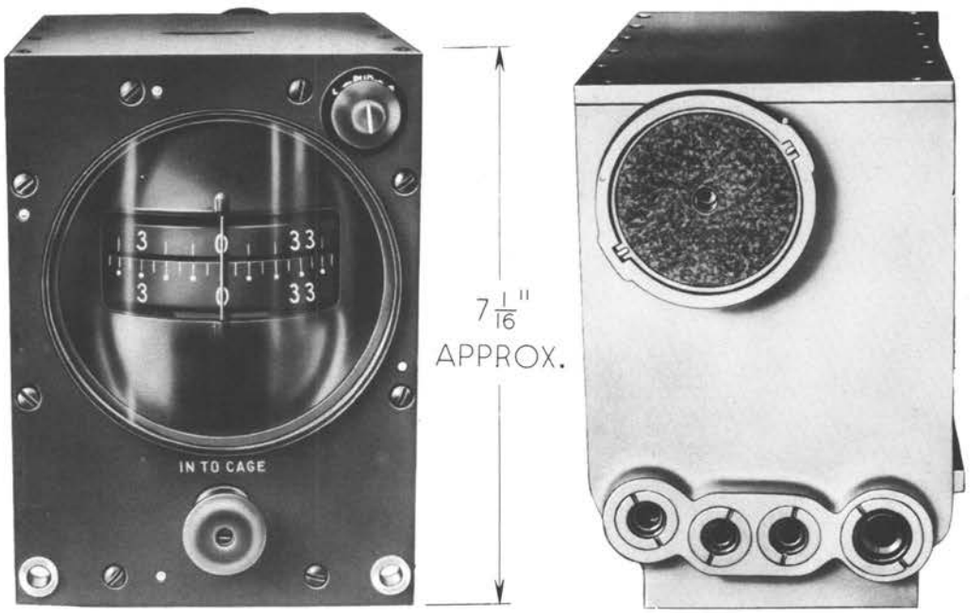
ARMY TYPE A-3 AND A-3A NAVY MARK 3 AND 3A

ITEM	NOMENCLATURE	A. E. REFERENCE (Army)	F. S. S. C. NUMBER	REMARKS
1	Directional Gyro Control	60-8202	88-U-165	
2	Vertical Gyro Control	60-8201	88-U-110	
3	Gyro Control Mount	60-8205	88-U-700	60-8208 is substituted for this item
4*	Manifold Block (Straight)	60-8210	Mfr's Part No. JH3211	One used for each installation
	Manifold Block (90 Degree)	60-8211	Mfr's Part No. JH3212	
	Manifold Block (30 Degree)	60-8212	88-M-60	
5*	Oil Sump	None	88-T-370	
6*	Drain Oil Trap	60-8328	88-T-2800	Used only when oil sump is mounted above gyro control mount level
7	Air Filter	60-8303	88-F-1035	
8	Speed Control Valve	60-8207	88-V-180	
9	Oil Pressure Gage	60-3120	88-G-875	
10	Oil Pressure Regulator	60-8206	88-R-245	
11	Oil Filter	60-8204	88-F-1060	
12*	6″ Stroke Gang Servo	None	88-S-264	3 Servos cast en bloc, one set used for each installation, or three single cylinders, push pull type, may be used for each installation.
	8″ Stroke Gang Servo	60-8224	88-S-265	
	11″ Stroke Gang Servo	60-8225	88-S-270	
	14″ Stroke Gang Servo	None	88-S-275	

ITEMS USED FOR REMOTE CONTROL INSTALLATIONS

	Directional Gyro Control	60-8252	No Navy Item	Replaces item 1
	Gyro Control Mount	60-8254	No Navy Item	Replaces item 3
13	Flexible Shaft Angle Gear	60-8251	No Navy Item	
14	Turn Controller	60-8253	No Navy Item	

NOTE: *ARMY: All items except 4, 5, 6, and 12 are Government furnished
NAVY: All items listed are G. F. E.



CONTROL—DIRECTIONAL GYRO

A. E. REFERENCE NUMBER 60-8202 F. S. S. C. NUMBER 88-U-165

NAMES: Directional gyro control
Azimuth control
Turn control
Directional control unit

DESCRIPTION: The directional gyro control, a part of the Army type A-3 and A-3A and Navy Mark 3 and 3A automatic pilots, contains the gyroscope which supplies the directional reference for both manual and automatic rudder control. It also contains air pick-offs, and a caging mechanism which locks the gyro to prevent damage to the instrument during maneuvers which exceed its normal operating range.

Two cards, graduated in 360 degrees of azimuth, are located on the dial. The lower card may be set to any desired heading by pushing in and turning the caging knob. When in operation, the automatic pilot maintains the direction of the airplane by manipulation of the rudder to correspond to the heading indicated on the lower card. To make turns with the automatic pilot in operation, the upper or rudder follow-up card is turned with the rudder knob, which is attached directly to the air pick-offs. The indices of this instrument can also be used for reference during manual flight.

CHARACTERISTICS:

Dimensions	approximately 5 1/16 by 7 1/16 by 12 inches
Weight	approximately 8 1/2 pounds
Power	4 inches of mercury vacuum
Markings	fluorescent and radioactive fluorescent
Graduations	0 to 360 degrees of azimuth

ARMY

A. E. REFERENCE NUMBER: 60-8202

SPECIFICATIONS:

General	94-27977-B
Detail	94-27978-B
Superseded	94-27978-A

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

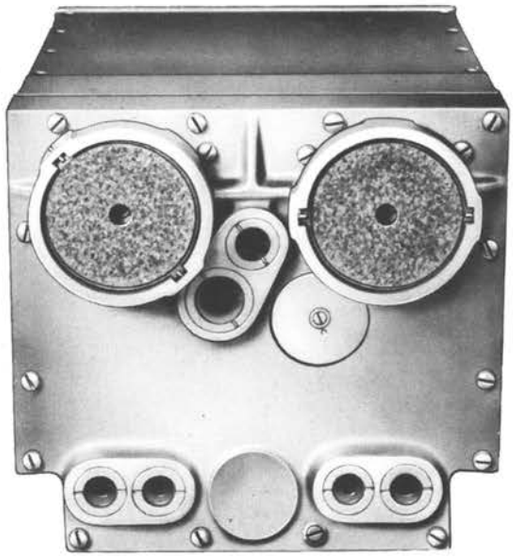
NAVY

F. S. S. C. STOCK NUMBER: 88-U-165

PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number	Current Model (X)	Remarks
Sperry Gyroscope Co., Inc.	643915	Assembly 643915 Outline 76571	A-N-B-C	6000096500	05-45AB	106J/601		Illuminated by 3-volt dial lamp.
	648010	648010	A-N-B-C	6000096515	05-45AB	106J/750	X	
Jack & Heintz, Inc.	JH5000	JH5000 Outline JH5185	A-N-B	6000096555	05-45BA	106J/692	X	



CONTROL—VERTICAL GYRO

A. E. REFERENCE NUMBER 60-8201 F. S. S. C. NUMBER 88-U-110

NAMES: Vertical gyro control
Bank and climb control (NAVY)
Bank and climb gyro control unit
Horizon control

DESCRIPTION: The vertical gyro control is a part of the Army types A-3 and A-3A, and Navy Mark 3 and 3A, automatic pilots. It contains the gyroscope, which provides a reference for manual or automatic control of the attitude of the airplane, a suction gage, gyro caging device, and mechanism to operate the air pick-off assembly.

The caging device locks the gyro to prevent damage to the instrument during maneuvers which exceed operating limits. In operation, the horizon bar in front of the dial appears to rise as the plane noses down, and to descend as the plane noses up. The horizon bar remains in the horizontal position when the plane banks. The position of the miniature plane in relation to the horizon bar affords the pilot visual indication of the airplane's flight attitude.

The elevator and aileron follow-up indices give a visual indication of the air pick-off settings. The air pick-offs for the ailerons are set by the aileron knob, while the elevator knob provides for adjustment of the elevator. Neutral or no signal positions are set by matching the aileron follow-up index with the bank index, and the elevator follow-up index with the elevator alignment index. For level flight, or preparatory to engaging the automatic pilot, the indices for each control must be matched.

CHARACTERISTICS:

Dimensions	approximately 7 1/16 by 7 1/16 by 12 inches
Weight	approximately 13 1/2 pounds
Power	4 inches of mercury vacuum
Markings	fluorescent and radioactive fluorescent

ARMY

A. E. REFERENCE NUMBER: 60-8201

SPECIFICATIONS:

General	94-27977-B
Detail	94-27979-B
Superseded	92-27979-A

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

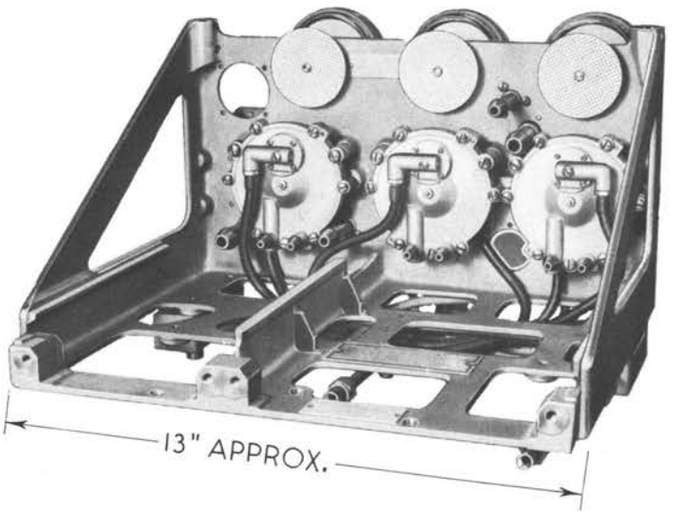
NAVY

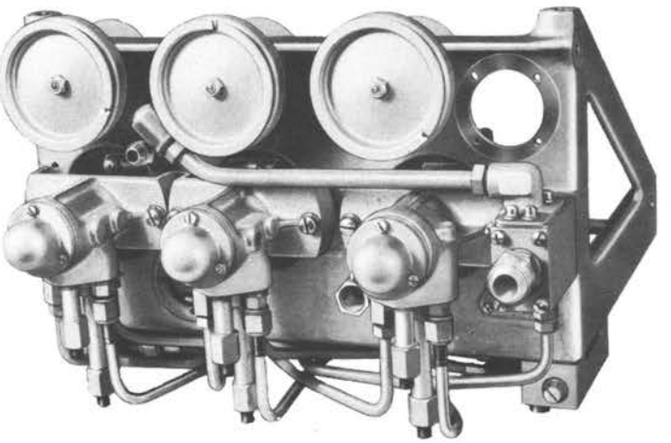
F. S. S. C. STOCK NUMBER: 88-U-110

PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number	Current Model (X)	Remarks
Sperry Gyroscope Co., Inc.	643916	Assembly 643916 Outline 644354	A-N-B-C	6000094250	05-45AB	106J/602		Illuminated by 3-volt dial lamp
	648011	648011	A-N-B-C	6000094450	05-45AB	106J/751	X	
Jack & Heintz, Inc.	JH6000	JH6000 Outline JH6260	A-N-B	6000094875	05-45BA	106J/691	X	





MOUNT—GYRO CONTROL

A. E. REFERENCE NUMBER 60-8205 F. S. S. C. NUMBER 88-U-700

NAMES: Gyro control mount
Automatic pilot mounting unit
Gyro pilot mounting unit

DESCRIPTION: The gyro control mount is attached to the structure of the airplane to hold the directional and vertical gyro controls of the Army types A-3 and A-3A and Navy Mark 3 and 3A automatic pilots.

The mount consists of a shock-mounted frame, to which are attached air relays, balance oil valves, follow-up pulleys, pressure and drain manifolds. The air intake connections for the two control units are fitted to the suction manifold, permitting the entire system to be connected through a central air filter.

All connections are made automatically when the gyro controls are slid onto the frame tracks and locked in position.

CHARACTERISTICS:

Dimensions.....approximately 13 by 8 9/16 by 15 inches
Weight.....refer to the chart

ARMY

A. E. REFERENCE NUMBER: 60-8205
SPECIFICATIONS:

General.....94-27977-B
Detail.....94-27980-A
Superseded.....94-27980

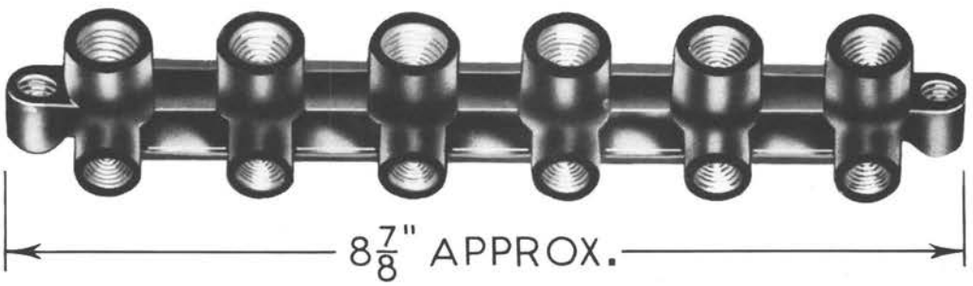
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

F. S. S. C. STOCK NUMBER: 88-U-700
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number	Weight
Sperry Gyroscope Co.	643917	Assembly 643917 Outline 644393	A-N-B-C	6000298000	05-45AB	106J/603	10¾ pounds
Jack & Heintz	JH4000	JH4000 Outline JH4127	A-N-B	6000298710	05-45BA	106J/690	8½ pounds



BLOCK—MANIFOLD

A. E. REFERENCE NUMBERS 60-8210, 60-8211, 60-8212 F. S. S. C. NUMBERS 88-M-60, 88-M-62

NAME: Manifold block

DESCRIPTION: This unit, a part of the Army type A-3, A-3A and the Navy Mark 3 and 3A automatic pilots, provides a junction for connecting the flexible and rigid oil lines. It is attached to the structure of the airplane, adjacent to the gyro control mount.

It consists of a block with six ¼-inch standard pipe thread openings for attaching the flexible tubing from the gyro control mount, and six ⅛-inch standard pipe thread openings, at an angle, for attaching the rigid metal tubing which is connected to the servo. The mount assembly is isolated from vibration of the aircraft structure without the necessity for running flexible hoses from the gyro control to the servos through the use of this manifold block.

For convenience in installation, the manifold blocks are furnished with inlets and outlets 180°, 90° and 30° apart.

CHARACTERISTICS:

Dimensions.....refer to chart
Weight.....refer to chart

(Continued on Page 174)

BLOCK—MANIFOLD

(Continued from Page 173)

ARMY

A. E. REFERENCE NUMBER: Refer to chart.

SPECIFICATIONS:

General.....94-27977-B

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

NAVY

A. S. O. OR F. S. S. C. STOCK NUMBER: Refer to chart.

PROCUREMENT STATUS: Refer to chart.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 6
A-Army, N-Navy, B-British, C-Commercial

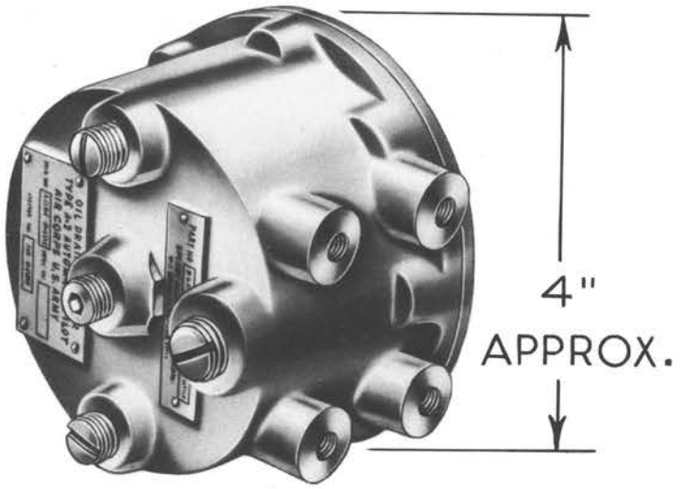
Manufacturer	Manufacturer's Part and Drawing Number	Angle Between Openings	Dimensions (Inches Approximately)	Weight (Ounces Approximately)	Used By	A. E. Reference Number	Air Service Command Stock Number	Army Technical Order Number	F. S. S. C. Number	British Reference Number
Jack & Heintz, Inc.	JH3211	Straight	6½ by 1⅛ by ⅞	4	A-N-B	60-8210	6300520868	05-45BA		106J/714 †
	JH3212	90 degree	8⅞ by 1¼ by 1¼	4	A-N-B	60-8211	6300520870	05-45BA		106J/712 †
	JH3213	30 degree	10⅛ by 1⅜ by ⅞	5	A-N-B	60-8212	6300520872	05-45BA	88-M-60	106J/713 ‡
Sperry Gyroscope Co., Inc.	801011	See Note*	11¾ by 1⅛ by 41½	6	A-N-B-C		6300521973	05-45AB	88-M-62	106J/609 ‡

*NOTE: Has twelve ⅛-inch pipe thread openings, providing straight or 90° angle between inlet and outlet. Interchangeable with any of the above by blanking off with plugs the six ⅛-inch openings not used.

Navy Procurement:

†Standard. G. F. E.—Order through A. S. O. by Manufacturer's Part Number.

‡Standard. G. F. E.—Order through A. S. O. by F. S. S. C. Number.



TRAP—DRAIN OIL

A. E. REFERENCE NUMBER 60-8328 F. S. S. C. NUMBER 88-T-2800

NAMES: Drain oil trap
Oil drain trap
Oil type trap

DESCRIPTION: The drain oil trap, a part of the Army type A-3, A-3A and A-4, and the Navy Mark 3, Mark 3A and Mark 4 automatic pilots, is used only in installations where the balanced oil valve is placed below the level of the oil sump.

The function of the unit is to accumulate the drain oil from the transfer valve, and, through the use of a vent, to eliminate air from the hydraulic system as the oil is returned thereto.

CHARACTERISTICS:

Dimensions.....approximately 3½ by 4 by 4 inches
Weight.....approximately ¾ pound

ARMY

A. E. REFERENCE NUMBER: 60-8328

SPECIFICATIONS:

General.....94-27977-B
Detail.....94-27770A
Superseded.....94-27770

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: 05-45AC

PRODUCTION STATUS: Under procurement (from Navy).

SHIPPING DATA: Shipped as a complete unit.

NAVY

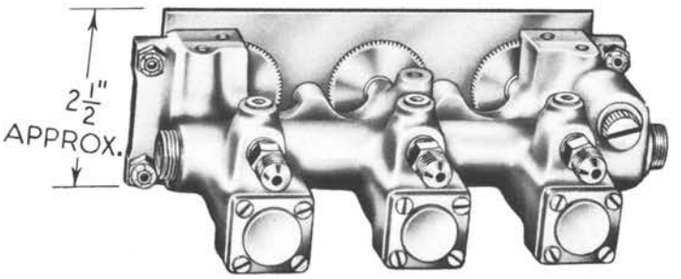
BUREAU OF AERONAUTICS SPECIFICATIONS: SE-8A

F. S. S. C. NUMBER: 88-T-2800

PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	641775	641775 Outline 89878	A-N-B	6000443000	05-45AC	106J/611
Jack & Heintz, Inc.	JH3050	JH3050 Outline JH3114	A-N-B	6000442900	05-45BA	106J/706



VALVE—SPEED CONTROL

A. E. REFERENCE NUMBER 60-8207 F. S. S. C. NUMBER 88-V-180

NAMES: Speed control valve — Speed control valve for aircraft automatic pilots
Speed valve

DESCRIPTION: The speed control valve is used to regulate the rate of flow of oil from the servos of the Army type A-3, A-3A and A-4 and Navy Mark 3, 3A and 4 automatic pilots. It consists of three identical valves, marked, respectively, "RUDDER" "AILERON" and "ELEVATOR". The speed control valve determines the responsiveness of the automatic pilot when the attitude of the airplane changes, by controlling the rate of oil flow from the servos.

The speed control valve is usually mounted at the bottom of the gyro control mount assembly, but may be located anywhere in the cockpit, convenient to the pilot. The control knobs are turned counterclockwise for quicker response, and clockwise for slower response. The numbers on the dials indicate the degree of opening or closing.

CHARACTERISTICS:

Dimensions ..... approximately $7\frac{17}{32}$ by $2\frac{1}{2}$ by $4\frac{9}{32}$ inches
Weight ..... approximately $2\frac{1}{5}$ pounds

ARMY

A. E. REFERENCE NUMBER: 60-8207

SPECIFICATIONS:

General 94-27977-B
Detail 94-27985
Superseded 27985

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: 05-45AB

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

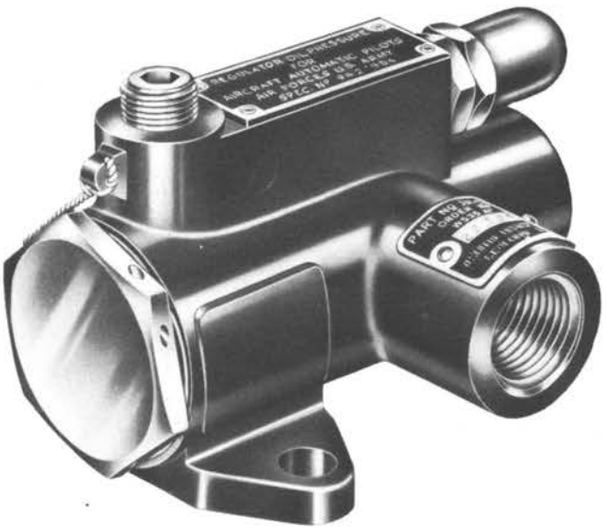
NAVY

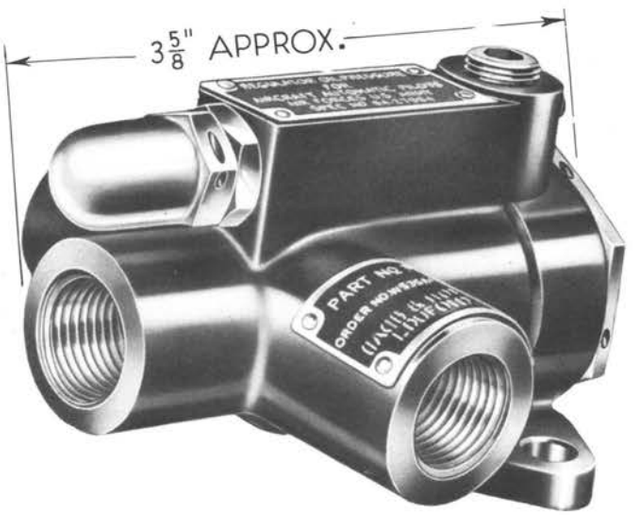
F. S. S. C. STOCK NUMBER: 88-V-180

PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Model Identification	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644255	Assembly 644255 Outline 76627	A-N-B-C	6000469050	05-45AB	106J/608
Jack & Heintz, Inc.	JH3100	JH3100 Outline JH3109	A-N-B	6000469025	05-45BA	106J/708





REGULATOR—OIL PRESSURE

A. E. REFERENCE NUMBER 60-8206 F. S. S. C. NUMBERS 88-R-245, 88-R-255

NAMES: Oil pressure regulator
3/8 inch relief valve assembly
Pressure reducer
Relief valve assembly

DESCRIPTION: The oil pressure regulator of the Army types A-3, A-3A and A4 and the Navy Mark 3, 3A and 4 automatic pilots automatically regulates the pressure from the oil pump. It returns the oil to the sump, or reservoir, whenever the balanced oil valve cuts off oil circulation to the servos, and is adjustable, to maintain the required oil pressure at the balanced oil valves. This regulator may be mounted on top of the sump, or separately, when the airplane has its own hydraulic system with a central oil reservoir. The regulator has two connections for overflow oil, the one used depending upon installation space. It also has one connection for regulated oil to the balanced oil valve and the other for the oil pressure line from the pump.

