

Chapter 2

LINEAR ACTUATORS

LIST OF CONTENTS

	Para.		Para.
Introduction	1	Servicing	6
Description	2	Brushgear	7
Installation	5	Insulation resistance test	11
		General	12

LIST OF APPENDICES

	App.		App.
Western, in-line, Type EJ series ...	7	Plessey, Jaguar series	9
Western, off-set, Type EOJ150 series ...	8	Plessey, Cougar series	12

Note . . .

General information on various series of linear actuators, e.g. Plessey, Jaguar series, will no longer be issued in Appendices to this Chapter. Existing Appendices will gradually be deleted, as they are transferred to the appropriate Section in A.P.4343D, Vol. 1, Book 3, until only chapters of a purely general nature remain.

Introduction

1. Since linear actuators produced by different manufacturers vary considerably in design, this chapter will not attempt to describe any one actuator in detail, but will confine itself to general principles. More detailed information on the different types of linear actuators will be given in Chapters in the appropriate Sections of A.P.4343D, Vol. 1, Book 3; where there are several variants within a series, these will be covered in Appendices to the Chapter concerned.

DESCRIPTION

2. Linear actuators have many applications in aircraft installations where remote control of certain equipment can be effected by extension and retraction of the plunger of an actuator. They are used for such purposes as operation of valves, retractable landing lamps, air intakes, flaps and shutters. They incorporate a small alternative-field, series wound motor, operating from the main aircraft supply, which transmits the drive through a gear train and lead screw to the ram or plunger. Limit switches are fitted to control the plunger at each extreme of its travel, while certain actuators also have a mid-position limit switch, whereby the plunger can be stopped at an intermediate point. In some applications the limit switches also control remote indicating lamps.

3. An electro-magnetic brake is a common feature of linear actuators; the brake coil is connected in series with the armature of the

RESTRICTED

motor, and the brake is released when the motor is energized. The action of the brake when the electrical supply to the actuator is switched off prevents overtravel of the plunger.

4. Electrical connection to the actuator is normally made at a multi-pole plug and socket connection. Circuit diagrams for each actuator appear in the individual chapters in A.P.4343D, Vol. 1, Book 3. Different end fittings are employed according to the particular function of the actuator, whereby it can be secured to the aircraft structure at one end, and at the plunger end to the component to be actuated.

INSTALLATION

5. The chapters in A.P.4343D, Vol. 1, Book 3, give general installation details only, with any precautions that may be necessary for a particular type. For details relating to a particular aircraft installation, reference should be made to the relevant Aircraft Handbook.

SERVICING

6. The following general examination will normally be required for all linear actuators; details of further servicing procedure will be given in the relevant Chapters in A.P.4343D, Vol. 1, Book 3, and should be undertaken in accordance with the appropriate Servicing Schedule.

Brushgear

7. After removal of the brush cover plates, the brushes should be examined for cracks, security of flexible connections and wear. Brushes should be renewed at the periods prescribed in the relevant Servicing Schedule, and whenever examination reveals that they

will not remain serviceable for the period that must elapse before the next servicing.

8. Brushes should be free, but not slack in their boxes. If they are tight as a result of carbon being deposited in the boxes, the deposits should be removed using