CHARACTERISTICS:

Pressure range	minimum 50 pounds per square inch maximum 300 pounds per square inch
Maximum flow	three gallons per minute
Dimensions	approximately $3\frac{5}{8}$ by $2\frac{5}{16}$ by $4\frac{13}{32}$ inches
Weight	approximately $1\frac{1}{5}$ pounds

ARMY

A. E. REFERENCE NUMBER: 60-8206
SPECIFICATIONS:

General	94-27977-B
Detail	94-27984-A
Superseded	94-27984

A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

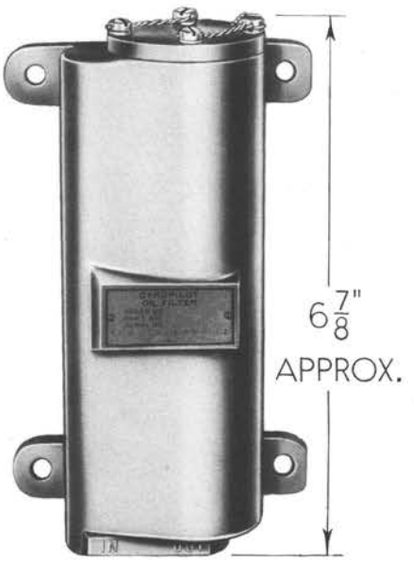
NAVY

F. S. S. C. STOCK NUMBER: Refer to chart.
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number	F. S. S. C. Number	Remarks
Sperry Gyroscope Co., Inc.	644256	Assembly 644256 Outline 801063	A-N-B-C	6000320300	05-45AB	106J/619	88-R-255	Not interchangeable if regulator is to be mounted on oil sump. Has one overflow connection only.
Jack & Heintz, Inc.	JH3120	JH3120 Outline JH3264	A-N-B	6000320400	05-45BA	106J/707	88-R-245	
Vickers, Inc.	43689	43689	A-N-B-C		05-45AB	106/619	88-R-255	
General Elec. Co.	GE8292141-G1		N-B			106J/619	88-R-255	
Air Accessories	40016		B			106J/619	88-R-255	

JACK & HEINTZ
SKINNER DESIGN



SPERRY DESIGN

SPERRY
PUROLATOR DESIGN

FILTER—OIL

A. E. REFERENCE NUMBER 60-8204 F. S. S. C. NUMBER 88-F-1060

NAMES: Oil filter
Automatic pilot oil filter
Filter; oil, for aircraft automatic pilot

DESCRIPTION: This oil filter is part of the Army type A-3, A-3A and A-4 and Navy Mark 3, 3A and 4 automatic pilots. It has a replaceable filter element and is mounted in the oil line of the automatic pilot hydraulic system to strain out foreign matter and provide a continuous supply of clean oil to the servos. The filter element can be removed for cleaning or replacement without disconnecting the oil lines.

The filter is installed between the oil pressure regulator and the pressure manifold on the gyro control mount assembly.

CHARACTERISTICS:
Dimensions.....Refer to chart
Weight.....Refer to chart
Cartridge.....Removable
Capacity.....2½ gallons per minute

ARMY

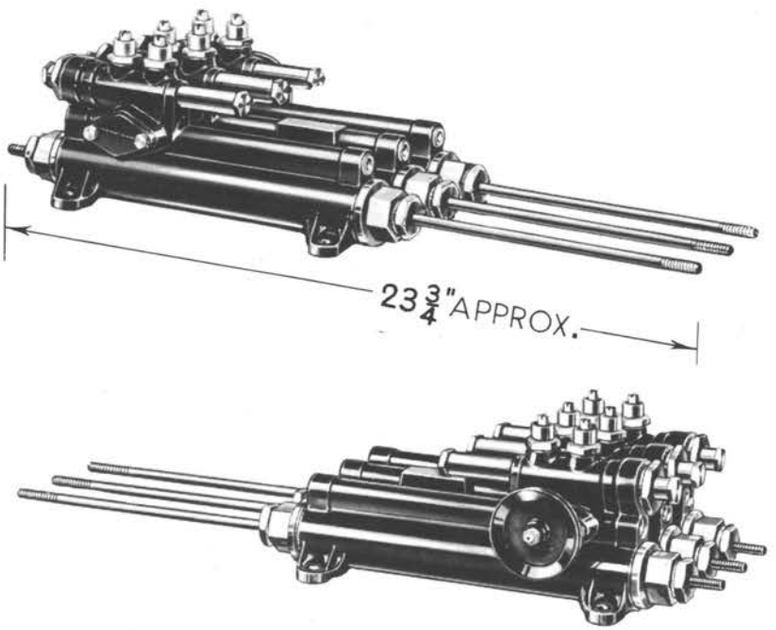
A. E. REFERENCE NUMBER: 60-8204
SPECIFICATIONS:
General.....94-27977-B
Detail.....94-27983-A
Superseded.....94-27983
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: 05-45AB
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

F. S. S. C. STOCK NUMBER: 88-F-1060
BuAer TECHNICAL ORDER NUMBER: 24-42
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 7
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Approximate Dimensions (Inches)	Approximate Weight (Pounds)	Current Model (X)	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644100	Assembly 644100 Outline 800867	4 x 6¾ x 2¼	1¼		A-N-B-C	6000104100	05-45AB	106J/612
	647983	647983	4 x 6⅞ x 2¼	⅜	X	A-N-B-C			106J/705
	648039	648039	4 x 6¾ x 2¼	1 1/10	X	A-N-B-C	6000104075	05-45AB	106J/705
Jack & Heintz, Inc.	JH3126	JH3126	4 x 6⅞ x 2¼	⅜	X	A-N-B	6000104050	05-45BA	106J/705
Purolator Prod., Inc.	PR93	28768	4 x 6½ x 2⅜	1 1/10	X	A-N-B-C	6000104065	05-45AB	106J/705
Skinner Purifiers, Inc.	27400	27400	4 x 6⅞ x 2¼	⅜	X	A-N-B-C	6000104060	05-45BA	106J/705



SERVO—8 INCH STROKE GANG

A. E. REFERENCE NUMBER 60-8224 F. S. S. C. NUMBER 88-S-265

NAMES: 8 inch stroke gang servo
Hydraulic surface control
Mechanical by-pass hydraulic surface control
Triple double-end type hydraulic surface control
Double-end type three bank servo

DESCRIPTION: This unit, a part of the Army type A-3 and A-3A and the Navy Mark 3 and 3A automatic pilots, consists of three cylinders cast in one piece. Inside each cylinder there is an hydraulically actuated piston. A rod on both ends of the piston extends outside the servo and is connected by cables to either the ailerons, elevators, or rudder. Any movement of the piston from its neutral position is therefore communicated directly to the airplane control with which it is connected.

A manually operated by-pass valve is provided for engaging or disengaging the automatic pilot.

Relief or overpower valves are built into each cylinder, permitting the human pilot, if necessary, to overpower the automatic pilot by applying increased force to the controls.

ARMY

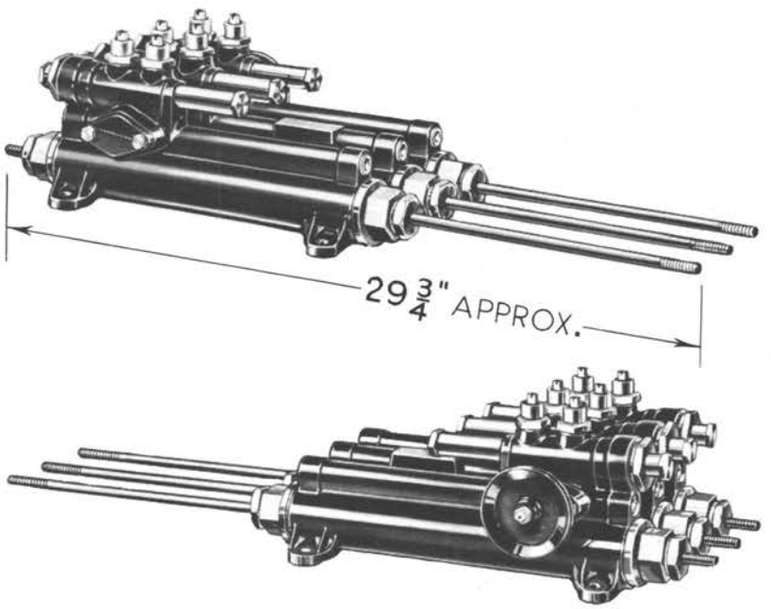
A. E. REFERENCE NUMBER: 60-8224
SPECIFICATIONS:
General.....94-27977-B
Detail.....94-27981-B
Superseded.....94-27981-A
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

A. S. S. C. STOCK NUMBER: 88-S-265
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTEECHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644191	644191 Outline 644359	A-N-B-C	6000097320	05-45AB	106J/606
Jack & Heintz, Inc.	JH3110	JH3110 Outline JH3087	A-N-B	6000097275	05-45BA	106J/688



SERVO—11 INCH STROKE GANG

A. E. REFERENCE NUMBER 60-8225 F. S. S. C. NUMBER 88-S-270

NAMES: 11 inch stroke gang servo
Hydraulic surface control
Mechanical by-pass hydraulic surface control
Triple double-end type hydraulic surface control
Double-end type three bank servo (Navy)
Hydraulic type servo unit

DESCRIPTION: This unit, a part of the Army type A-3 and A-3A and the Navy Mark 3 and 3A automatic pilots, consists of three cylinders cast in one piece. Inside each cylinder there is an hydraulically actuated piston. A rod on both ends of the piston extends outside the servo, and is connected by cables to either the ailerons, elevators, or rudder. Any movement of the piston from its neutral position is therefore communicated directly to the airplane control with which it is connected.

A manually operated by-pass valve is provided, for engaging or disengaging the automatic pilot.

Relief or overpower valves are built into each cylinder, permitting the human pilot, if necessary, to overpower the automatic pilot by applying increased force to the controls.

CHARACTERISTICS:
Dimensions ..... approximately 29¾ by 9$\frac{5}{32}$ by 5¼ inches
Weight ..... approximately 14½ pounds

ARMY

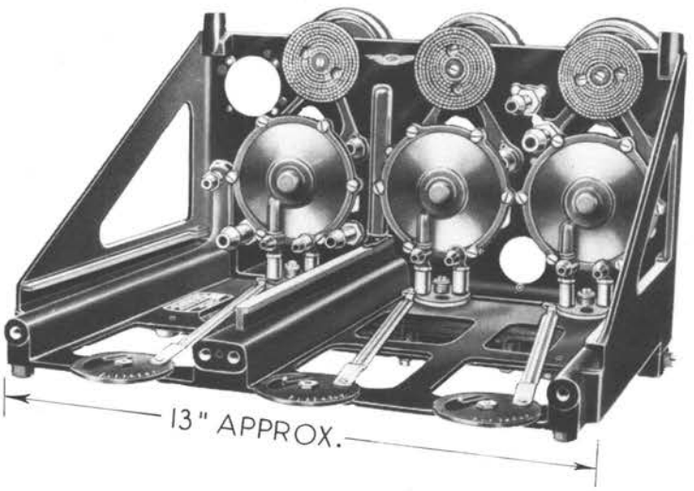
A. E. REFERENCE NUMBER: 60-8225
SPECIFICATIONS:
General 94-27977-B
Detail 94-27981-B
Superseded 94-27981-A
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

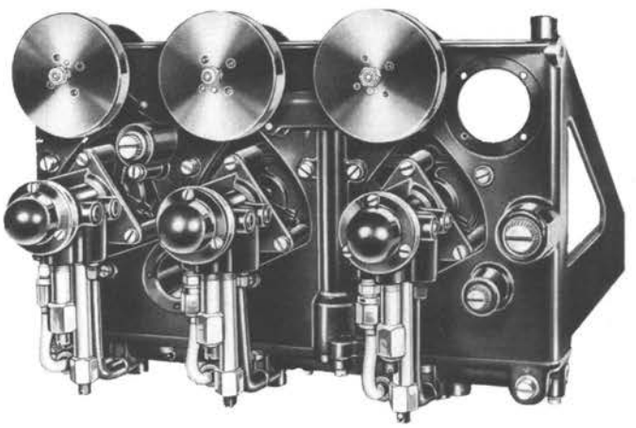
NAVY

F. S. S. C. STOCK NUMBER: 88-S-270
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644192	644192 Outline 644360	A-N-B-C	6000097380	05-45AB	106J/607
Jack & Heintz, Inc.	JH3000	JH3000 Outline JH3049	A-N-B	6000097335	05-45BA	106J/689





MOUNT—GYRO CONTROL

A. E. REFERENCE NUMBER 60-8208

NAMES: Gyro control mount
Automatic pilot mounting unit
Gyro pilot mounting unit

DESCRIPTION: The gyro control mount is attached to the structure of the airplane to hold the directional and vertical gyro controls of the Army types A-3, and A-3A, and the Navy Mark 3 and 3A, automatic pilots.

The mount consists of a shock-mounted frame, to which air relays, balanced oil valves, follow-up pulleys, pressure and drain manifolds are attached. The air intake connections for the two control units are fitted to the suction manifold, permitting the entire system to be connected through a central air filter.

All connections are automatically made when the gyro controls are slid onto the frame tracks and locked in position.

Since the speed control valves are built into this mount, a separate oil manifold providing three connections for the oil supply is shipped with the mount. The manifold is mounted on the structure of the airplane, near the mount.

CHARACTERISTICS:

Dimensions	approximately 13 by 8 9/16 by 15 inches
Weight	approximately 9 1/4 pounds

ARMY

A. E. REFERENCE NUMBER: 60-8208
SPECIFICATIONS:

General	94-27977-B
Detail	94-27980
Superseded	27980

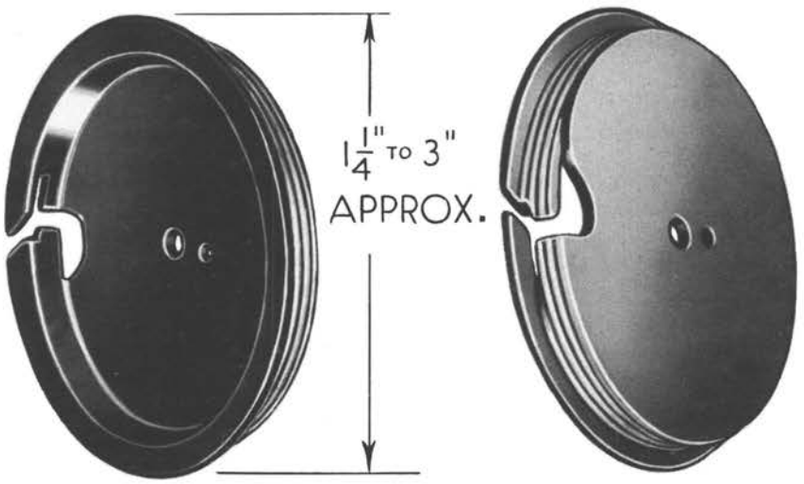
MANUFACTURER: Jack and Heintz, Inc.
MANUFACTURER'S PART NUMBER: JH4000-1
A. S. C. STOCK NUMBER: 6000298895
TECHNICAL ORDER NUMBER: 05-45BA
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Mount and oil manifold, Jack and Heintz part number JH3139, shipped as one unit.

NAVY

PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by Manufacturer's Part Number.

BRITISH

BRITISH REFERENCE NUMBER: 106J/760.



PULLEY—FOLLOW-UP

NAME: Follow-up pulley

DESCRIPTION: The follow-up pulley, varying in size from 1 to 2¾ inches in diameter, according to the installation requirements, is a part of the Army type A-3A and the Navy Mark 3A automatic pilot. Three pulleys are required for each installation, and they are attached to the gyro control mount.

The pulley, of single flange construction, has a number of grooves to guide the cable, and can be used to accommodate the cable from servos either to the right or left of the mount assembly.

CHARACTERISTICS:

Dimensions . . . . . refer to the chart.
Weight . . . . . approximately ¾ ounce

ARMY

A. E. REFERENCE NUMBER: Refer to chart.

SPECIFICATIONS:

General 94-27977-B
Detail 94-27980-A
Superseded 94-27980

A. S. C. STOCK NUMBER: Refer to chart.

RECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

NAVY

F. S. S. C. STOCK NUMBER: Refer to chart.

PROCUREMENT STATUS: Under procurement. Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

(*Continued on Page 183*)

PULLEY—FOLLOW-UP

(Continued from Page 182)

TABULATED ITEMS BELOW ARE NOT INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

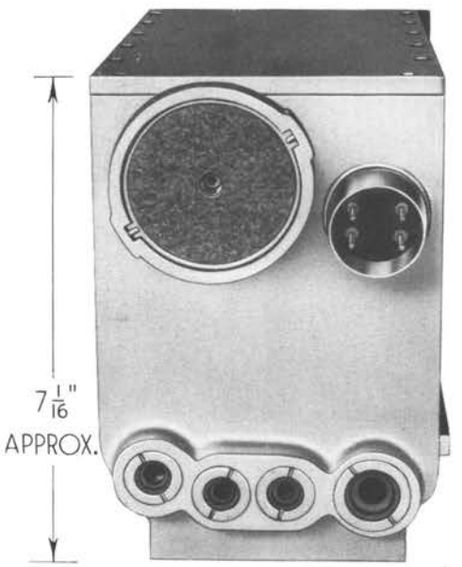
Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number	A. E. Reference Number	Pulley Diameter	F. S. S. C. Number
Jack & Heintz, Inc.	JH20-1	A-N-B	6000310200	05-45BA	106J/718	60-8213	1 inch	88-P-1050
	JH20-2	A-N-B	6000310250	05-45BA	106J/721	60-8214	1⅛ inches	88-P-1051
	JH20-3	A-N-B	6000310300	05-45BA	106J/724	60-8215	1¼ inches	88-P-1052
	JH20-4	A-N-B	6000310350	05-45BA	106J/703	60-8216	1⅜ inches	88-P-1053
	JH20-5	A-N-B	6000310400	05-45BA	106J/729	60-8217	1½ inches	88-P-1054
	JH20-6	A-N-B	6000310450	05-45BA	106J/732	60-8218	1⅝ inches	88-P-1055
	JH20-7	A-N-B	6000310500	05-45BA	106J/735	60-8219	1¾ inches	88-P-1056
	JH20-8	A-N-B	6000310550	05-45BA	106J/738	60-8220	2 inches	88-P-1057
	JH20-9	A-N-B	6000310600	05-45BA	106J/741	60-8221	2¼ inches	88-P-1058
	JH20-10	A-N-B	6000310650	05-45BA	106J/744	60-8222	2½ inches	88-P-1059
	JH20-11	A-N-B	6000311100	05-45BA	106J/747	60-8223	2¾ inches	88-P-1060

NOTE: Follow-up pulleys made by the Sperry Gyroscope Company are made specifically for right and left hand installation. Jack & Heintz pulleys may be replaced by Sperry pulleys of the same diameter, but proper consideration must be given to direction of rotation.

TABULATED ITEMS BELOW ARE NOT INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Diameter	Used By	A. S. C. Stock Number	Army Technical Order Number	F. S. S. C. Number	British Reference Number	Remarks
Sperry Gyroscope Co.	162703	1¼ inches	A-N-B	6000312275	05-45AB	88-P-1075	106J/728	Left Hand
	162702	1½ inches	A-N-B	6000315300	05-45AB	88-P-1080	106J/727	Right Hand
	178855	1⅝ inches	A-N-B	6000315550	05-45AB	88-P-1080-100	106J/730	Right Hand
	178846	1¾ inches	A-N-B	6000312775	05-45AB	88-P-1081	106J/734	Left Hand
	178847	2 inches	A-N-B	6000313100	05-45AB	88-P-1082	106J/737	Left Hand
	178848	2¼ inches	A-N-B	6000313275	05-45AB	88-P-1083	106J/740	Left Hand
	178849	2½ inches	A-N-B	6000313525	05-45AB	88-P-1084		Left Hand
	178850	2¾ inches	A-N-B	6000313775	05-45AB	88-P-1085	106J/746	Left Hand
	178857	2 inches	A-N-B	6000316100	05-45AB	88-P-1086	106J/736	Right Hand
	178858	2¼ inches	A-N-B	6000316275	05-45AB	88-P-1087	106J/739	Right Hand
	178859	2½ inches	A-N-B	6000316550	05-45AB	88-P-1088	106J/742	Right Hand
	178860	2¾ inches	A-N-B	6000316775	05-45AB	88-P-1089	106J/745	Right Hand

NOTE: Sperry pulleys may be replaced by pulleys of the same diameter manufactured by Jack & Heintz, Inc., since Jack & Heintz pulleys are designed for either direction of rotation.



CONTROL—REMOTE CONTROL DIRECTIONAL GYRO

A. E. REFERENCE NUMBER 60-8252

NAMES: Remote control directional gyro control
Directional gyro control (for remote control operation)
Azimuth gyro control

DESCRIPTION: This directional gyro control, which provides for remote control of the rudder, is a part of the Army types A-3 and A-3A automatic pilots. It contains the gyroscope which supplies the directional reference for both manual and automatic rudder control. It also contains air pick-offs, and a caging mechanism to lock the gyro and prevent damage during maneuvers which exceed its normal operating range.

This unit is equipped with a 24 volt direct current reversible motor which is geared to the air pick-offs through a differential and clutch, to enable a remote turn controller to be used.

Two cards, graduated in 360 degrees of azimuth, are located on the dial. The lower card may be set to any desired heading by pushing in and turning the caging knob. The upper, or rudder follow-up, may be set by turning the rudder knob, which is attached directly to the pick-offs. Pick-offs are neutral when the two card readings coincide. The upper card can also be used by the pilot, during manual flight, to maintain a desired course.

When this remote control directional gyro control is used, the gyro control mount, A. E. Reference Number 60-8254, must be used.

CHARACTERISTICS:

Dimensions	approximately 5 1/16 by 7 1/16 by 12 inches
Weight	approximately 9 3/4 pounds
Power	4 inches of mercury vacuum
Markings	fluorescent
Graduations	0 to 360 degrees azimuth

ARMY

A. E. REFERENCE NUMBER: 60-8252
SPECIFICATIONS:

General	94-27977-B
Detail	94-27978-B
Superseded	94-27978-A

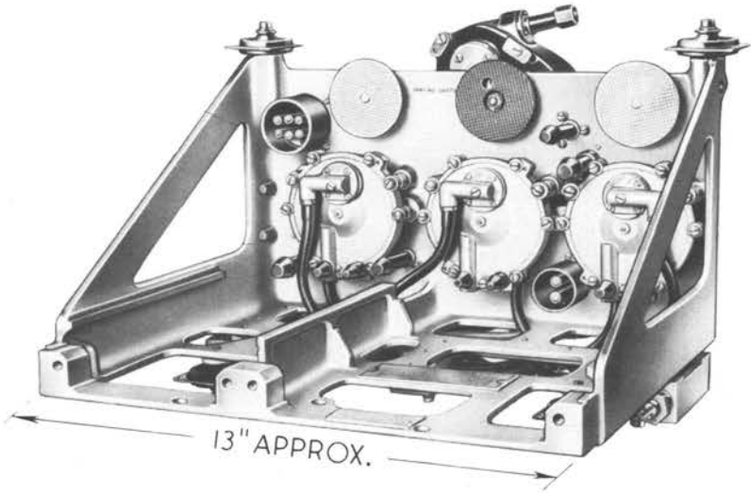
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

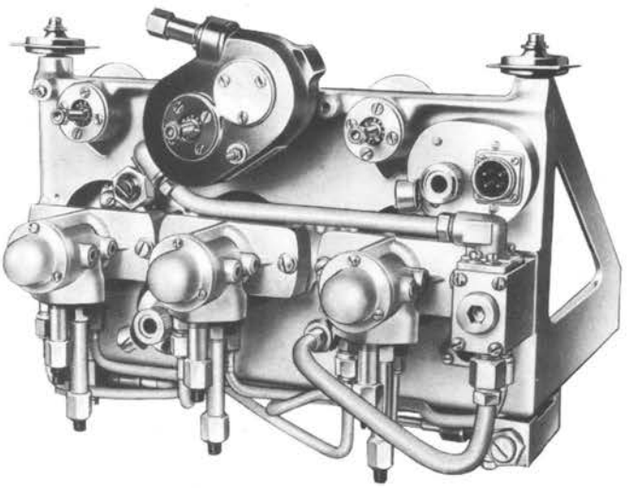
NAVY

There is no Navy equivalent for this item.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number	Current Model (X)	Remarks
Sperry Gyroscope Co., Inc.	645318	A-B-C	6000096530	05-45AB	106J/614		Illuminated by 3 volt dial lamp.
	648012	A-B-C	6000096520	05-45AB	106J/752	X	No individual illumination.





MOUNT—REMOTE CONTROL GYRO CONTROL

A. E. REFERENCE NUMBER 60-8254

NAMES: Remote control gyro control mount
Mount assembly—directional gyro control
Mounting unit—remote control

DESCRIPTION: The remote control gyro control mount, a part of the Army type A-3 automatic pilot, is attached to the structure of the airplane to support the vertical and the directional gyro controls. It is used, primarily, when remote control of turns is required.

This mount consists of a shock mounted frame to which are attached the air relays, balanced oil valves, follow-up pulleys, pressure and drain manifolds. The air intake connections for the two control units are fitted to the suction manifold, permitting the entire system to be connected through a central air filter. The remote control adapter is fastened to the aileron follow-up pulley, and is connected to the turn controller which is mounted in the pilot's compartment.

All air, mechanical and electrical connections are made automatically when the gyro controls are slid onto the frame tracks and locked in position.

CHARACTERISTICS:

Dimensions	approximately 13 by $8\frac{9}{16}$ by $14\frac{15}{16}$ inches
Weight	approximately $12\frac{1}{4}$ pounds

ARMY

A. E. REFERENCE NUMBER: 60-8254

SPECIFICATIONS:

General	94-27977-B
Detail	94-27980
Superseded	27980

MANUFACTURER: Sperry Gyroscope Co., Inc.

MANUFACTURER'S DRAWING NUMBER: 644707

A. S. C. STOCK NUMBER: 6000298650

TECHNICAL ORDER NUMBER: 05-45AB

PRODUCTION STATUS: Under procurement.

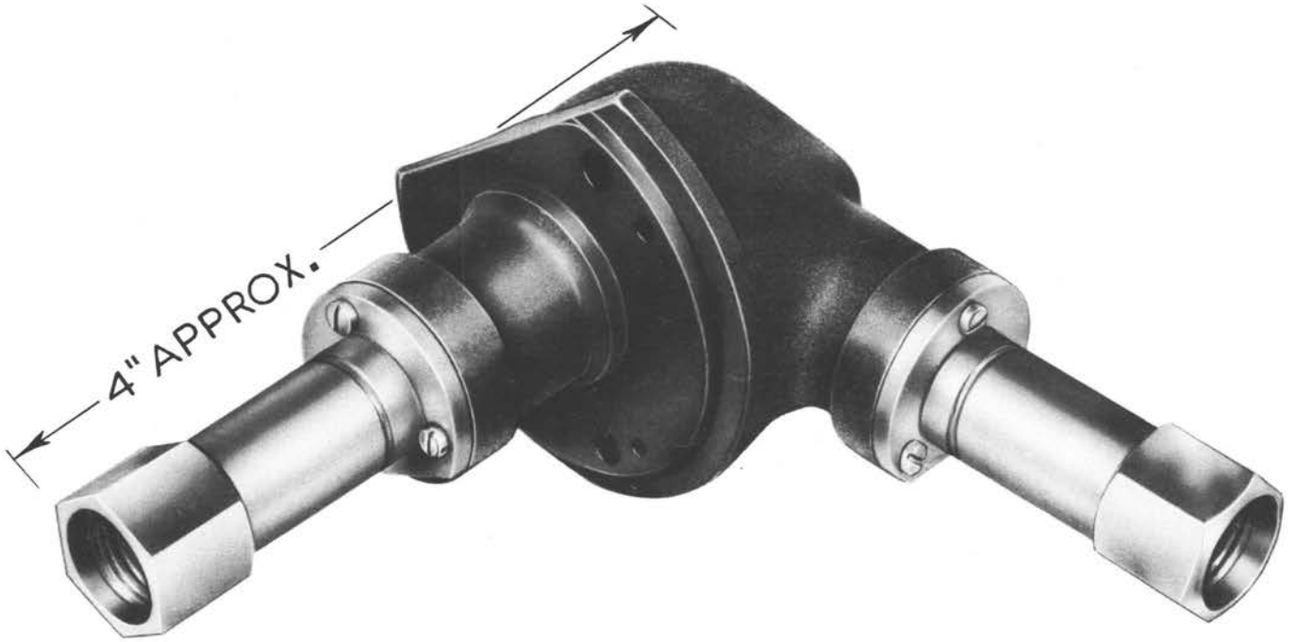
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

BRITISH

BRITISH REFERENCE NUMBER: 106J/616



GEAR—FLEXIBLE SHAFT ANGLE

A. E. REFERENCE NUMBER 60-8251

NAMES: Flexible shaft angle gear — Gear box assembly

DESCRIPTION: The flexible shaft angle gear, also known as the gear-box, is a part of the Army type A-3 or A-3A automatic pilots. It is used for remote control operation of the automatic pilot, and is mounted in the cable assembly between the remote turn controller and the aileron adapter attached to the mount.

It contains two 45-degree angle gears. Two ratios being available, the 25:42 ratio is used at speeds of 220 to 250 miles per hour, and the 25:48 ratio is used with air speeds of 250 to 280 miles per hour.

CHARACTERISTICS:

Dimensions	approximately 3⅝ by 2⅛ by 4 inches.
Weight	approximately 1⅓ pounds
Gear ratios	25:42 ratio for 220 to 250 miles per hour, and 25:48 ratio at 250 to 280 miler per hour, true air speed.

ARMY

A. E. REFERENCE NUMBER: 60-8251

SPECIFICATIONS: General.....94-27977-B

MANUFACTURER: Sperry Gyroscope Co.

MANUFACTURER'S DRAWING NUMBER: 645996

A. S. C. STOCK NUMBER: 6300643689-6

TECHNICAL ORDER NUMBER: 05-45AB

PRODUCTION STATUS: Under procurement.

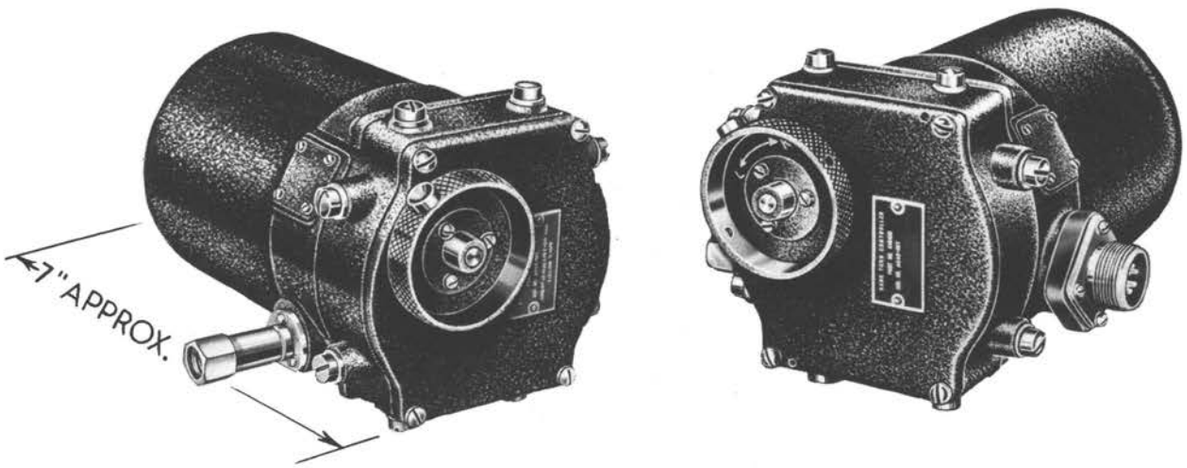
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

BRITISH

BRITISH REFERENCE NUMBER: 109/20



CONTROLLER—BANKED TURN

A. E. REFERENCE NUMBER 60-8253

NAMES: Banked turn controller
Turn controller
Bank and turn controller
Bank-turn controller

DESCRIPTION: The banked turn control, part of the Army type A-3 automatic pilot, is mounted in the pilot's compartment. It is connected to the vertical gyro control by an electric cable, and to the differential adapter attached to the remote control gyro control mount by a flexible cable.

An electric turn motor in the directional gyro and the aileron pick-offs in the vertical gyro are actuated through use of the turn control, permitting properly banked turns to be made by the automatic pilot.

CHARACTERISTICS:

Markings.....fluorescent-radioactive
Dimensions.....approximately 6½ by 4¾ by 7 inches
Weight.....approximately 2½ pounds

ARMY

A. E. REFERENCE NUMBER: 60-8253

SPECIFICATIONS:

General.....94-27977-B

MANUFACTURER: Sperry Gyroscope, Incorporated.

MANUFACTURER'S DRAWING NUMBER: 646400

A. S. C. STOCK NUMBER: 6000099685

TECHNICAL ORDER NUMBER: 05-45AB

PRODUCTION STATUS: Under procurement.

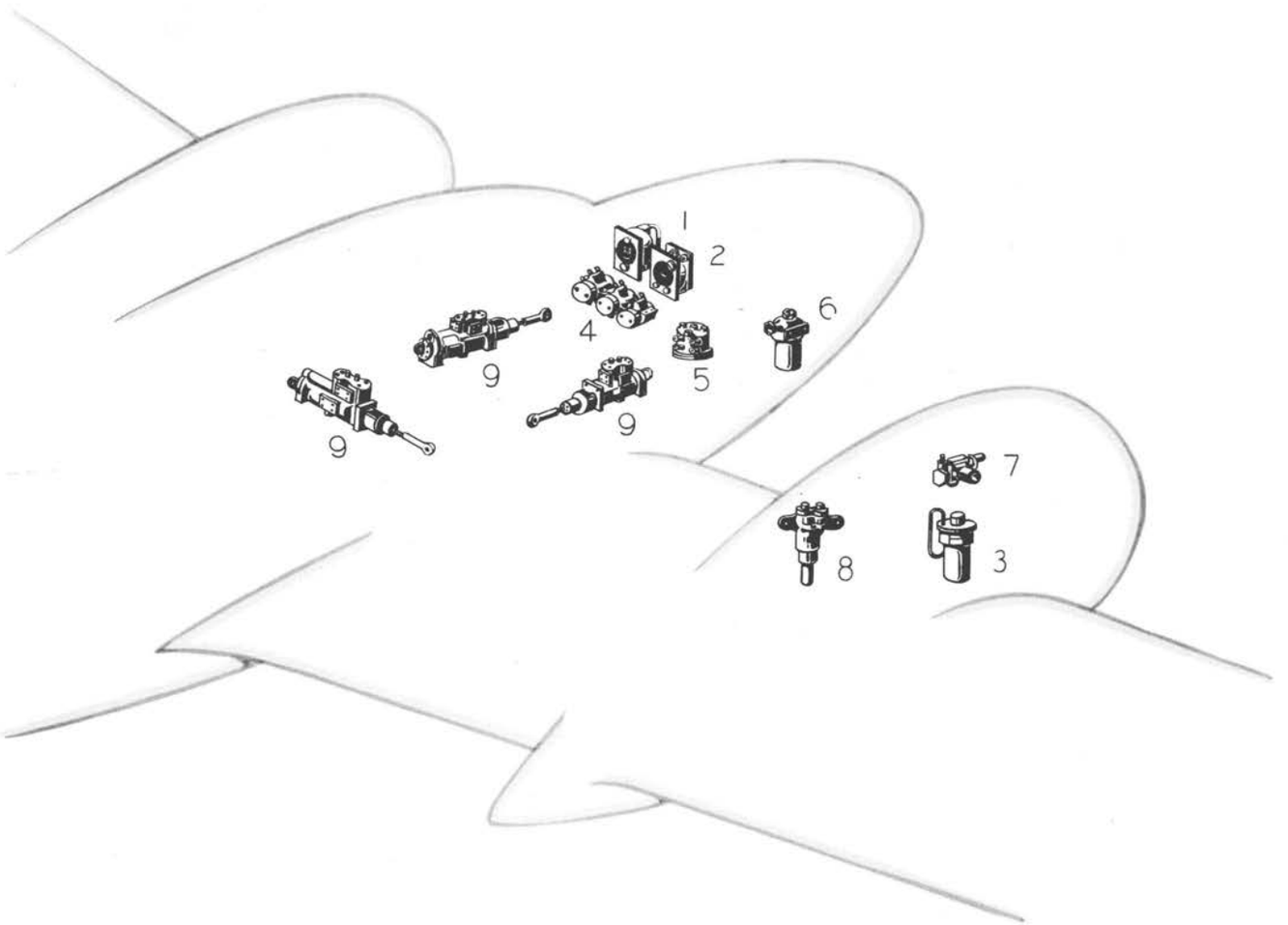
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

BRITISH

BRITISH REFERENCE NUMBER: 106J/634



AUTOMATIC PILOT

ARMY TYPE A-4 AND NAVY MARK 4

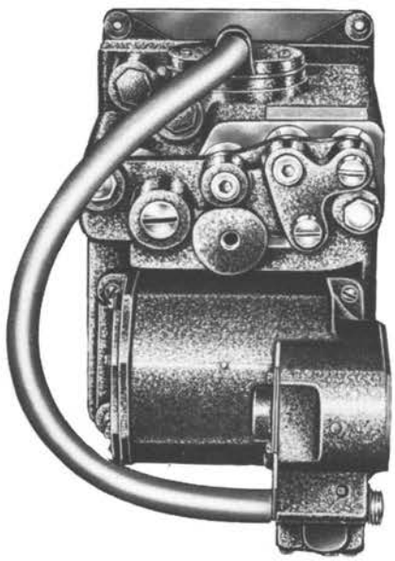
SPERRY OUTLINE DRAWING 644367

COMPONENT ITEMS

ITEM	NOMENCLATURE	A. E. REFERENCE NUMBER	F. S. S. C. NUMBER	REMARKS
1	Directional Gyro Control	60-8325	88-U-170	
2	Vertical Gyro Control	60-8326	88-U-200	
3	Oil Sump	None	88-T-370	
4	Transfer Valve	60-8327	88-V-550	
5	Drain Oil Trap	60-8328	88-T-2800	
6	Air Filter	60-8303	88-F-1035	
7	Oil Pressure Regulator	60-8206	88-R-245	
8	Oil Filter	60-8204	88-F-1060	
9	Push Pull 6″ Stroke Servo	60-8329	88-S-260	
	Mounting Brackets: Corner	60-8330	None	6 Used when gyros are mounted together
	Corner	60-8331	None	
	Top Center	60-8332	None	8 Used when gyros are mounted separately
	Bottom Center	60-8333	None	

NOTE: Army contracts: All Items Government Furnished
Navy contracts: All Items Government Furnished

$6\frac{22}{32}$" APPROX.



CONTROL—DIRECTIONAL GYRO

A. E. REFERENCE NUMBER 60-8325 F. S. S. C. NUMBER 88-U-170

NAMES: Directional gyro control
Azimuth gyro
Directional unit
Directional—air

DESCRIPTION: The directional gyro control, a part of the Army type A-4 and Navy Mark 4, automatic pilot, contains the gyroscope which supplies the directional reference for both manual and automatic rudder control of the airplane. It also contains the air pick-offs and caging mechanism. Setting the directional card and caging the gyroscope are accomplished through the use of the caging knob and mechanism. Caging prevents damage to the instrument during maneuvers which exceed its operating range.

Two circular cards, graduated in 360 degrees of azimuth, are visible in the dial face.

The lower, or directional, card may be set to any desired heading by pushing in on the caging knob and turning.

The upper, or reference, card may be set by rotating the course setting knob, which is located above the dial.

To facilitate reading the amount of course change, a small dial, graduated in degrees, is provided. One revolution of this dial represents 10 degrees of course change.

This unit also contains a rate gyro, operating a pick-off, to originate a signal proportional to the rate of turn and to prevent overshooting the course selected.

CHARACTERISTICS:

Dimensions	approximately $6\frac{22}{32}$ by $4\frac{17}{32}$ by $8\frac{11}{16}$ inches
Weight	approximately 9 pounds
Dial markings	fluorescent radioactive
Power	4 inches mercury vacuum

ARMY

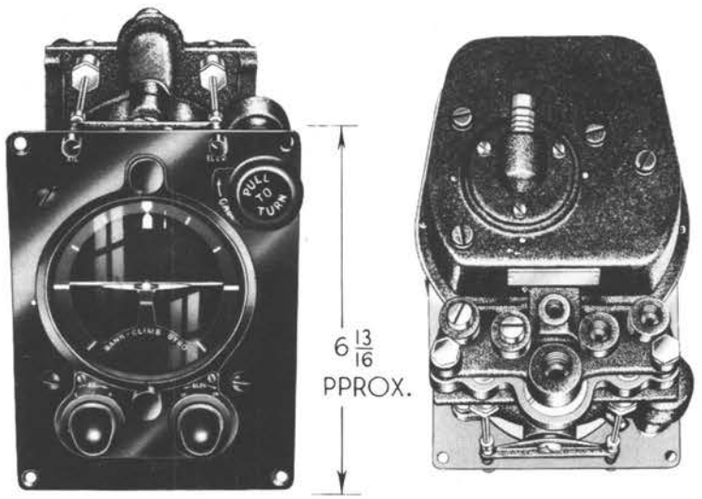
A. E. REFERENCE NUMBER: 60-8325
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement (from Navy).
SHIPPING DATA: Shipped as a complete unit.

NAVY

SPECIFICATIONS: BUREAU OF AERONAUTICS: SE-8A
F. S. S. C. STOCK NUMBER: 88-U-170 (Formerly 88-U-810)
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	Current Model (X)	Remarks
Sperry Gyroscope Co., Inc.	643902	643902; outline 166418	A-N-C	6000095570	05-45AC		Illuminated dial; bank indicator.
	648046	648046	A-N-C	6000096558	05-45AC	X	
Electric Auto-Lite	643902	643902; outline 166418	A-N	6000095570			Illuminated dial; bank indicator.
	648046	648046	A-N	6000096558		X	
War Products Division of Eversharp, Inc.	648046	648046	A-N	6000096558		X	



CONTROL—VERTICAL GYRO

A. E. REFERENCE NUMBER 60-8326 F. S. S. C. NUMBER 88-U-200

NAMES: Vertical gyro control
Bank and climb gyro control
Bank and climb control unit (Navy)
Horizon—air

DESCRIPTION: The vertical gyro control, a part of the Army type A-4 and Navy Mark 4 automatic pilot, contains the gyroscope which supplies the reference for both manual and automatic control of the aileron and elevator surfaces of the airplane It also contains the air pick-offs and anticipators for these controls and a caging device and mechanism for manually operating the air pick-offs. The caging device makes it possible to lock the gyro, thereby preventing damage to the instrument during maneuvers in excess of its operating range.

Manual operation of the air pick-offs is accomplished by rotation of the aileron and elevator trim knobs. The numbers on the graduated dials around the knobs give visual indication of the relative position of the pick-offs.

Two small knobs at the top of the instrument marked "AIL" and "ELEV" permit the pilot to adjust the strength of signals for these two controls.

Indication of the degree of bank is given by a banking indicator on the front of the instrument.

The horizon bar in front of the dial moves with relation to a miniature airplane to give the pilot an indication of flight attitude; the miniature airplane can be raised or lowered to compensate for load conditions.

CHARACTERISTICS:

Dimensions ..... approximately $6\frac{13}{16}$ by $5\frac{1}{16}$ by $8\frac{15}{16}$ inches
Weight ..... approximately 8 pounds
Dial markings ..... Fluorescent radioactive
Power ..... 4 inches mercury vacuum

ARMY

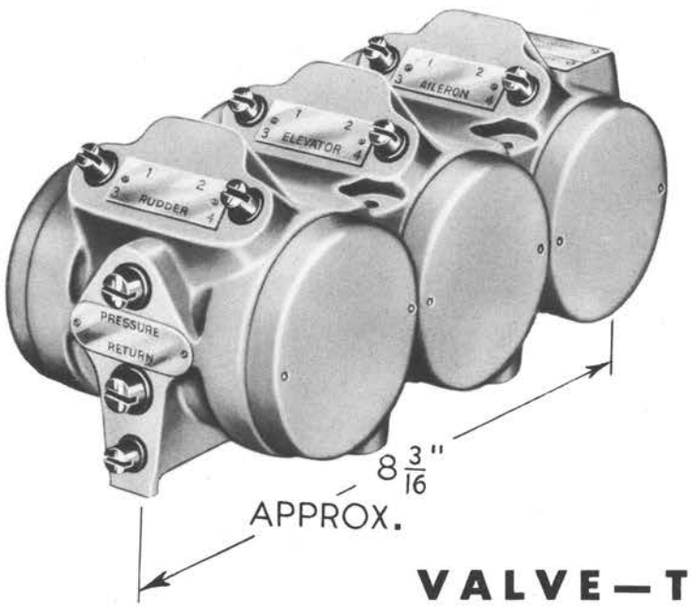
A. E. REFERENCE NUMBER: 60-8326
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: 05-45AC
PRODUCTION STATUS: Under procurement (from Navy)
SHIPPING DATA: Shipped as a complete unit

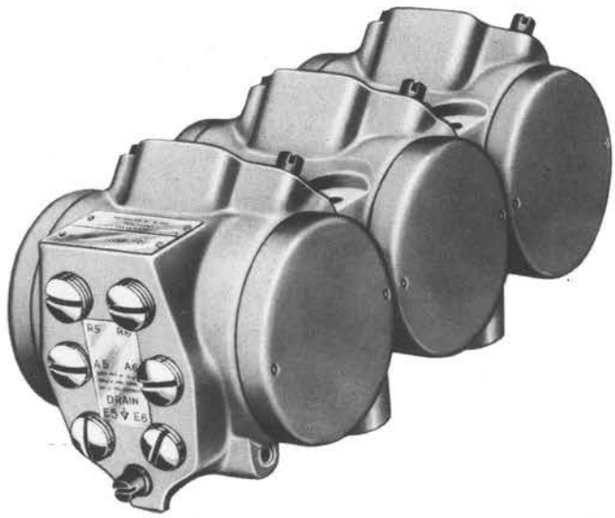
NAVY

SPECIFICATIONS: BuAer.: SE-8A
F. S. S. C. STOCK NUMBER: 88-U-200 (formerly 88-U-925)
PROCUREMENT STATUS: Standard G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 4
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	Current Model (X)
Sperry Gyroscope Co., Inc.	643580	643580 Outline 166312	A-N-C	6000093950	05-45AC	
Electric Auto-Lite Co.	648045	648045	A-N	6000094475		X
War Products Division of Eversharp, Inc.	648045	648045	A-N	6000094475		X





VALVE—TRANSFER

A. E. REFERENCE NUMBER 60-8327 F. S. S. C. NUMBER 88-V-550

NAMES: Transfer valve Valve—Transfer automatic pilot air hydraulic

DESCRIPTION: The transfer valve, a part of the Army type A-4 and Navy Mark 4 automatic pilots, contains the three sets of diaphragms, valves, and connections for transforming air signals which originate in the gyro controls into amplified oil pressure impulses capable of operating the servos which actuate the ailerons, rudder, and elevator of the airplane.

Oil is supplied to the transfer valves, under pressure, by an engine driven oil pump.

Air signals from the control gyros cause the valve to move from its center, or no signal position, and to open one oil line to pressure and the other to the oil return. The oil lines are connected to opposite ends of the servo cylinder, and cause the piston to move in one direction or the other, depending upon the signal, and to move the control surfaces accordingly. The three valves operate independently, as above, though they are contained in one casting.

CHARACTERISTICS:

Dimensions.....approximately $3\frac{3}{4}$ by $3\frac{11}{16}$ by $8\frac{3}{16}$ inches
Weight.....approximately $5\frac{1}{8}$ pounds

ARMY

A. E. REFERENCE NUMBER: 60-8327

A. S. C. STOCK NUMBER: 6000469150

TECHNICAL ORDER NUMBER: 05-45AC

MANUFACTURER: Sperry Gyroscope Co., Inc.

MANUFACTURER'S PART AND DRAWING NUMBERS: 644230; Outline Dwg.—76608

PRODUCTION STATUS: Under procurement (from Navy).

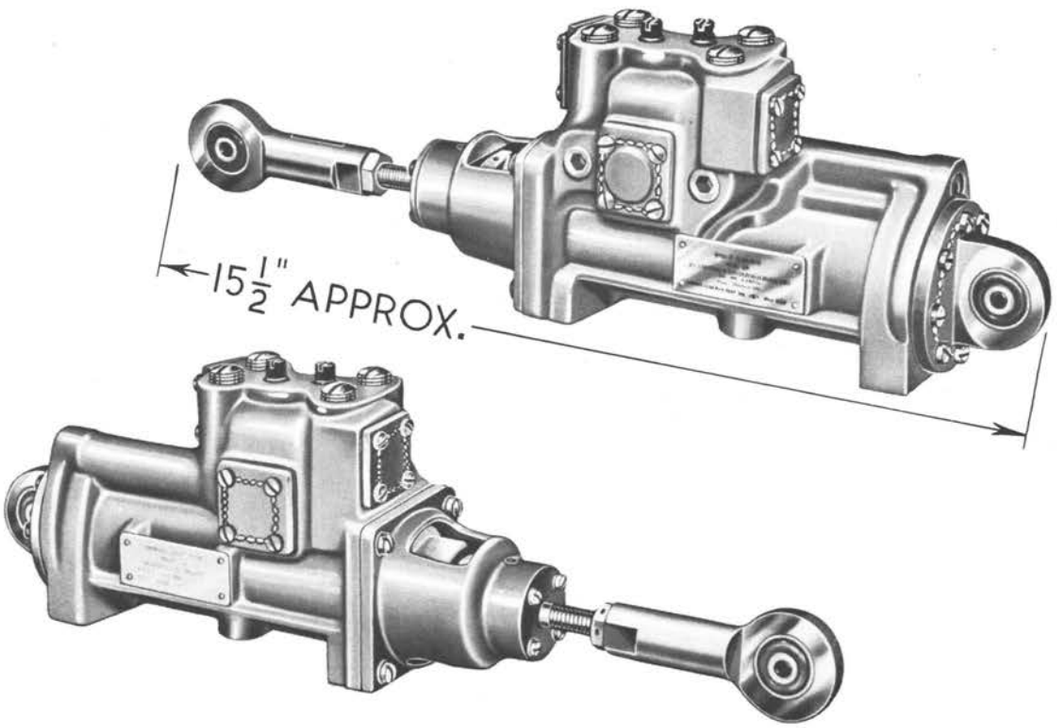
SHIPPING DATA: Shipped as a complete unit.

NAVY

BUREAU OF AERONAUTICS: SE-8A

F. S. S. C. STOCK NUMBER: 88-V-550

PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.



SERVO—6 INCH STROKE PUSH-PULL

A. E. REFERENCE NUMBER 60-8329 F. S. S. C. NUMBER 88-S-260

NAMES: 6 inch stroke, push-pull servo
Hydraulic surface control
Control assembly
6 inch individual push-pull type servo
Servo—automatic pilot, push-pull type individual (6 inch)

DESCRIPTION: This servo unit, a part of the Army type A-4 and Navy Mark 4 automatic pilots, provides the actual power for changing the position of the control surfaces of the airplane. Three individual units are used for each installation, one each for the ailerons, rudder, and elevator.

Each unit consists of a cylinder, piston, by-pass valve, and an over-powering valve which permits the human pilot to over-power the automatic pilot, if necessary, by applying additional force to the manual controls of the airplane.

When the control surface of the airplane is in a neutral position, the piston is approximately in the center of the cylinder. Oil under pressure is supplied through the proper channel of the transfer valve to one end of the servo cylinder, depending upon the signal originating in the control gyro, while the oil in the opposite end of the cylinder is returned to the transfer valve. The pressure difference causes the piston to move and adjust the control surface accordingly.

Pressure of the oil in the cylinders may be relieved by the by-pass valve, thus permitting manual movement of the controls without opposition from the servo when the automatic pilot is disengaged.

CHARACTERISTICS: Refer to chart.

ARMY

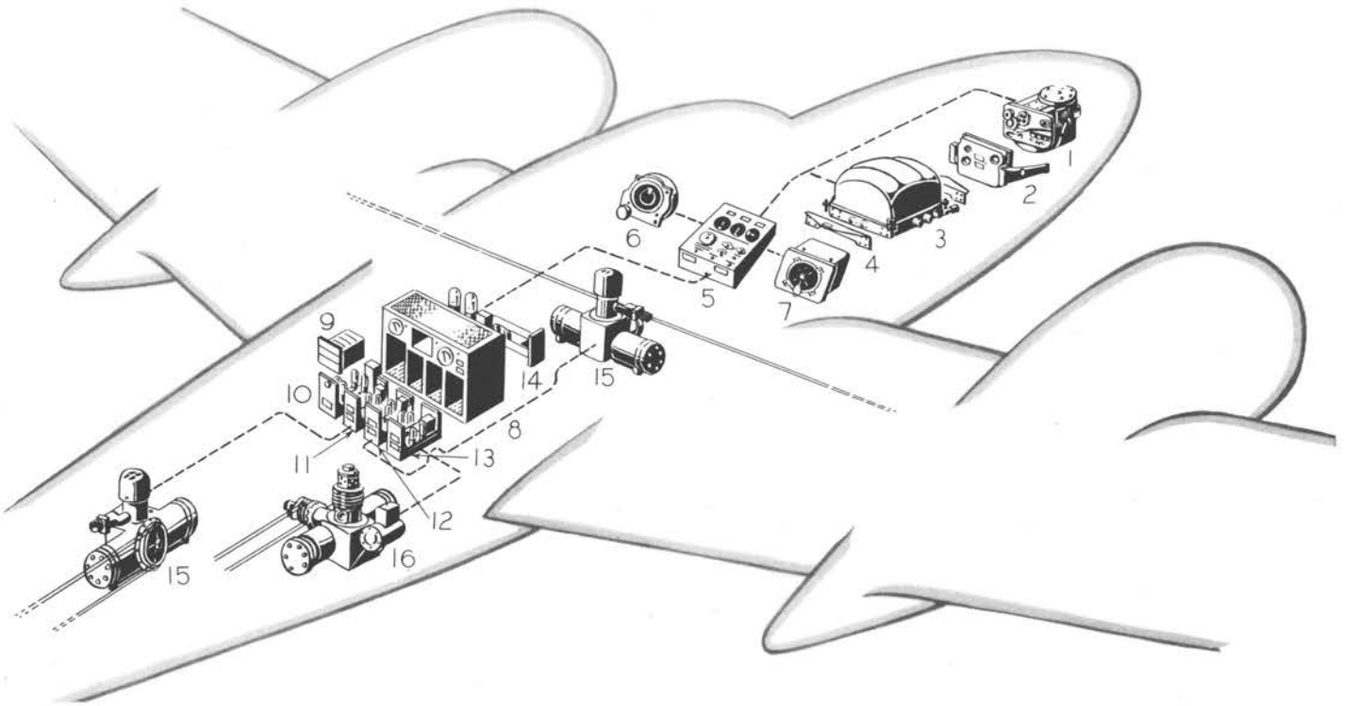
A. E. REFERENCE NUMBER: 60-8329
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement (from Navy).
SHIPPING DATA: Shipped as a complete unit.

NAVY

SPECIFICATIONS: Bureau of Aeronautics: SE-8A
F. S. S. C. STOCK NUMBER: 88-S-260
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 6
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part Number	Manufacturer's Drawing Number	Dimensions (Inches)	Weight (Pounds)	Used By	Air Service Command Stock Number	Army Technical Order Number
Sperry Gyroscope Co.	644180	644180 Outline 76577	Approximately 4⅛ x 2 11/16 x 15½	Approximately 4½	A-N	6000096580	05-45AC
General Electric Co.	GE8254205-G1		Approximately 4⅛ x 2 11/16 x 15½	Approximately 4½	N		



AUTOMATIC PILOT

COMPONENT ITEMS

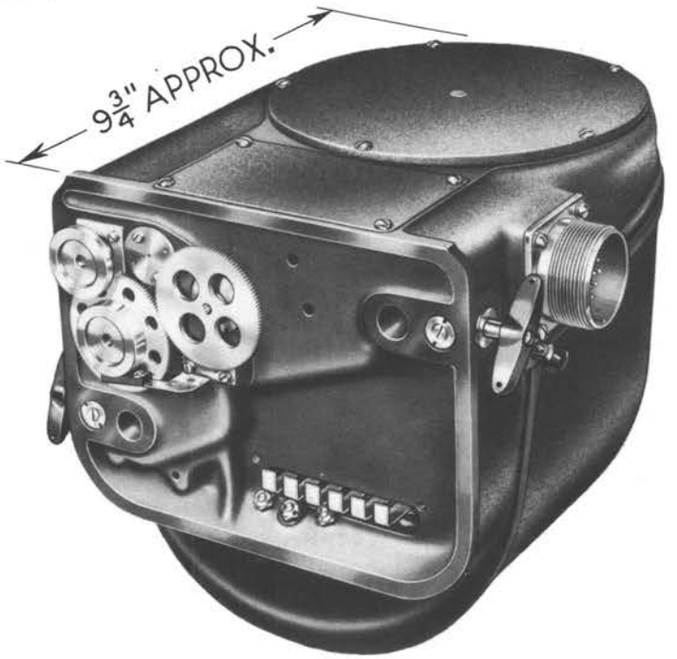
ARMY TYPE A-5 AUTOMATIC PILOT (All Items Government Furnished)

ITEM	NOMENCLATURE		A. E. REFERENCE No.	REMARKS
1	Directional Gyro Control		60-8406	
2	Directional Gyro Control Mount		60-8411	
3	Vertical Gyro Control		60-8405	
4	Vertical Gyro Control Mount		60-8412	
5	Control Panel		60-8413	
6	Pilot Director Indicator		60-8410	
7	Turn Controller		60-8419	
8	Amplifier Rack		60-8414	
9	Constant Altitude Control		60-8407	
10	Directional Gyro Follow-up Amplifier		60-8401	
11	Rudder Servo Amplifier		60-8350	
12	Aileron Servo Amplifier		60-8403	
13	Elevator Servo Amplifier		60-8404	
14	Constant Altitude Control Amplifier		60-8402	
15	Aileron or Rudder Servo	0.1 H.P. 4 Inch Drum	60-8418	Two used on an installation
		0.1 H.P. 6 Inch Drum	60-8420	
		0.2 H.P. 4 Inch Drum	None	
		0.2 H.P. 6 Inch Drum	60-8416	
16	Elevator Servo	0.1 H.P. 4 Inch Drum	60-8417	One used on an installation
		0.1 H.P. 6 Inch Drum	60-8421	
		0.2 H.P. 4 Inch Drum	60-8415	
		0.2 H.P. 6 Inch Drum	None	
	Trim Tab Servo (Not Illustrated)		60-8408	Use Discontinued
	Navigator's Turn Controller (Not Illustrated)		60-8409	Use Discontinued

SUBSTITUTE ITEMS

Directional Gyro Control	60-8422	*May be used in place of Item 1
Directional Gyro Follow-up Amplifier	60-8423	*May be used in place of Item 10
Aileron Servo 0.2 H.P. Motor 6 Inch Drum	60-8424	(For Aileron operation only. Limited to specific installation)

*These two units must be used together.



CONTROL—DIRECTIONAL GYRO

A. E. REFERENCE NUMBER 60-8406

NAMES: Directional gyro control
Azimuth gyro
Directional type control unit

DESCRIPTION: The directional gyro originates the electrical signal which controls the airplane's forward direction. This signal emanates from a gyroscope, which is driven by an electric motor. The angle of the airplane's deviation from the horizontal axis of the gyroscope furnishes the basic reference which determines its forward direction of flight.

The directional gyro control assembly consists principally of a gyroscope and driving motor with its housing, a follow-up motor, and a signal generator.

The gyroscope is suspended in a frame which allows freedom in all directions, and which is so arranged that when the airplane's direction changes, the difference between the position of this frame and an outer frame, which is rigidly mounted to the airplane, is translated into an electrical impulse by a magnetic pick-off.

The impulse is led from the pick-off to a follow-up amplifier, and the strengthened signal is returned to operate the follow-up motor. The follow-up motor causes the signal generator to send a signal to the servo amplifier, where it is amplified and used to operate the rudder servo valves. The servo then moves the airplane's rudder to bring the airplane to its prescribed course.

The follow-up system and a leveling magnet cause the gyro control to reset itself automatically after a correction to the airplane direction has been made.

CHARACTERSITICS:

Dimensions ..... approximately 8½ by 8 by 9¾ inches
Weight ..... approximately 14½ pounds
Power ..... alternating current 115 volt 3 phase 400 cycles

RELATIONSHIP OF PARTS: Used with Army type A-5 automatic pilot.

ARMY

A. E. REFERENCE NUMBER: 60-8406
SPECIFICATIONS:

General 27329
Detail 27358

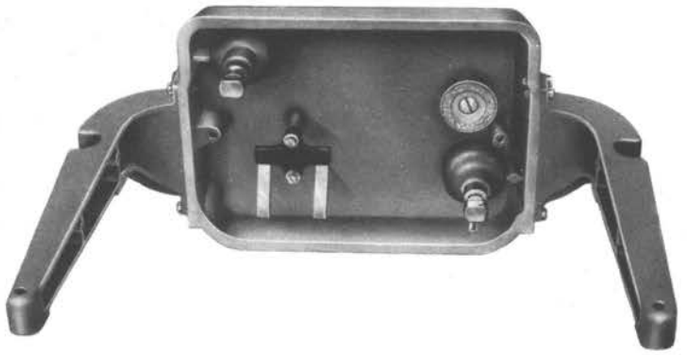
A. S. C. STOCK NUMBER: Refer to chart
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644842 Outline 647323	A-B	6000096560	05-45AD	106J/682
Electric Auto-Lite Company	644842 Outline 647323	A-B	6000096560	05-45AD	106J/682
A. C. Spark Plug Division	644842 Outline 647323	A-B	6000096560	05-45AD	106J/682



MOUNT—DIRECTIONAL GYRO CONTROL

A. E. REFERENCE NUMBER 60-8411

NAMES: Directional gyro control mount Azimuth gyro mount

DESCRIPTION: The directional gyro mount is part of the Army type A-5 automatic pilot.

The mount consists of a "U" shaped bracket which cradles the directional gyro control. The control is attached to the mount by four screws close to the base of the instrument. The mount itself is attached to the airplane structure by four bolts, one at each end of the bracket and two near the center.

CHARACTERISTICS:

Dimensions ..... approximately 11¾ by 5¾ by 8 inches
Weight ..... approximately 3½ pounds

ARMY

A. E. REFERENCE NUMBER: 60-8411

SPECIFICATIONS:

General 27329
Detail ..... 27358 (part of)

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

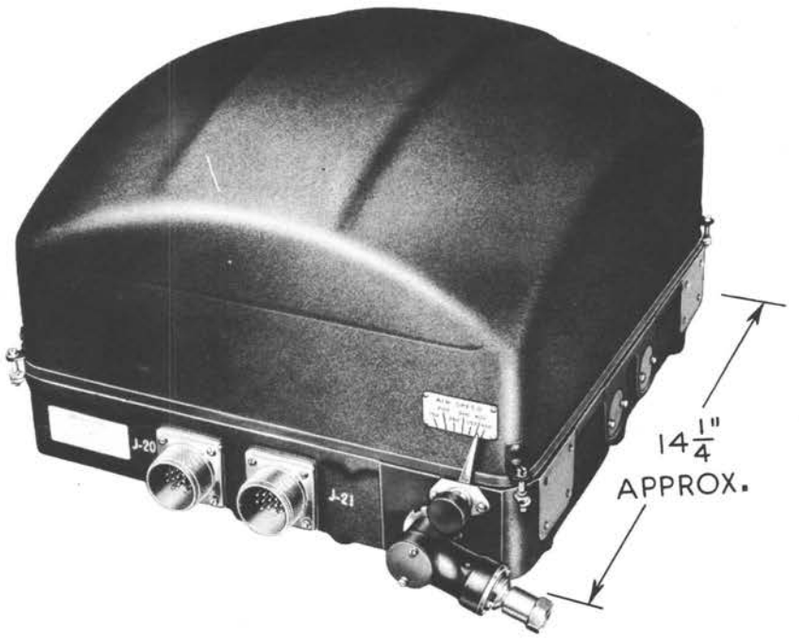
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co. Inc.	645263 Outline 647323	A-B	6000298740	05-45AD	106J/683
Electric Auto Lite Company	645263 Outline 647323	A-B	6000298740	05-45AD	106J/683
A. C. Spark Plug Division	645263 Outline 647323	A-B	6000298740	05-45AD	106J/683



CONTROL—VERTICAL GYRO

A. E. REFERENCE NUMBER 60-8405

NAMES: Vertical gyro control — Vertical type control unit
Bank and climb gyro control

DESCRIPTION: The vertical gyro control originates the electrical signals by which the airplane's attitude is controlled in roll and pitch.

The vertical gyro control is dependent on the use of a gyroscope, which spins about a vertical axis, for its operation. The gyroscope, which is driven by an integral electric motor, furnishes the basic reference from which to determine changes in the airplane's attitude.

The vertical gyro control assembly consists, principally, of a gyroscope and an electric driving motor with its frame, erection torque motors, and follow-up amplifiers.

The gyroscope is suspended in a frame which allows freedom in all directions, and which is so arranged that when the airplane attitude changes, the difference between the position of the normally stable gyroscope and an outer frame, which is rigidly mounted to the airplane, is translated into electrical impulses or signals by magnetic pick-offs.

The impulse from one set of pick-offs is led to the servo amplifier, and the amplified signal is used to operate the servo valves. Control of pitch is effected through the elevator servo, and control of roll through the aileron servo.

Signals from another set of pick-offs are sent to the integral amplifiers, which close relays to operate torque motors. The erection torque motors cause the vertical gyro control to automatically reset itself after the correction to the airplane attitude has been made.

CHARACTERISTICS:

Dimensions	approximately 12 by 9 by 14¼ inches
Weight	approximately 29 pounds
Power	alternating current 115 volts 3 phase 400 cycle

RELATIONSHIP OF PARTS: Used with Army type A-5 automatic pilot.

ARMY

A. E. REFERENCE NUMBER: 60-8405
SPECIFICATIONS:

General	27329
Detail	27359

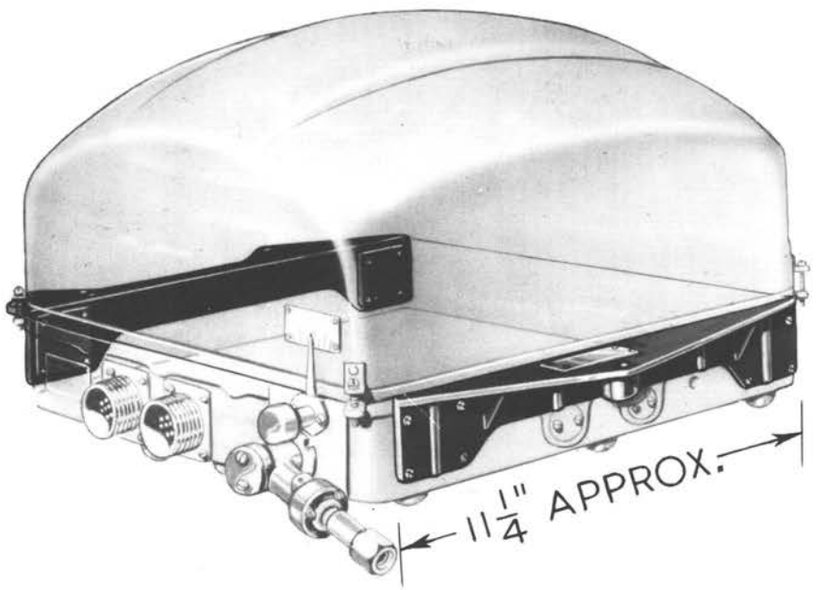
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644841 Outline 647322	A-B	6000094920	05-45AD	106J/679
Electric Auto-Lite Company	644841 Outline 647322	A-B	6000094920	05-45AD	106J/679
A. C. Spark Plug Division	644841 Outline 647322	A-B	6000094920	05-45AD	106J/679



MOUNT—VERTICAL GYRO CONTROL

A. E. REFERENCE NUMBER 60-8412

NAMES: Vertical gyro control mount
Bank and climb gyro mount
Vertical type gyro mount

DESCRIPTION: The vertical gyro control mount is a part of the Army type A-5 automatic pilot, and provides support for the vertical gyro control.

The mount consists of two "L" shaped brackets, one for each side of the instrument, each attached to the instrument by eight screws. The brackets are fastened to the airplane by two bolts on one side and one on the other. Through the use of these brackets, vibration and flexing are minimized.

CHARACTERISTICS:

Dimensions ..... approximately 1⅞ by 1¾ by 11¼ inches
Weight ..... approximately ½ pound

ARMY

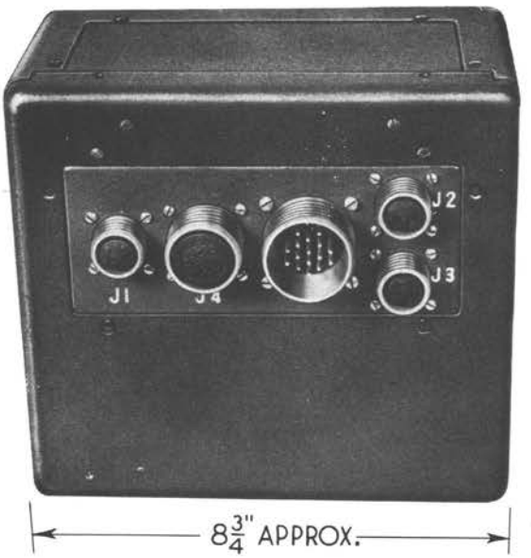
A. E. REFERENCE NUMBER: 60-8412
SPECIFICATIONS:
General 27329
Detail ..... 27359 (part of)
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: 2 pieces required for installation. Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	645918 Outline 647322	A-B	6000298900	05-45AD	106J/680
Electric Auto-Lite Company	645918 Outline 647322	A-B	6000298900	05-45AD	106J/680
A. C. Spark Plug Division	645918 Outline 647322	A-B	6000298900	05-45AD	106J/680



PANEL—CONTROL

A. E. REFERENCE NUMBER 60-8413

NAMES: Control panel — Panel type control unit
Control unit

DESCRIPTION: The automatic pilot control panel, part of the Army type A-5 automatic pilot, is mounted on the instrument panel, and provides the human pilot with a means of controlling and operating the automatic pilot.

Three dials at the top of the panel (one each for the rudder, aileron, and elevator controls) indicate when a signal is applied to each control, and whether or not the controls are properly adjusted. Corresponding aligning switches are located to the right of the master switch. Momentary closing of a switch displaces the proper gyroscope pick-off, and produces a new flight attitude if that shown on one of the dials indicates improper adjustment.

The station selector switch, located in the lower center of the control unit, permits the automatic pilot to control the airplane, or permits turning on the pilot director indicator and using the directional flight gyro as a reference for control by the human pilot.

The altitude control switch in the lower left center of the control panel permits the pilot to set the altitude at which he desires to fly.

Three switches located along the lower edge of the control unit are used to turn the servo units operating the elevator, rudder, and elevator trim tab OFF or ON.

The master control switch which actuates the pilot is located in the left center of the control panel. This switch is provided with four positions, one OFF and three ON.

Number 1 "ON" position of the knob controls all the direct current for the automatic pilot; when in this position, the tube filaments can be heated and the pump drive motors in the servo units can be started.

All the alternating current for the automatic pilot is controlled when the knob is in the number 2 "ON" position. When in this position, the gyro motors in the control units are started, the signal generators energized, and the leveling and erection systems put into operation.

When the knob is turned to the number 3 "ON" position, the aileron servo is turned on and the equipment made ready for the elevator and rudder servo units to be turned on.

CHARACTERISTICS:

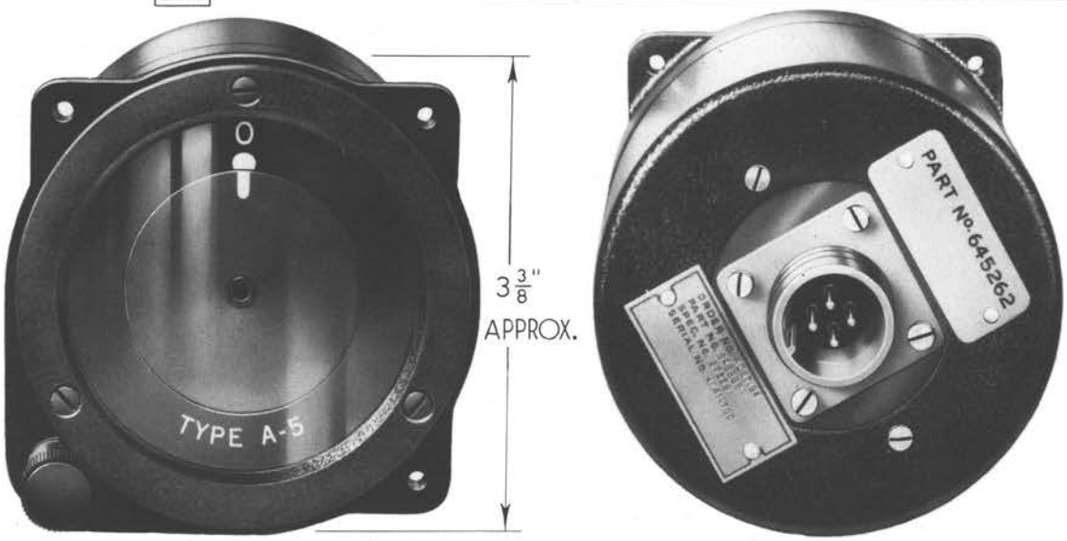
Dimensions	approximately 8¾ by 7½ by 5⅝ inches
Weight	approximately 7 pounds
Illumination	none
Markings	fluorescent
Power	alternating current, 115 volts, 3 phase, 400 cycles
Power	direct current, 27 volts

ARMY A. E. REFERENCE NUMBER: 60-8413
SPECIFICATIONS:
General 27329
Detail 27364
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644836 Outline 77042	A-B	6000306600	05-45AD	106J/661
Electric Auto-Lite Company	644836 Outline 77042	A-B	6000306600	05-45AD	106J/661
A. C. Spark Plug Division	644836 Outline 77042	A-B	6000306600	05-45AD	106J/661



INDICATOR—PILOT DIRECTOR

A. E. REFERENCE NUMBER 60-8410

NAMES: Pilot director indicator
Pilot director
Director—pilot
P. D. I.

DESCRIPTION: The pilot director indicator of the Army type A-5 automatic pilot is mounted on the instrument panel.

The unit operates when the control panel selector switch is turned to the position marked P. D. I. (pilot director indicator) and the airplane is being flown by the human pilot. The indicator shows the pilot the direction in which to turn to maintain the pre-determined heading which has previously been set on the directional gyro control.

A knob is provided on the front of the instrument for setting the indicator to zero.

The indication on the face of the instrument is obtained through a signal generator in the instrument which is coupled electrically to a similar signal generator in the directional gyro of the automatic pilot.

CHARACTERISTICS:

Dimensions	approximately 3⅜ by 3⅜ by 5 inches
Weight	approximately 1½ pounds
Illumination	none
Markings	fluorescent luminescent
Power	115 volts, 3 phase, 400 cycle alternating current
Range	24 degrees to one revolution of dial pointer

ARMY

A. E. REFERENCE NUMBER: 60-8410
SPECIFICATIONS:

General	27329
Detail	27365

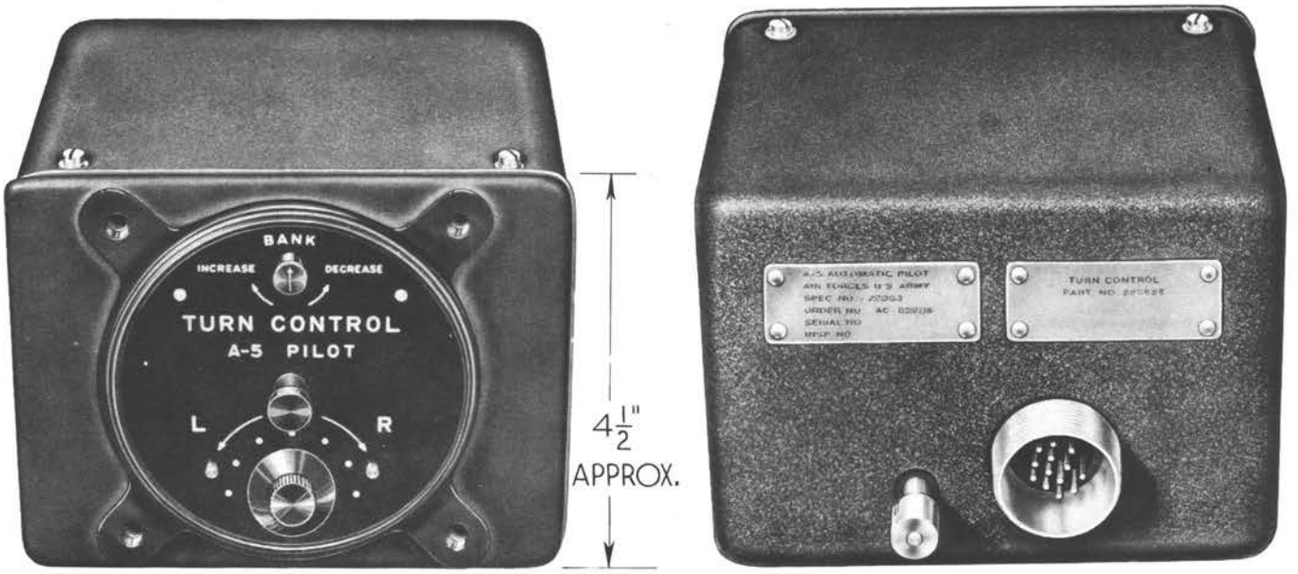
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	654262 Outline 803135	A-B	6000225950	05-45AD	109/32
Electric Auto-Lite Co.	645262 Outline 803135	A-B	6000225950	05-45AD	109/32
A.C. Spark Plug Division	645262 Outline 803135	A-B	6000225950	05-45AD	109/32



CONTROLLER—TURN

A. E. REFERENCE NUMBER 60-8419

NAMES: Turn controller
Banked turn control
Remote turn type control unit

DESCRIPTION: This unit, a part of the Army type A-5 automatic pilot, is mounted on the instrument panel, and permits the human pilot to make correctly banked right or left turns, up to 180 degrees per minute. It is operative only when the selector switch on the control panel is in the position marked PILOT.

CHARACTERISTICS:

Dimensions	approximately 5⅝ by 4½ by 7/16 inches
Weight	approximately 5½ pounds
Illumination	none
Markings	fluorescent
Airspeed range	150 to 450 miles per hour
Rate of turn	180 degrees per minute, right or left

ARMY

A. E. REFERENCE NUMBER: 60-8419
SPECIFICATIONS:

General	27329
Detail	27363

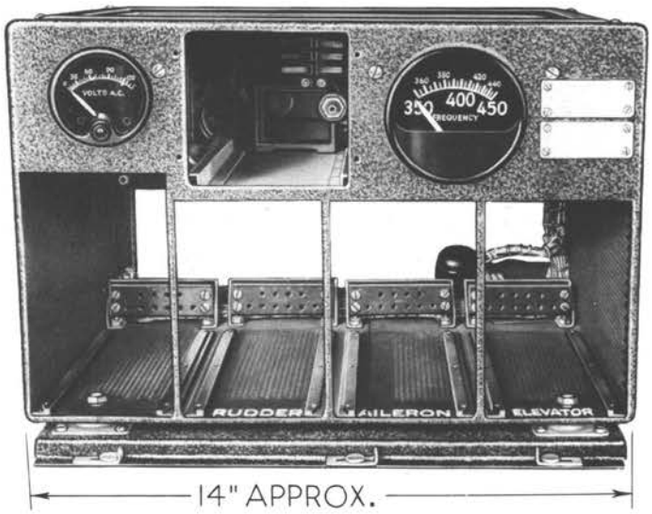
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

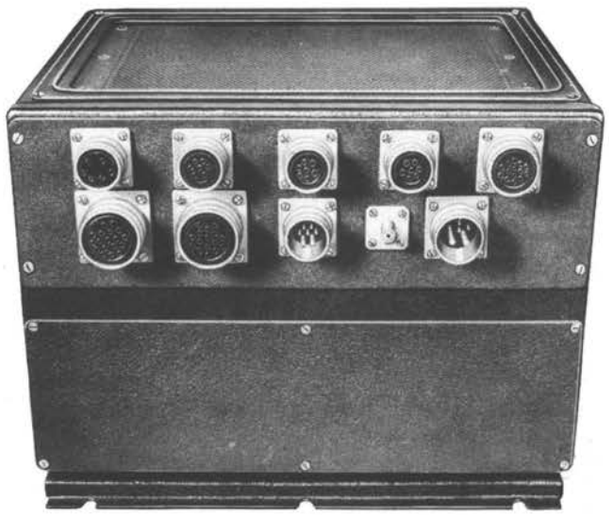
NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	647409	A-B	6000098470	05-45AD	106J/755
Electric Auto-Lite Company	647409	A-B	6000098470	05-45AD	106J/755
A. C. Spark Plug Division	647409	A-B	6000098470	05-45AD	106J/755





RACK—AMPLIFIER

A. E. REFERENCE NUMBER 60-8414

NAMES: Amplifier rack Amplifier type rack

DESCRIPTION: The amplifier rack, a part of the Army type A-5 automatic pilot, houses the azimuth follow-up amplifier, the rudder, aileron and elevator servo amplifiers, and the constant altitude control and its amplifier. With the exception of the constant altitude control amplifier, each of these units can be removed and replaced in the rack like drawers, all electrical and other connections being made or broken automatically. This type of mounting permits inspection, adjustment, and repair of the individual units while the airplane is in flight.

The voltmeter and frequency meter, which indicate the voltage and the frequency of the A. C. power source, are mounted on the face of the amplifier rack.

CHARACTERISTICS:

Dimensions	approximately 14 by 10½ by 12¾ inches
Weight	approximately 19 pounds
Illumination	none
Markings	fluorescent
Power	115 volt, 3 phase, 400 cycle alternating current
Range-frequency meter	350 to 450 cycles
Markings	fluorescent
Range-voltmeter	0 to 130 volts
Markings	fluorescent

ARMY

A. E. REFERENCE NUMBER: 60-8414

SPECIFICATIONS:

General	27329
Detail	27360

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

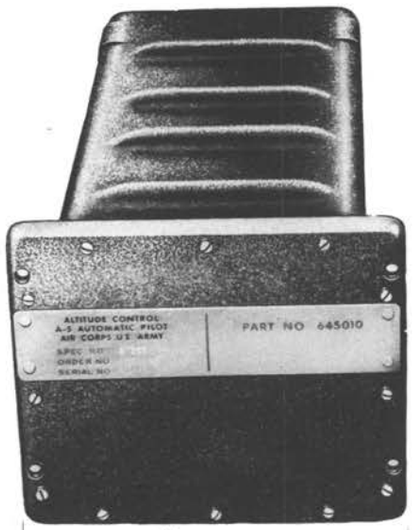
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644890 Outline 77175	A-B	6000318600	05-45AD	106J/662
Electric Auto-Lite Company	644890 Outline 77175	A-B	6000318600	05-45AD	106J/662
A. C. Spark Plug Division	644890 Outline 77175	A-B	6000318600	05-45AD	106J/662



CONTROL—CONSTANT ALTITUDE

A. E. REFERENCE NUMBER 60-8407

NAMES: Constant altitude control
Altitude control
Altitude type control unit remote

DESCRIPTION: The constant altitude control of the Army type A-5 automatic pilot is used to maintain the airplane at a pre-set altitude. It consists of a bellows which is responsive to changes in barometric pressure, mechanical linkage and a magnetic pick-up. The motion of the bellows is transmitted through the mechanical linkage to the magnetic pick-up. The signal from the pick-up goes to the constant altitude control amplifier.

When the altitude control switch is in the ON position, the amplified signal causes the elevator servo to operate to maintain the desired altitude. When the switch is in the OFF position, the signal is returned to the constant altitude control, where it maintains the magnetic pick-up in the "zero signal" position to prevent sudden changes in altitude when the switch is turned on.

CHARACTERISTICS:

Dimensions	approximatly 4½ by 3¾ by 9 inches
Weight	approximately 2½ pounds
Power	115-volt, 3-phase, 400-cycle alternating current.

ARMY

A. E. REFERENCE NUMBER: 60-8407

SPECIFICATIONS:

General	27329
Detail	27360 (part of)

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

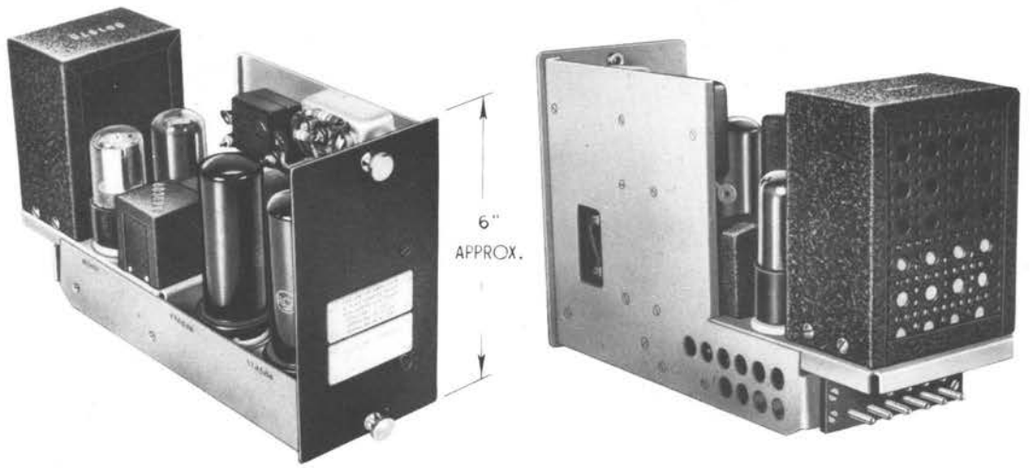
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	645010	A-B	6000096600	05-45AD	106J/667
Electric Auto-Lite Company	645010	A-B	6000096600	05-45AD	106J/667
A. C. Spark Plug Division	645010	A-B	6000096600	05-45AD	106J/667



AMPLIFIER—DIRECTIONAL GYRO FOLLOW-UP

A. E. REFERENCE NUMBER 60-8401

NAMES: Directional gyro follow-up amplifier
Azimuth follow-up amplifier
Follow-up amplifier
Azimuth follow-up type amplifier

DESCRIPTION: The directional gyro follow-up amplifier, part of the Army type A-5 automatic pilot, receives the impulse from the directional gyro and prepares it for use in the follow-up drive motor relay of the directional gyro. The chassis also carries the leveling amplifier, which receives the leveling signal from the directional gyro and amplifies it for use in a relay to energize the gyro leveling coil.

The amplifier is of the vacuum tube type. It slides into the amplifier rack, automatically making all electrical connections to the rack, and may be removed for adjustment or repair while the airplane is in flight.

CHARACTERISTICS:

Dimensions . . . . . approximately 3½ by 6 by 10 inches
Weight . . . . . approximately 6 pounds
Power . . . . . alternating current, 115-volt, 3-phase, 400-cycle

ARMY

A. E. REFERENCE NUMBER: 60-8401

SPECIFICATIONS:

General 27329
Detail . . . . . 27360 (part of)

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

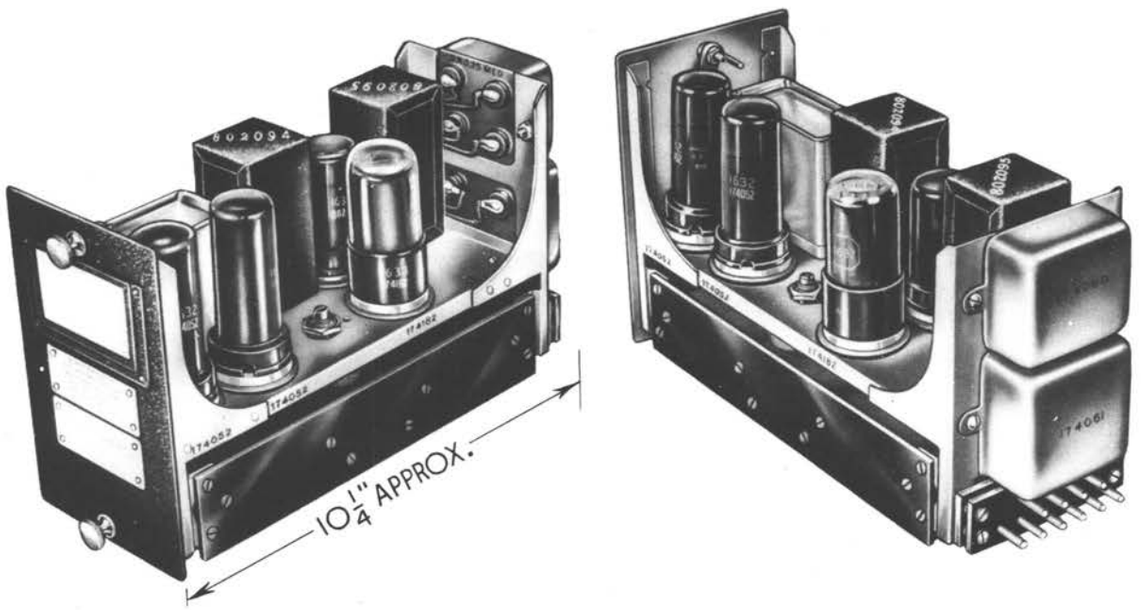
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent.

MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644835	A-B	6000024300	05-45AD-1	106J/664
Electric Auto-Lite Co.	644835	A-B	6000024300	05-45AD-1	106J/664
A. C. Spark Plug Division	644835	A-B	6000024300	05-45AD-1	106J/664



AMPLIFIER—RUDDER SERVO

A. E. REFERENCE NUMBER 60-8350

NAMES: Rudder servo amplifier
Servo amplifier
Rudder surface control amplifier

DESCRIPTION: The rudder servo amplifier is part of the amplifier rack assembly of the Army type A-5 automatic pilot.

The amplifier receives the signals from the directional gyro control. It then increases and modifies the signals, to cause the control valves in the rudder servo to operate. The rudder servo moves the rudder to correct any change in direction (motion about the vertical axis) when the airplane is under the control of the automatic pilot.

The pilot can modify the signals and make a turn to set the aircraft on a new heading by using the pilot's turn control on the control unit.

The amplifier is mounted on a drawer-like panel which slides into the amplifier rack, automatically plugging in all connections. It may be removed for adjustment or repair while the airplane is in flight.

CHARACTERISTICS:

Dimensions ..... approximately 3½ by 5½ by 10¼ inches
Weight ..... approximately 3¾ pounds
Power ..... alternating current, 115-volt, 3-phase, 400-cycle

ARMY

A. E. REFERENCE NUMBER: 60-8350

SPECIFICATIONS:

General 27329
Detail ..... 27360 (part of)

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

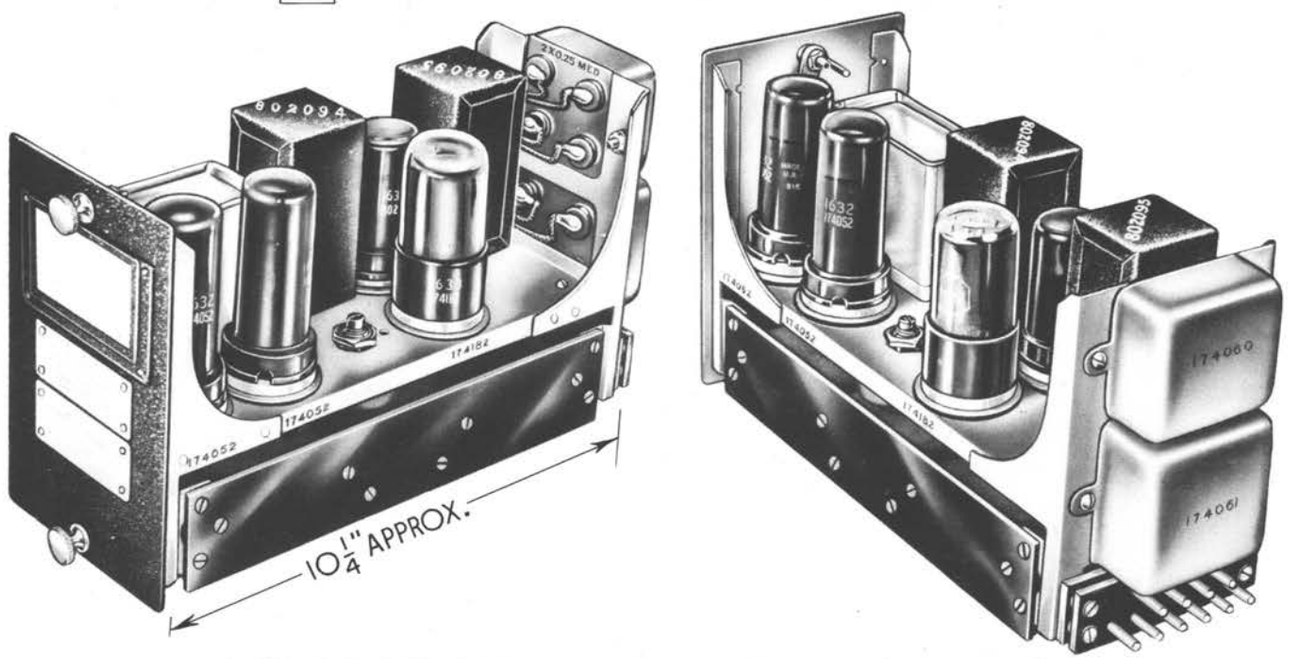
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	656044	A-B	6000024385	05-45AD	106J/754
Electric Auto-Lite Company	656044	A-B	6000024385	05-45AD	106J/754
A. C. Spark Plug Division	656044	A-B	6000024385	05-45AD	106J/754



AMPLIFIER—AILERON SERVO

A. E. REFERENCE NUMBER 60-8403

NAMES: Aileron servo amplifier
Servo amplifier
Aileron surface control amplifier
Servo type amplifier

DESCRIPTION: The aileron servo amplifier is part of the amplifier rack assembly of the Army type A-5 automatic pilot. The amplifier receives signals from the vertical gyro control. It then increases and modifies the signals to cause the control valves in the aileron servo to operate. The aileron servo moves the ailerons to correct any tilting (motion about the longitudinal axis) when the airplane is under the control of the automatic pilot.

The amplifier is mounted on a drawer-like panel which slides into the amplifier rack, automatically plugging in all connections. It may be removed for adjustment or repair while the airplane is in flight.

CHARACTERISTICS:

Dimensions . . . . . approximately 3½ by 5½ by 10¼ inches
Weight . . . . . approximately 3¾ pounds
Power . . . . . alternating current, 115-volts, 3-phase, 400-cycles

ARMY

A. E. REFERENCE NUMBER: 60-8403

SPECIFICATIONS:

General 27329
Detail . . . . . 27360 (part of)

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

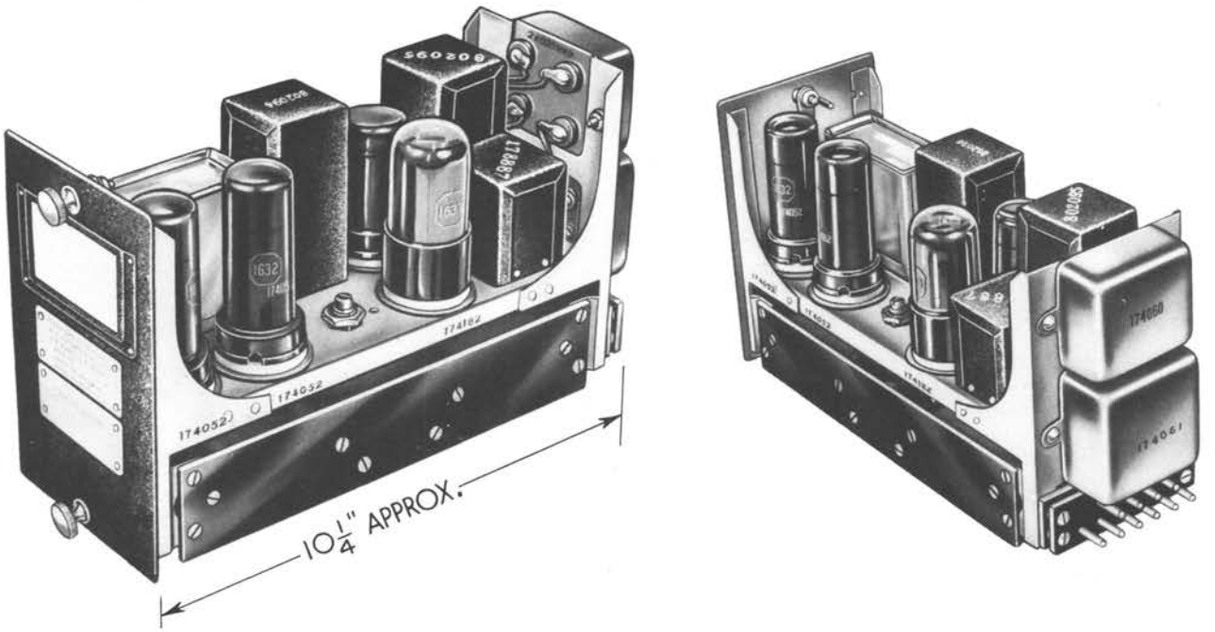
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644838	A-B	6000024400	05-45AD	106J/665
Electric Auto-Lite Company	644838	A-B	6000024400	05-45AD	106J/665
A. C. Spark Plug Division	644838	A-B	6000024400	05-45AD	106J/665



AMPLIFIER—ELEVATOR SERVO

A. E. REFERENCE NUMBER 60-8404

NAMES: Elevator servo amplifier
Servo amplifier
Elevator surface control amplifier
Servo type amplifier

DESCRIPTION: The elevator servo amplifier is part of the amplifier rack assembly of the Army type A-5 automatic pilot.

The amplifier receives the signals from the vertical control gyro. It then increases and modifies the signals to cause the control valves in the elevator servo to operate. The elevator servo moves the elevators to correct climbing or diving (motion about the lateral axis) when the airplane is under the control of the automatic pilot.

When the altitude control switch on the pilot's control panel is in the ON position, this amplifier receives and blends the gyro signal with any impulses from the altitude control amplifier and thus corrects any departure from the altitude established by the human pilot.

The amplifier is mounted in a drawer-like panel which slides into the amplifier rack, automatically plugging in all connections. It may be removed for adjustment or repair while the airplane is in flight.

CHARACTERISTICS:

Dimensions	approximately 3½ by 5¼ by 10¼ inches
Weight	approximately 4 pounds
Power	alternating current, 115-volt, 3-phase, 400-cycle

ARMY

A. E. REFERENCE NUMBER: 60-8404
SPECIFICATIONS:

General	27329
Detail	27360 (part of)

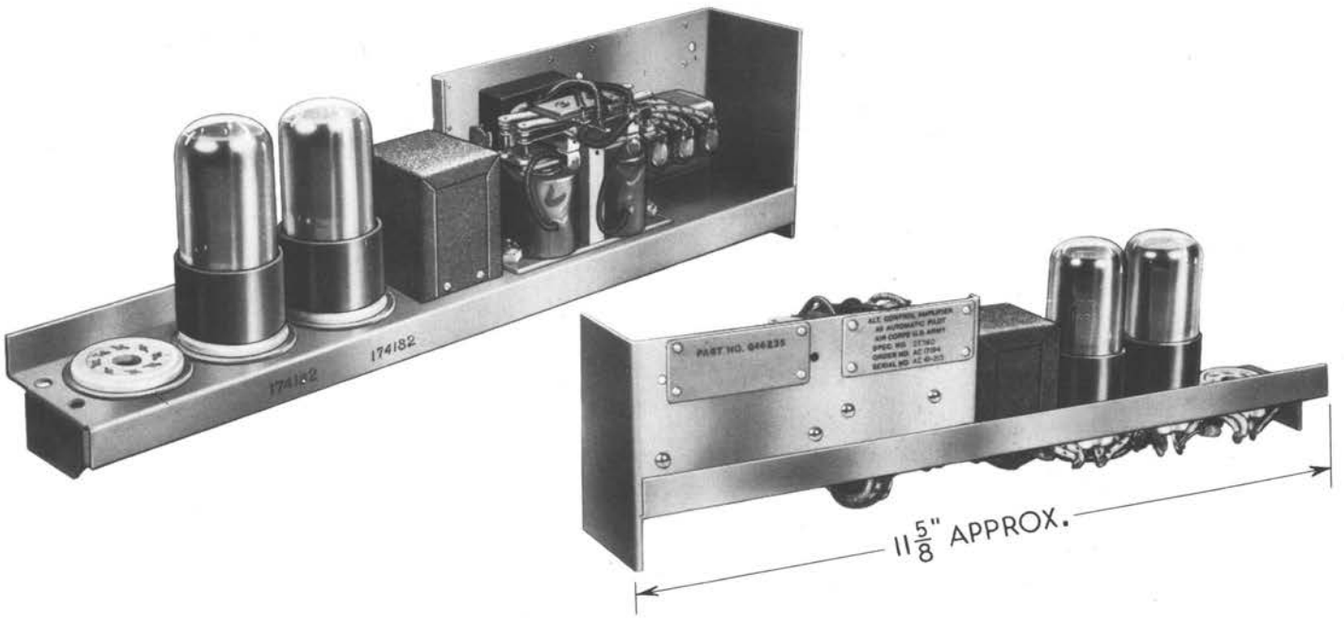
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	645919	A-B	6000024450	05-45AD	106J/666
Electric Auto-Lite Company	645919	A-B	6000024450	05-45AD	105J/666
A. C. Spark Plug Division	645919	A-B	6000024460	05-45AD	106J/666



AMPLIFIER—CONSTANT ALTITUDE CONTROL

A. E. REFERENCE NUMBER 60-8402

NAMES: Constant altitude control amplifier Altitude control follow-up amplifier

DESCRIPTION: The constant altitude amplifier unit, part of the Army type A-5 automatic pilot, increases the strength of the signal originating in the altitude control unit.

When the altitude control switch is in the OFF position, the signal from the altitude control operates a follow-up motor which keeps the altitude control in a "zero signal" position to prevent sudden changes in altitude when the switch is turned ON.

When the altitude control is in the ON position, the amplifier signal is conducted to the servo amplifier, where it is combined with the elevator signal from the vertical gyro control.

CHARACTERISTICS:

Dimensions ..... approximately 2 by 3¾ by 11⅝ inches
Weight ..... approximately 1¾ pounds
Power ..... alternating current 115-volt, 3-phase, 400-cycle

ARMY

A. E. REFERENCE NUMBER: 60-8402
SPECIFICATIONS:
General 27329
Detail ..... 27360 (part of)
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	646235	A-B	6000024320	05-45AD-1	106J/663
Electric Auto-Lite Co.	646235	A-B	6000024320	05-45AD-1	106J/663
A. C. Spark Plug Division	646235	A-B	6000024320	05-45AD-1	106J/663

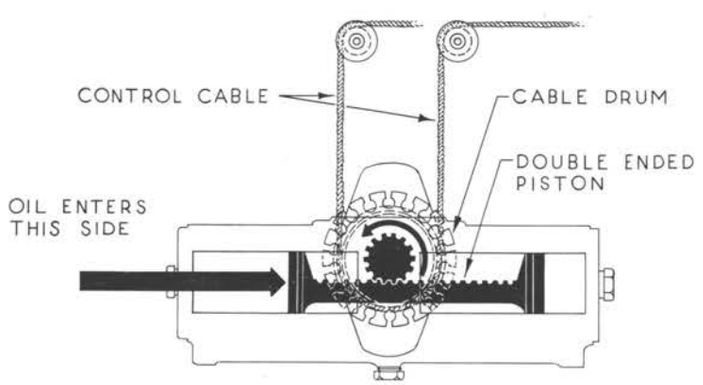
SERVO—A-5 AUTOMATIC PILOT

The servo, which is controlled by the electrical impulse from the servo amplifier, supplies hydraulic power for moving the airplane control surfaces, such as the rudder, ailerons and elevators.

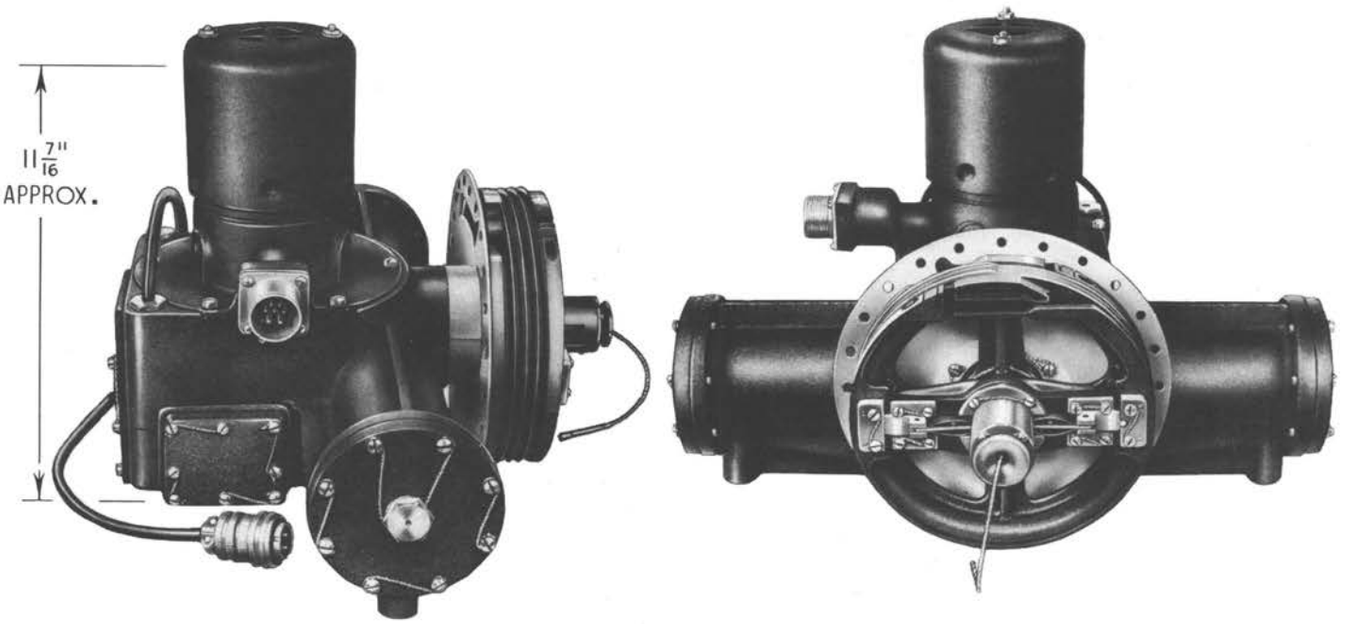
Basically, the device depends upon two pistons, connected together by a shaft and operating in a cylinder, for its operation. The pistons are moved by oil pressure supplied by an integral motor operated gear pump.

The pump has two lines, connected, through solenoid-operated valves, to opposite ends of the cylinder. In the "neutral," or no-signal position, the valves permit oil to flow to a reservoir, and equal pressures are exerted on both of the pistons. When the servo amplifier applies a signal to the valve solenoid, the oil flow is so directed that more pressure is applied to one of the pistons than to the other, and the pistons move. This movement is transmitted by a rack and pinion to a pulley, and thence by control cables to the airplane's control surface.

An emergency release mechanism is incorporated, to disconnect the cable drum from the drive shaft in the event that the pilot's emergency switch fails to disengage the automatic pilot. In order to again operate through the servo in the event of such failure and emergency release, the cable drum must be reset. This can be done only when the airplane is on the ground. The servo unit also embodies a thermostatically controlled heating element, powered from the airplane electrical system, to heat the servo oil during low temperature operation.



SERVO



SERVO—AILERON OR RUDDER

A. E. REFERENCE NUMBER 60-8418

NAMES: Aileron or rudder servo — Rudder and aileron control assembly
Servo unit — Electric-hydraulic type servo unit

DESCRIPTION: This servo, a part of the A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating either the ailerons or rudder surfaces, depending upon the installation.

CHARACTERISTICS:

Dimensions	approximately 15 by 11 7/16 by 12 inches
Weight	approximately 22 pounds
Drum diameter	4 inches
Cable travel	5 inches
Power supply	27 volts direct current
Motor output	0.1 horsepower

ARMY

A. E. REFERENCE NUMBER: 60-8418
SPECIFICATIONS:

General	27329
Detail	27361 (part of)

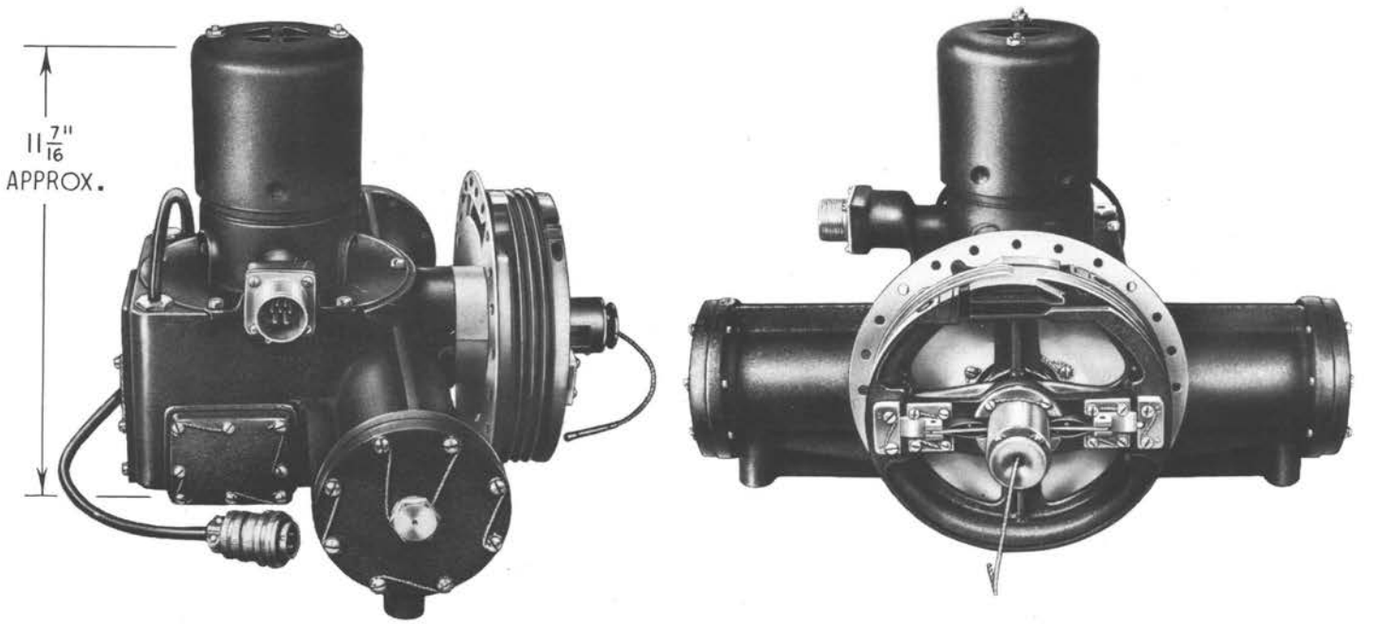
A. A. F. DRAWING NUMBER: 42D20067
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	646853	A-B	6000097072	05-45AD	106J/677
Electric Auto-Lite Co.	646853	A-B	6000097072	05-45AD	106J/677
A. C. Spark Plug Division	646853	A-B	6000097072	05-45AD	106J/677



SERVO—AILERON OR RUDDER

A. E. REFERENCE NUMBER 60-8420

NAMES: Aileron or rudder servo
Servo unit
Rudder and aileron control assembly
Electric hydraulic type servo unit

DESCRIPTION: This servo, a part of the A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating either the ailerons or rudder surfaces, depending upon the installation.

CHARACTERISTICS:

Dimensions	approximately 15 by 11 7/16 by 12 inches
Weight	approximately 22 pounds
Drum diameter	6 inches
Cable travel	8 inches
Power supply	27 volts direct current
Motor output	0.1 horsepower

ARMY

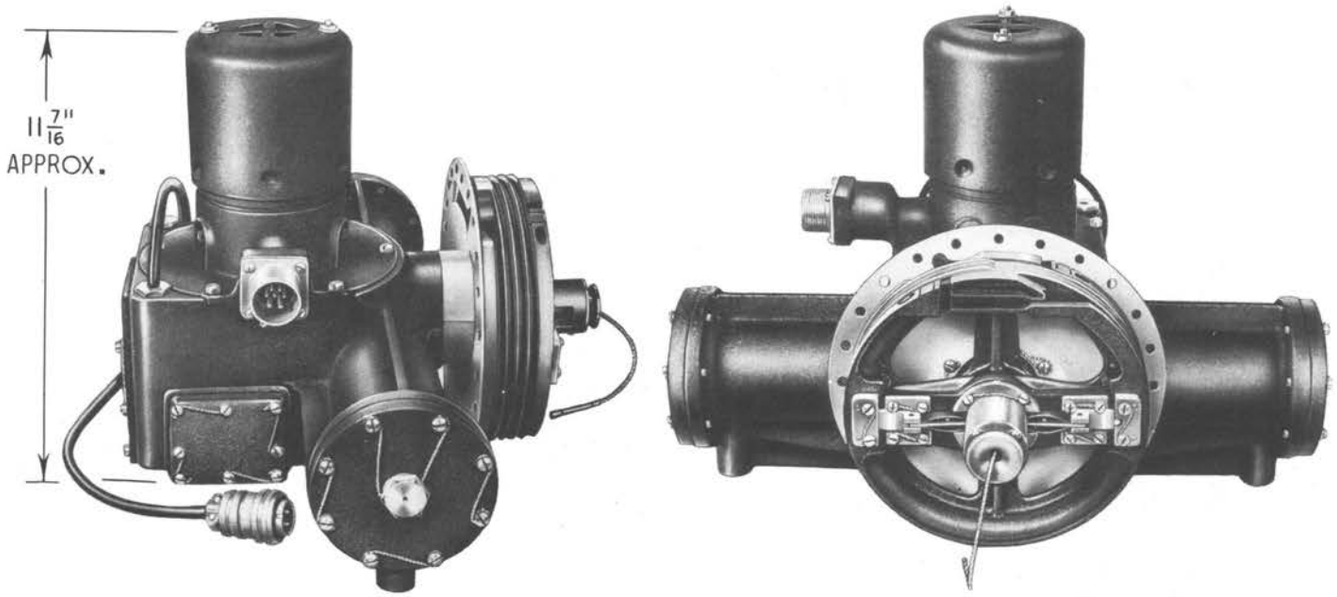
A. E. REFERENCE NUMBER: 60-8420
SPECIFICATIONS:
General 27329
Detail: . . . . . 27361 (part of)
A. A. F. DRAWING NUMBER: 42D20067
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644833 Outline 645095	A-B	6000098400	05-45AD	106J/678
Electric Auto-Lite Co.	644833 Outline 645095	A-B	6000098400	05-45AD	106J/678
A.C. Spark Plug Division	644833 Outline 645095	A-B	6000098400	05-45AD	106J/678



SERVO—AILERON OR RUDDER

A. E. REFERENCE NUMBER 60-8416

NAMES: Aileron or rudder servo
Servo unit
Rudder and aileron control assembly
Electric hydraulic type servo unit

DESCRIPTION: This servo, a part of the A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating either the ailerons or rudder surfaces, depending upon the installation.

CHARACTERISTICS:

Dimensions	approximately 15 by 11 7/16 by 12 inches
Weight	approximately 27 pounds
Drum diameter	6 inches
Cable travel	22 inches
Power supply	27 volts direct current
Motor output	0.2 horsepower

ARMY

A. E. REFERENCE NUMBER: 60-8416
SPECIFICATIONS:

General	27329
Detail	27361 (part of)

AN OR A. A. F. DRAWING NUMBER: 42D20068
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

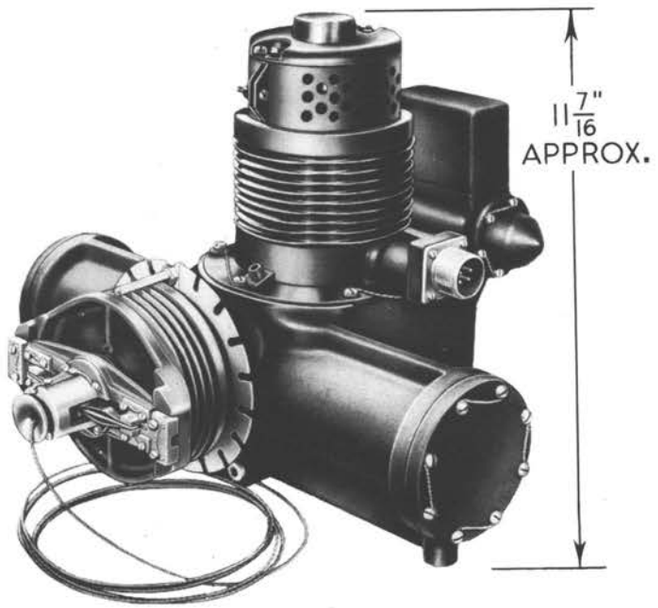
There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	646065	A-B	6000098450	05-45AD	106J/676
	*648558	A-B	6000096570	05-45AD	106J/756
Electric Auto-Lite Co.	646065	A-B	6000098450	05-45AD	106J/676
	*648558	A-B	6000096570	05-45AD	106J/756
A. C. Spark Plug Division	646065	A-B	6000098450	05-45AD	106J/676
	*648558	A-B	6000096570	05-45AD	106J/756

*REMARKS: Has electrical connector on right side of motor housing. See note below.

NOTE: Part number 648558 (A. E. Reference Number 60-8424) may be interchanged with part number 646065 by removing motor housing and reversing position so that the electrical connector is on the left side of the motor when facing the servo pulley.



SERVO—ELEVATOR

A. E. REFERENCE NUMBER 60-8417

NAMES: Elevator servo
Servo unit
Elevator control assembly
Electric hydraulic type servo unit

DESCRIPTION: This servo, a part of the Army type A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating the elevator surfaces. The servo also contains an hydraulically operated electric switch which provides a signal for operating the trim tab control. See page 215.

CHARACTERISTICS:

Dimensions	approximately 15 by 11 7/16 by 14 7/8 inches
Weight	approximately 25 3/4 pounds
Drum diameter	4 inches
Cable travel	5 inches
Power supply	27 volts direct current
Motor output	0.1 horsepower

ARMY

A. E. REFERENCE NUMBER: 60-8417
SPECIFICATIONS:

General	27329
Detail	27361 (part of)

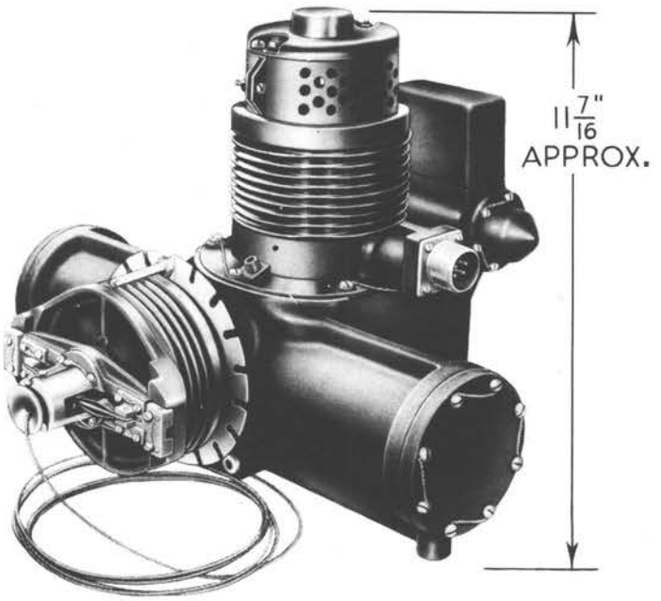
A. A. F. DRAWING NUMBER: 42D20067
A. S. C. STOCK NUMBER: Refer to chart
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	646852	A-B	6000097071	05-45AD	106J/672
Electric Auto-Lite Co.	646852	A-B	6000097071	05-45AD	106J/672
A. C. Spark Plug Division	646852	A-B	6000097071	05-45AD	106J/672



SERVO—ELEVATOR

A. E. REFERENCE NUMBER 60-8421

NAMES: Elevator servo
Servo unit
Elevator control assembly
Electric hydraulic type servo unit

DESCRIPTION: This servo, a part of the Army type A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating the elevator surfaces. The servo also contains an hydraulically operated electric switch which provides a signal for operating the trim tab control. See page 215.

CHARACTERISTICS:

Dimensions	approximately 12 by 11 7/16 by 14 7/8 inches
Weight	approximately 25 3/4 pounds
Drum diameter	6 inches
Cable travel	8 inches
Power	27 volts direct current
Motor	0.1 horsepower

ARMY

A. E. REFERENCE NUMBER: 60-8421
SPECIFICATIONS:

General	27329
Detail	27361 (part of)

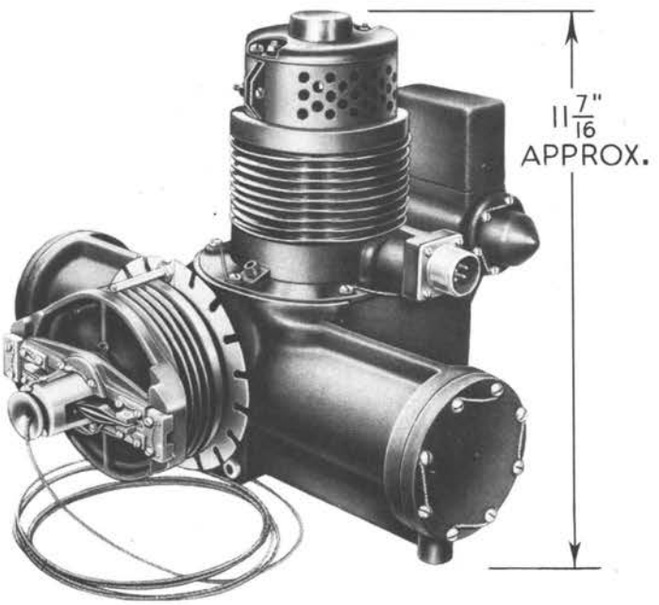
A. A. F. DRAWING NUMBER: 42D20067
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644832 Outline 645061	A-B	6000096620	05-45AD	106J/670
Electric Auto-Lite Co.	644832 Outline 645061	A-B	6000096620	05-45AD	106J/670
A. C. Spark Plug Division	644832 Outline 645061	A-B	6000096620	05-45AD	106J/670



SERVO—ELEVATOR

A. E. REFERENCE NUMBER 60-8415

NAMES: Elevator servo
Servo unit
Elevator control assembly
Electric hydraulic type servo unit

DESCRIPTION: This servo, a part of the Army type A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating the elevator surfaces. The servo also contains an hydraulically operated electric switch which provides a signal for operating the trim tab control. See page 215.

CHARACTERISTICS:

Dimensions	approximately 15 by 11 7/16 by 14 7/8 inches
Weight	approximately 29 pounds
Drum diameter	4 inches
Cable travel	14 inches
Power supply	27 volts direct current
Motor output	0.2 horsepower

ARMY

A. E. REFERENCE NUMBER: 60-8415
SPECIFICATIONS:

General	27329
Detail	27361 (part of)

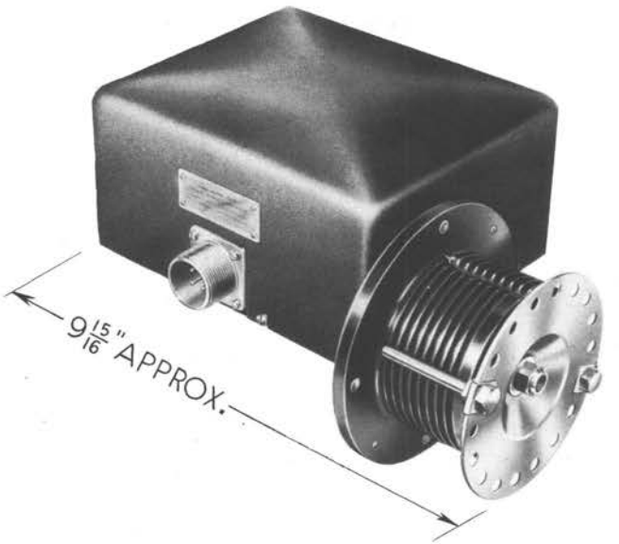
A. A. F. DRAWING NUMBER: 42D20068
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	646454	A-B	6000096630	05-45AD	106J/671
Electric Auto-Lite Co.	646454	A-B	6000096630	05-45AD	106J/671
A. C. Spark Plug Division	646454	A-B	6000096630	05-45AD	106J/671



SERVO—TRIM TAB

A. E. REFERENCE NUMBER 60-8408

NAMES: Trim tab servo
Elevator trim tab servo
Elevator trim tab control assembly
Electric type servo unit

DESCRIPTION: The elevator trim tab servo, a part of the Army type A-5 automatic pilot, automatically controls the elevator trim tab in response to signals from a pressure switch on the elevator servo. The switch makes contact on one side or the other, in accordance with the direction of the pressure in the cylinder of the elevator servo.

Upon contact of the switch on either side, current flows through a relay and supplies power to the reversible electric motor of the trim tab control unit which operates the cable drum to adjust the position of the trim tab.

In this manner, automatic adjustment of the trim tab is made to compensate for any change in the airplane's loading during flight, such as would be caused by dropping the bomb load or by a shift of personnel from position in the tail to position in the center section.

CHARACTERISTICS:

Dimensions	approximately 6¾ by 5⅞ by 9 15/16 inches
Weight	approximately 9 pounds
Cable travel	55 inches
Power	27 volts direct current

ARMY

A. E. REFERENCE NUMBER: 60-8408
SPECIFICATIONS:

General	27329
Detail	27362 (part of)

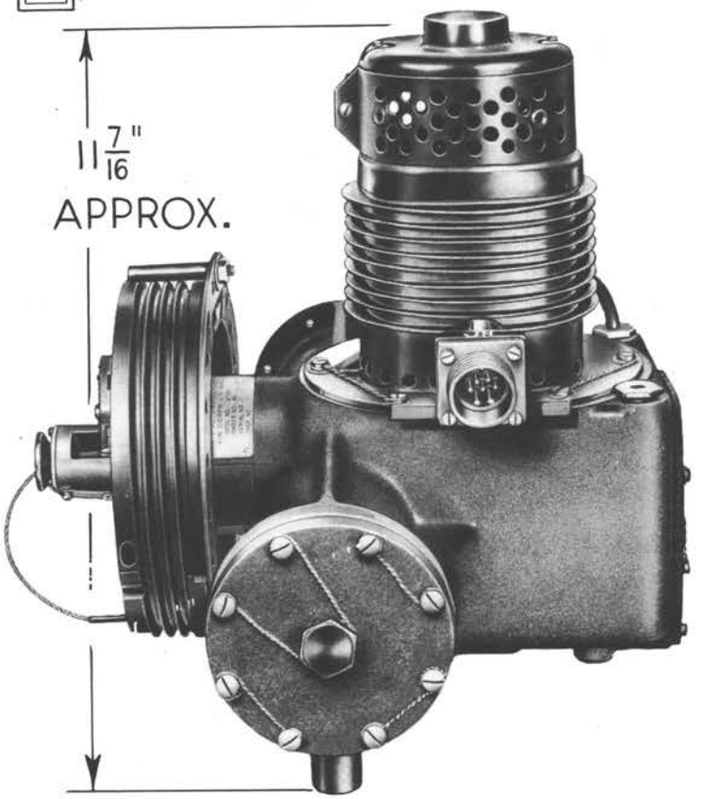
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Not under procurement for initial installation.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

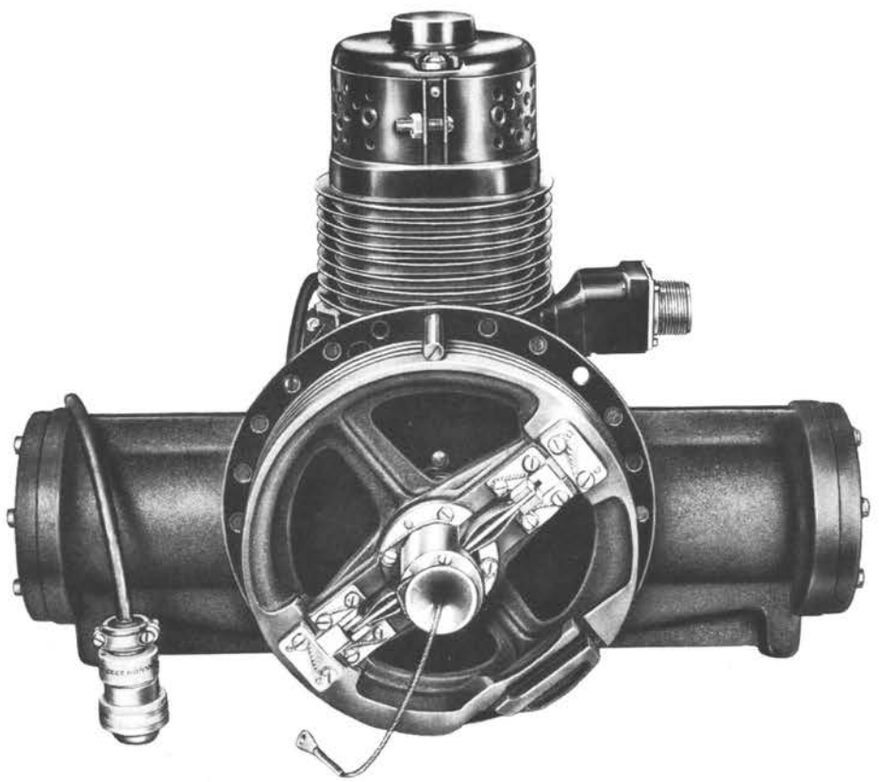
Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	644840 Outline 77554	A-B	6000096645	05-45AD	106J/668
Electric Auto-Lite Co.	644840 Outline 77554	A-B	6000096645	05-45AD	106J/668
A. C. Spark Plug Division	644840 Outline 77554	A-B	6000096645	05-45AD	106J/668



SERVO—AILERON

A. E. REFERENCE NUMBER 60-8424

NAMES: Aileron servo
Servo unit
Aileron control assembly
Electric-hydraulic type servo unit



(Continued on page 217)

SERVO—AILERON

(*Continued from page 216*)

DESCRIPTION: This servo, a part of the Army type A-5 automatic pilot, is an electrically controlled hydraulic unit used for operating the ailerons. The electrical receptacle is located on the right side of the motor housing when the observer is facing the servo pulley, and this limits its use to certain specific installations.

CHARACTERISTICS:

Dimensions	approximately 15 by 11 7/16 by 12 inches
Weight	approximately 27 pounds
Drum diameter	6 inches
Cable travel	22 inches
Power supply	27 volts direct current
Motor output	0.2 horsepower

ARMY

A. E. REFERENCE NUMBER: 60-8424

SPECIFICATIONS:

General	27329
Detail	27361 (part of)

AN OR A. A. F. DRAWING NUMBER: 42D20068

A. S. C. STOCK NUMBER: Refer to chart.

TECHNICAL ORDER NUMBER: Refer to chart.

PRODUCTION STATUS: Under procurement.

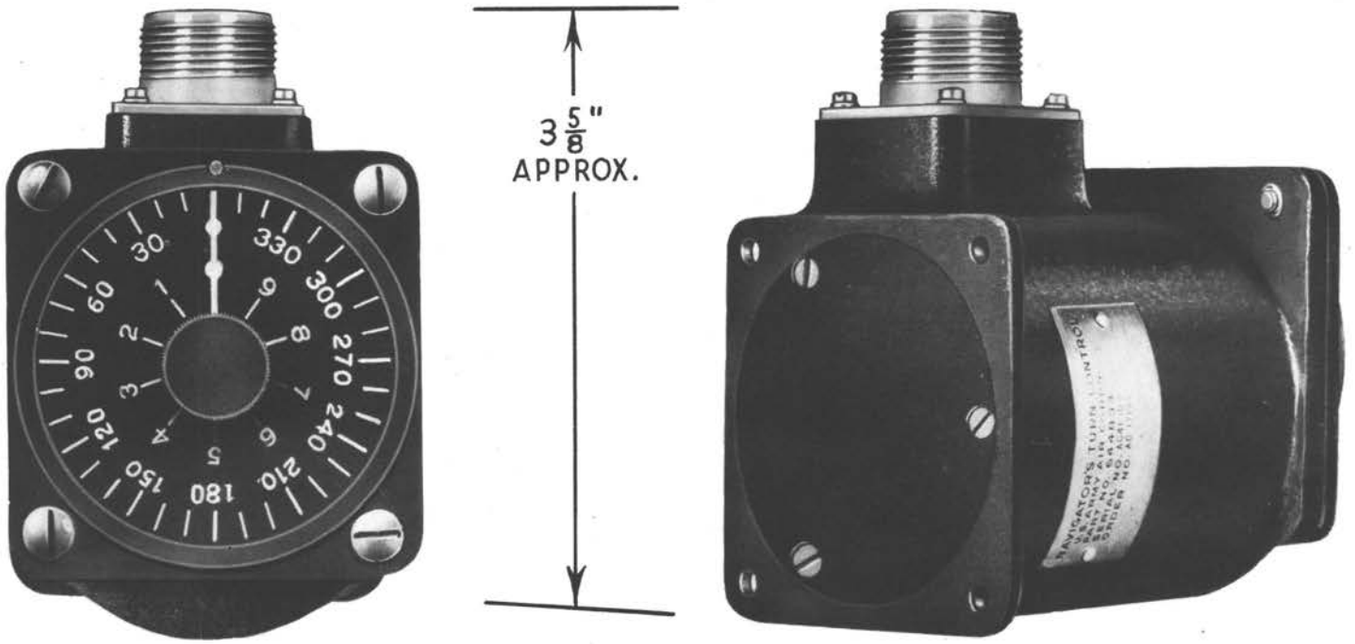
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Part and Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	648558	A-B	6000096570	05-45AD	106J/756
Electric Auto-Lite Co.	648558	A-B	6000096570	05-45AD	106J/756
A. C. Spark Plug Division	648558	A-B	6000096570	05-45AD	106J/756



CONTROLLER—NAVIGATOR'S TURN

A. E. REFERENCE NUMBER 60-8409

NAMES: Navigator's turn controller Remote turn controller

DESCRIPTION: The navigator's turn controller, part of the A-5 automatic pilot, incorporates a signal generator. It has two dials, the inner graduated in degrees from 0 to 10, the outer graduated in degrees from 0 to 360. When the selector switch on the pilot's control panel is in the position marked NAV., movement of the controller by the navigator at his station causes a signal to be generated and transmitted to the signal generator in the directional gyro control, thus causing the airplane to turn in the desired direction. Only flat turns can be made in this way.

Note: The newer models of the A-5 pilot do not have provision for control by the navigator.

CHARACTERISTICS:

Dimensions	approximately 2⅜ by 3⅝ by 3½ inches
Weight	approximately 1 pound
Illumination	none
Markings	fluorescent
Rate of turn	180 degrees per minute, right or left.

MANUFACTURER: Sperry Gyroscope Company, Incorporated.

MANUFACTURER'S DRAWING NUMBER: 644834. Outline drawing 801989.

ARMY

A. E. REFERENCE NUMBER: 60-8409

SPECIFICATIONS:

General	27329
Detail	27363

A. S. C. STOCK NUMBER: 6000099700

TECHNICAL ORDER NUMBER: 05-45AD

PRODUCTION STATUS: Not under procurement for initial installation.

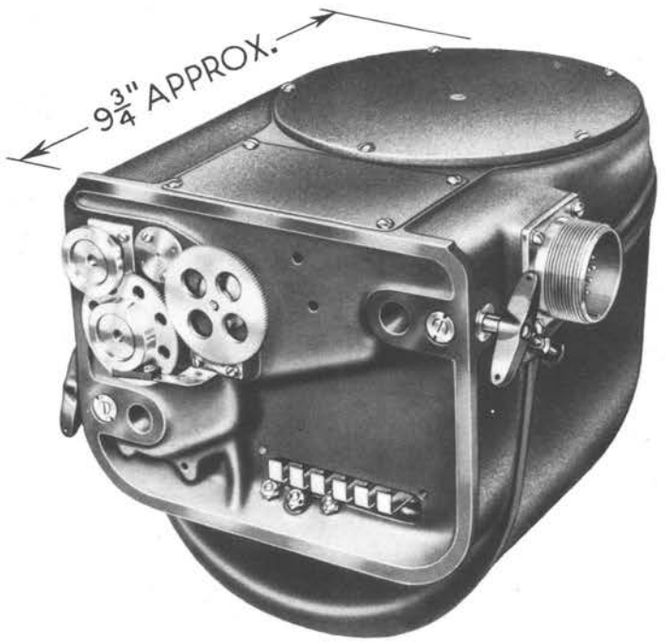
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

BRITISH

BRITISH REFERENCE NUMBER: 106J/681



CONTROL—DIRECTIONAL GYRO

A. E. REFERENCE NUMBER 60-8422

NAMES: Directional gyro control Azimuth gyro

DESCRIPTION: The directional gyro control, a part of the Army type A-5 automatic pilot, originates the electrical signal by which the airplane's forward direction is controlled.

The directional gyro control depends upon the use of a gyroscope, which spins about a horizontal axis, for its operation. The gyroscope, which is driven by an integral electric motor, furnishes the basic reference from which to determine changes in the airplane's direction.

The directional gyro control assembly consists, principally, of a gyroscope and driving motor with its housing, a follow-up motor, and a signal generator.

The gyroscope is suspended in a frame which allows freedom in all directions, and which is so arranged that when the airplane's direction changes, the difference between the position of this frame and an outer frame, which is rigidly mounted to the airplane, is translated into an electrical impulse by a magnetic pick-off.

The impulse is led from the pick-off to a follow-up amplifier, and the strengthened signal is returned to operate the follow-up motor. The follow-up motor causes the signal generator to send a signal to the servo amplifier, where it is amplified and used to operate the rudder servo valves. The servo then moves the airplane's rudder to bring the airplane to its prescribed course.

The directional gyro control automatically resets itself, after a correction to the airplane direction has been made, through the action of the follow-up system and a leveling magnet.

CHARACTERISTICS:

Dimensions	approximately 8½ by 8 by 9¾ inches
Weight	approximately 14½ pounds
Power	alternating current, 115 volts, 3 phase, 400 cycle

INSTALLATION PECULIARITIES: This unit to be used only with Directional Gyro Follow-up Amplifier, A. E. Reference Number 60-8423.

ARMY

A. E. REFERENCE NUMBER: 60-8422

SPECIFICATIONS:

General	27329
Detail	27358

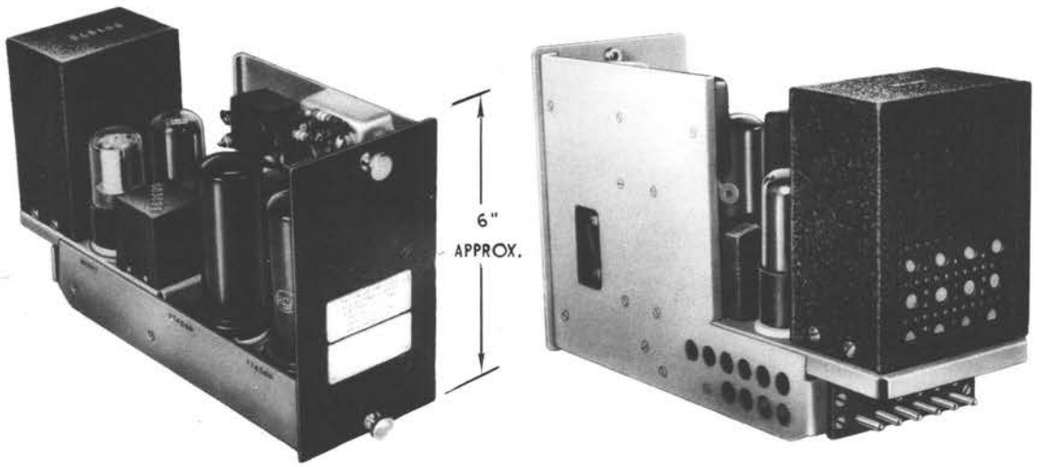
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA. Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	656029	A-B	6000096575	05-45AD	106J/749
Electric Auto-Lite Co.	656029	A-B	6000096575	05-45AD	106J/749
A. C. Spark Plug Division	656029	A-B	6000096575	05-45AD	106J/749



AMPLIFIER—DIRECTIONAL GYRO FOLLOW-UP

A. E. REFERENCE NUMBER 60-8423

NAMES: Directional gyro follow-up amplifier
Azimuth follow-up amplifier
Azimuth follow-up type amplifier

DESCRIPTION: The directional gyro follow-up amplifier, part of the Army type A-5 automatic pilot, receives the impulse from the directional gyro and prepares it for use in the follow-up drive motor relay of the directional gyro. The chassis also carries the leveling amplifier which receives the leveling signal from the directional gyro and amplifies it for use in a relay to energize the gyro leveling coil.

The amplifier is of the vacuum tube type. It slides into the amplifier rack, automatically making all electrical connections to the rack, and may be removed for adjustment or repair while the airplane is in flight.

CHARACTERISTICS:

Dimensions . . . . . approximately 3½ by 6 by 10 inches
Weight . . . . . approximately 6 pounds
Power . . . . . alternating current, 115-volt, 3-phase, 400-cycle

INSTALLATION PECULIARITIES: This unit to be used only with Directional Gyro Control, A. E. Reference Number 60-8422.

ARMY

A. E. REFERENCE NUMBER: 60-8423
SPECIFICATIONS:

General 27329
Detail . . . . . 27360 (part of)

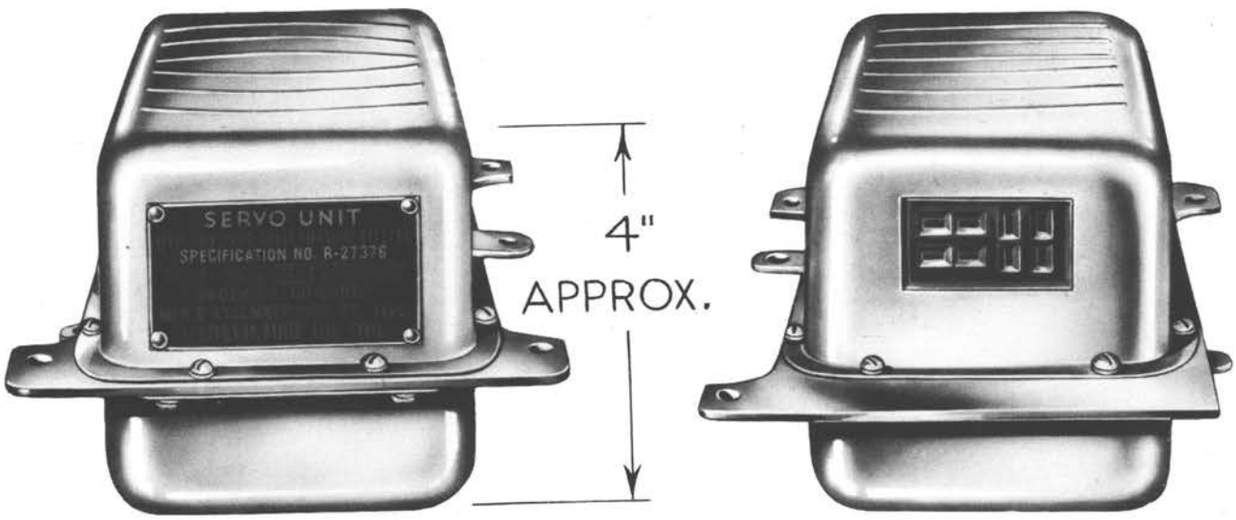
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 3
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Drawing Number	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	656030	A-B	6000024305	05-45AD-1	106J/748
Electric Auto-Lite Co.	656030	A-B	6000024305	05-45AD-1	106J/748
A. C. Spark Plug Division	656030	A-B	6000024305	05-45AD-1	106J/748



SERVO—ELECTRIC

ARMY TYPE D-1

NAMES: Electric servo
Control unit
Four inch stroke servo
Servo unit

DESCRIPTION: This electric servo unit is used to control the heading and attitude of radio-controlled miniature target airplanes. The unit, which is mounted in the airplane, consists of two reversible direct current motors with operating relays. Each motor moves a lever arm through reduction gearing. Through control cables, one arm operates the rudder surface, and the other arm operates the elevator surface.

Control signals originate in a remotely located sending set, and are received by a radio receiver located within the airplane. The output of the receiving set is used to operate the relays in the servo, which in turn operate the servo motors to control the airplane's flight.

CHARACTERISTICS:

Dimensions	approximately 4 by 4 by 6 inches
Weight	approximately 1⅔ pounds
Direct current input	6 volts; 500 milliamperes

MANUFACTURER: Hansen Manufacturing Co., Inc.

MANUFACTURER'S PART NUMBER: 7000

ARMY

A. E. REFERENCE NUMBER: 60-1800

SPECIFICATIONS:

Detail	R-27376-A
Superseded	R-27376

TYPE DESIGNATION: D-1

A. S. C. STOCK NUMBER: 6000097120

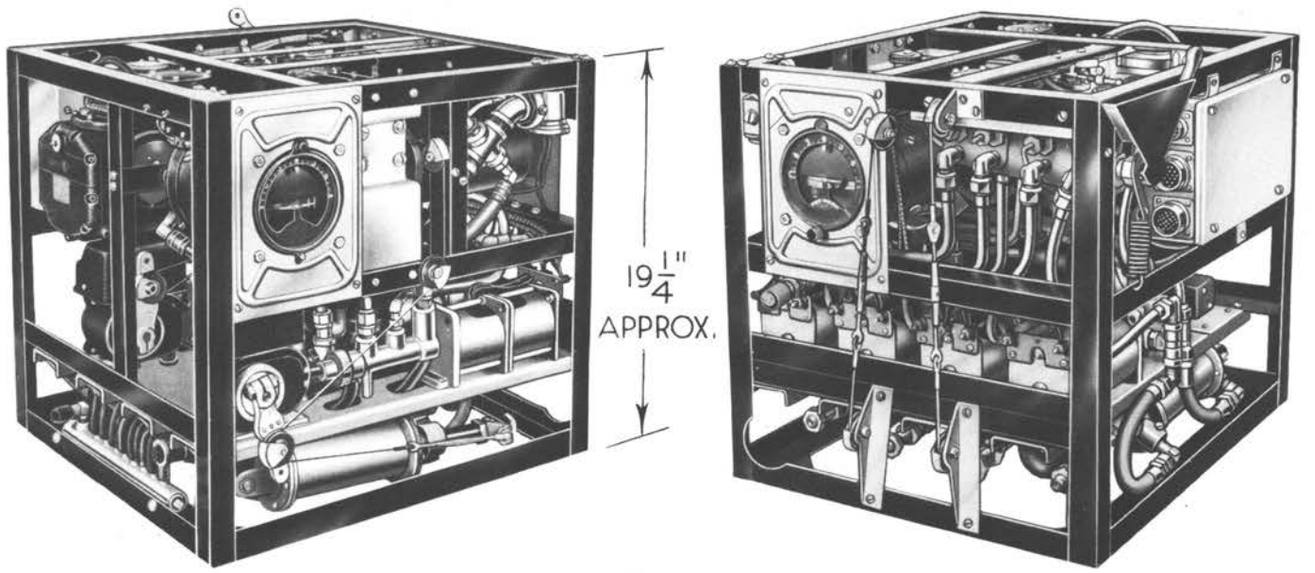
TECHNICAL ORDER NUMBER: 11-55AA

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.



SERVO—HYDRAULIC

A-3

NAMES: Hydraulic servo
Control unit—three axes stabilized
Three axes stabilized control unit
Hydraulic servo—three axes stabilized control
Automatic pilot

DESCRIPTION: This hydraulic servo is an accessory to the automatic pilot, embodying in one assembly the mechanism necessary for controlling all of the movements of an airplane. In addition to automatically maintaining a predetermined course and altitude, this unit makes possible remote control of the airplane by radio, or direct control from within the airplane itself. The unit must have a direct-current electrical supply, a source of vacuum and a source of oil pressure for operation. These are usually provided separately by engine-driven pumps and a generator.

The unit may be divided into three functional groups for purposes of explanation. The first group originates the signal, the second group converts the signal for use in the servos and the third group produces mechanical motion in the various control surfaces.

Reference planes are established in the first functional group by three vacuum-operated gyroscopes, two of which are mounted with vertical axes, and the third mounted with an horizontal axis. The gyroscopes contain vacuum pick-offs which, whenever the plane's altitude changes from its predetermined setting, or when a signal is introduced from the control panel, originate impulses which change the plane's direction or altitude. The pick-offs consist of small apertures, which are uncovered or covered, depending upon the position of the gyroscope. When the aperture is uncovered, the vacuum system is permitted to function through a line leading to a vacuum-operated switch.

In order to change the position of the vacuum pick-offs so that the airplane may be controlled externally, direct current electric motors called "trim motors" are used. These motors, through a system of pulleys, change the position of the vacuum pick-offs.

The second functional group consists of electrical circuits, vacuum-operated switches and solenoid controlled hydraulic valves, which convert the signals originated in the gyros so that they will operate the servo units. The signal from the vacuum pick-offs operates the electric switch. This switch then opens or closes the solenoid valve and changes the quantity of hydraulic fluid flowing to the servo.

The third functional group consists of four servos and their associated equipment. The servos are mechanically connected to operate the control surfaces and brakes. They are so arranged that when pressure is exerted on one face of the piston, the port leading to the other face is opened through a relief valve to a reservoir. The valves are controlled by the solenoids of the second group.

The controls for the unit are embodied in a device, separately mounted, known as the "metal stick." This device contains switches and relays for manual operation by the person controlling the

(Continued on page 223)

SERVO—HYDRAULIC

(*Continued from page 222*)

airplane. When used as a remote-operating device, the "metal stick" is mounted in another airplane, or on the ground. The signals from the stick are fed into a radio sending set, and picked up by a radio receiving set located in the controlled airplane. The signal from the radio receiver relays is then led to the trim motor, which moves the vacuum pick-off and begins the correction to the airplane direction.

When the "metal stick" is used for direct operation of the airplane, it is mounted in the pilot's cockpit, and its output is fed directly into the stabilized unit.

CHARACTERISTICS:

Dimensions	approximately 17 by 20 by 19¼ inches
Weight	approximately 112 pounds
Hydraulic pressure	40 to 160 pounds per square inch
Vacuum	2 to 4 inches of mercury, vacuum
Voltage	12 volts direct current

MANUFACTURER: Aro Equipment Corporation.

MANUFACTURER'S DRAWING NUMBER: T-502-3B

ARMY

A. E. REFERENCE NUMBER: 60-1825

SPECIFICATIONS: Detail R-27381

A. A. F. DRAWING NUMBER: 42N4279

TYPE DESIGNATION: A-3

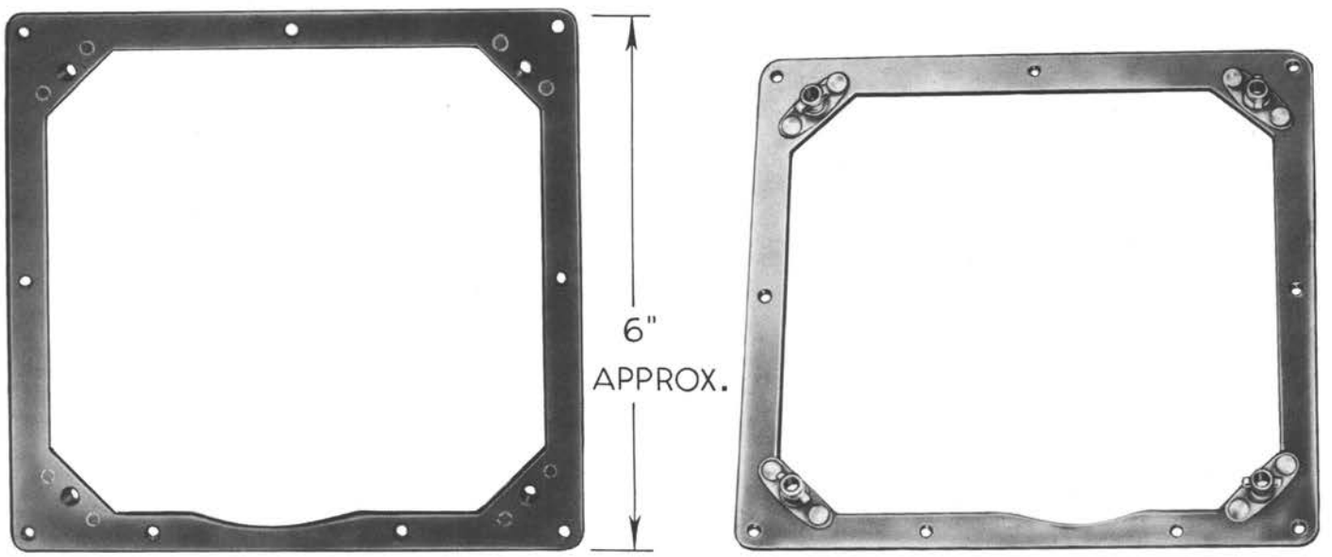
A. S. C. STOCK NUMBER: 6000323075

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.



FRAME—SINGLE MOUNTING

ARMY PART NUMBER 43B7625

NAME: Single mounting frame

DESCRIPTION: This is an aluminum alloy frame, having on the reverse side four elastic stop nuts for attaching a mounting plate to permit installation or removal of flight instruments from the front of the instrument panel.

CHARACTERISTICS:

Dimensions.....approximately 6 by 5¾ by ½ inches
Weight.....approximately 2 ounces

RELATIONSHIP OF PARTS: This unit is attached to rear of instrument panel to accommodate mounting plates, A. E. Reference Numbers 60-8100 or 60-8105, for the front mounting of the gyro horizon indicator or directional gyro indicator.

ARMY

A. E. REFERENCE NUMBER: 60-2350

A. A. F. DRAWING NUMBER: 43B7625

A. S. C. STOCK NUMBER: 6300623118

MANUFACTURER: Sperti Incorporated; Part Number 43B7625.

PRODUCTION STATUS: Under procurement.

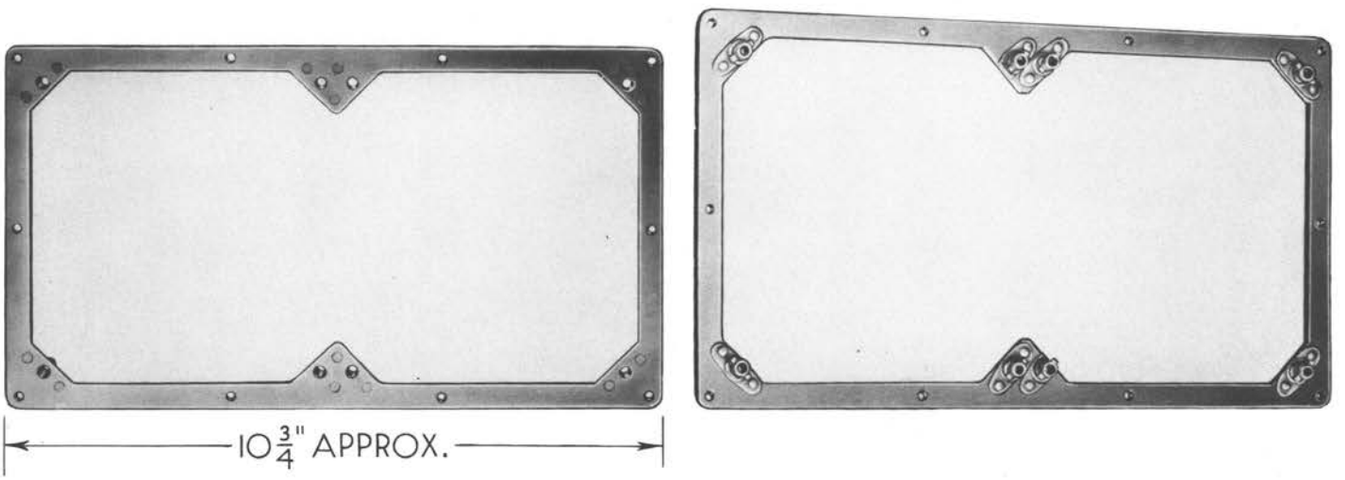
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

BRITISH

BRITISH REFERENCE NUMBER: 106A/1377



FRAME—DOUBLE MOUNTING

ARMY PART NUMBER 43D7014

NAME: Double mounting frame

DESCRIPTION: This is an aluminum alloy frame, having on the reverse side 8 electric stop nuts for attaching two mounting plates, to permit the installation or removal of flight instruments from the front of the instrument panel.

CHARACTERISTICS:

Dimensions.....approximately 6 by 10¾ by ½ inches
Weight.....approximately 3⅛ ounces

RELATIONSHIP OF PARTS: This unit is attached to the rear of the instrument panel to accommodate mounting plates, A. E. Reference Numbers 60-8100 and 60-8105, for the front mounting of the gyro horizon indicator and directional gyro indicator.

ARMY

A. E. REFERENCE NUMBER: 60-2355

A. A. F. DRAWING NUMBER: 43D7014

A. S. C. STOCK NUMBER: 6300623117

MANUFACTURER: Sperti Incorporated, part number 43D7014

PRODUCTION STATUS: Under procurement.

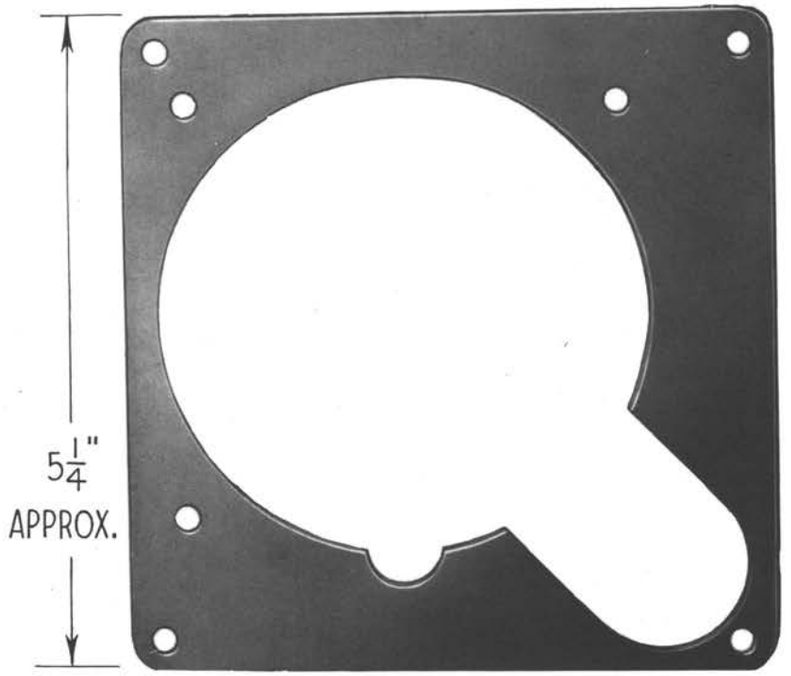
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for this item.

BRITISH

BRITISH REFERENCE NUMBER: 106A/1378



PLATE—FRONT MOUNTING

ARMY PART NUMBER 43B7016

NAME: Front mounting plate

DESCRIPTION: This front mounting plate is used with mounting frames to permit mounting and removal of the gyro horizon indicator from the front of the instrument panel. The plate is the same thickness as the instrument panel.

CHARACTERISTICS:

Size.....approximately 5 by 5¼ by ⅛ inches
Weight.....approximately 2½ ounces

RELATIONSHIP OF PARTS: This unit is attached to a mounting frame, A. E. Reference Number 60-2350 or 60-2355.

ARMY

A. E. REFERENCE NUMBER: 60-8100

A. A. F. DRAWING NUMBER: 43B7016

MANUFACTURER'S DRAWING NUMBER: Sperti, Inc., 43B7016

A. S. C. STOCK NUMBER: 6300735537-3

PRODUCTION STATUS: Under procurement.

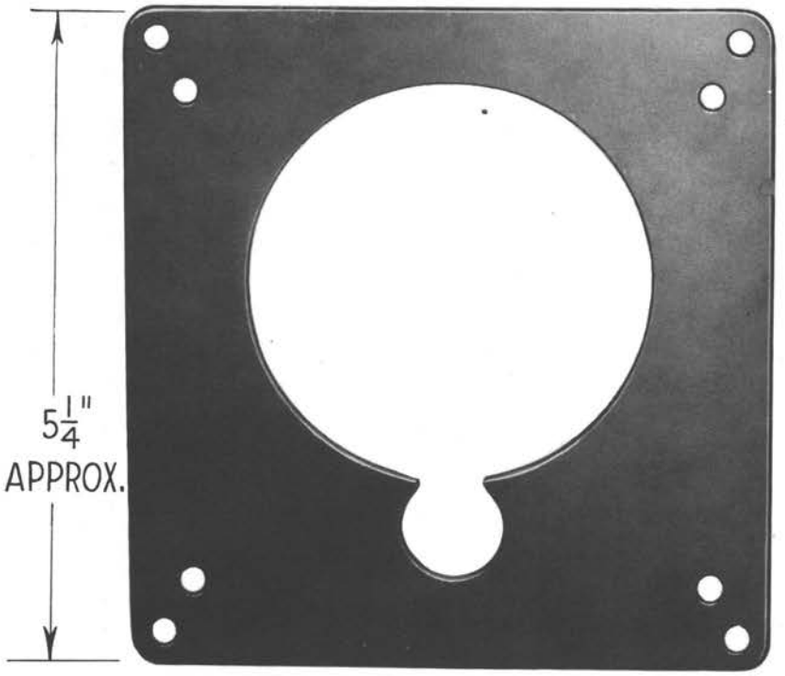
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

BRITISH

BRITISH REFERENCE NUMBER: 106A/1379



PLATE—FRONT MOUNTING

ARMY PART NUMBER 43B7015

NAME: Front mounting plate

DESCRIPTION: This front mounting plate is used with mounting frames to permit mounting and removal of the directional gyro indicator from the front of the instrument panel.

The plate is the same thickness as the instrument panel.

CHARACTERISTICS:

Size.....approximately 5 by 5¼ by ⅛ inches
Weight.....approximately 3½ ounces

RELATIONSHIP OF PARTS: This unit is attached to a mounting frame, A. E. Reference Number 60-2350 or 60-2355.

ARMY

A. E. REFERENCE NUMBER: 60-8105

A. A. F. DRAWING NUMBER: 43B7015

MANUFACTURER'S DRAWING NUMBER: Sperti, Inc., 43B7015

A. S. C. STOCK NUMBER: 6300735537

PRODUCTION STATUS: Under procurement.

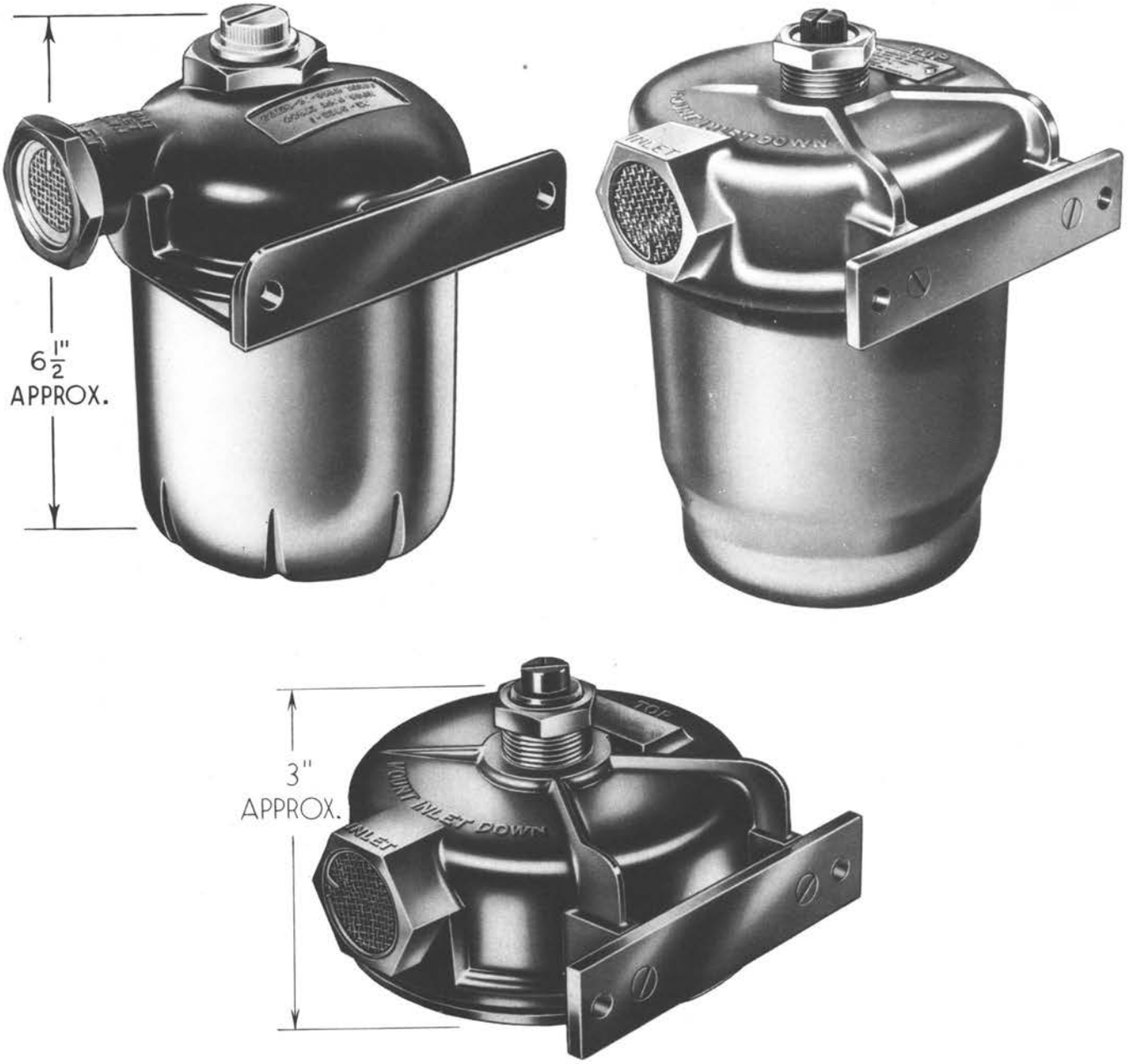
SHIPPING DATA: Shipped as a complete unit.

NAVY

There is no Navy equivalent for the Army item.

BRITISH

BRITISH REFERENCE NUMBER: 106A/1380



FILTER—AIR

AN5822-1 FORMER NAVY TYPE MARK III F. S. S. C. NUMBER 88-F-1035

NAMES: Air filter
Central system air filter
Filter; air, 10 C.F.M. (vacuum-operated instruments)
Filter, air, vacuum-operated instruments
Filter, air directional gyro

DESCRIPTION: Air and vacuum-driven instruments require a constant supply of air which is free from foreign matter. This air filter has a removable filtering element. The air inlet is covered by a removable screen, to prevent the entry of large objects such as insects, etc.

On pressurized cabin airplanes, the filter may be mounted outside the cabin, but the inlet port must be connected to the interior of the cabin to prevent the instruments from being subjected to an excessive pressure differential.

Although different in appearance, the filters pictured above have the same capacity and mounting dimensions.

(*Continued on page 229*)

(Continued from page 228)

CHARACTERISTICS:
Capacity . . . . . 10 cubic feet per minute
Dimensions . . . . . refer to chart
Weight . . . . . refer to chart.

ARMY

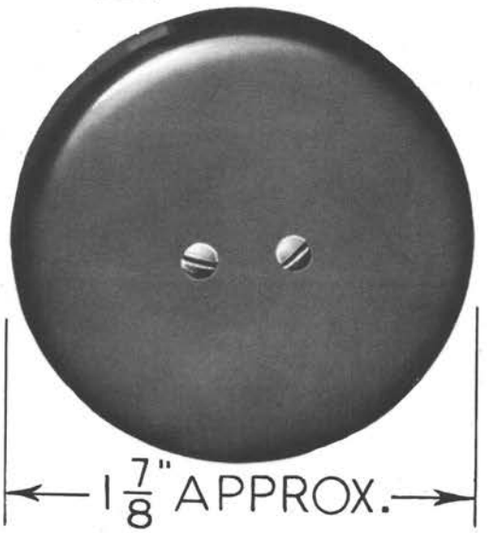
A. E. REFERENCE NUMBER: 60-8303
SPECIFICATIONS:
Detail AN-F-9A
Superseded 94-27366; AN-F-9
AN DRAWING NUMBER: AN5822
AN PART NUMBER: AN5822-1
A. S. C. STOCK NUMBER: Refer to chart.
TECHNICAL ORDER NUMBER: Refer to chart.
PRODUCTION STATUS: Under procurement.
SHIPPING DATA: Shipped as a complete unit.

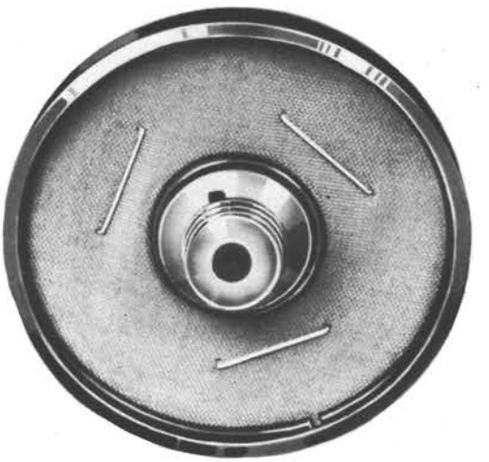
NAVY

FORMER TYPE DESIGNATION: Mark III.
SPECIFICATIONS: Detail AN-F-9A
AN DRAWING NUMBER: AN5822
F. S. S. C. STOCK NUMBER: 88-F-1035
PROCUREMENT STATUS: Standard. G. F. E.—Order through A. S. O. by F. S. S. C. number.

ALL MODELS BELOW ARE INTERCHANGEABLE
Models are used in services as noted in column 7
A-Army, N-Navy, B-British, C-Commercial

Manufacturer	Manufacturer's Model Identification	Manufacturer's Part and Drawing Number	Dimensions Approximately—Inches	Weight Approximately—Pounds	Current Model (X)	Used By	Air Service Command Stock Number	Army Technical Order Number	British Reference Number
Sperry Gyroscope Co., Inc.	76516	76516	5½ by 6½ by 4⅜	2¼		A-N-B-C	6000103800	05-45AB	106J/604
	647984	647984	5½ by 6½ by 4⅜	1⅝	X	A-N-B-C	6000103850	05-45AB	106J/702
Purolator Products, Inc.	24330	24330	5½ by 6½ by 4⅜	2¼		A-N-B-C			106J/604
	PA-11	28102	5½ by 7 by 4⅜	1½	X	A-N-B-C	6000103750	05-1-31	106J/702
	PA-12	28668	5½ by 3 by 4¾	1½	X	A-N-B-C	6000103760	05-1-34	106J/702
Jack & Heintz, Inc.	JH3116	JH3116	5½ by 6½ by 4⅜	1 7/16	X	A-N-B	6000103700	05-45BA	106J/704
Skinner Purifiers, Inc.	27300	27300	5½ by 6½ by 4⅜	1 7/16	X	A-N-B-C	6000103875		106J/704





FILTER—TURN AND BANK INDICATOR AIR

AN5821-1 F.S.S.C. NUMBER 88-F-1000

NAMES: Turn and bank indicator air filter — Air filter
Bank and turn indicator air filter

DESCRIPTION: This filter is for use with vacuum operated turn and bank indicators when the installation does not provide a central air filter. It consists of a filter pad stapled to a brass 100 mesh screen and attached to the underside of a concave cap. The filter has a 1/8 inch external pipe thread, so that it may be attached to the instrument air inlet. The air passes through the screen filter, and then through the threaded stem into the instrument.

CHARACTERISTICS:

Screen	100 mesh
Screen material	brass
Dimensions	approximately $1\frac{7}{8}$ diameter by $\frac{21}{32}$ inches
Weight	approximately 2 ounces

ARMY

A. E. REFERENCE NUMBER: 60-2300

SPECIFICATIONS:

Detail	AN-F-2
Superseded	27349

AN DRAWING NUMBER: AN5821

AN PART NUMBER: AN5821-1

A. S. C. STOCK NUMBER: 6000618775

TECHNICAL ORDER NUMBER: (Part of) 05-20-2

MANUFACTURER: Pioneer Instrument, Division Bendix Aviation Corp.

MANUFACTURER'S MODEL NUMBER: K-1

MANUFACTURER'S PART AND DRAWING NUMBER: 13362

PRODUCTION STATUS: Under procurement.

SHIPPING DATA: Shipped as a complete unit.

NAVY

SPECIFICATIONS: Detail AN-F-2

AN DRAWING NUMBER: AN5821

A. S. O. OR F. S. S. C. STOCK NUMBER: 88-F-1000

PROCUREMENT STATUS: Standard G.F.E.—Order through A. S. O. by F. S. S. C. number.

BRITISH

BRITISH REFERENCE NUMBER: 106A/1433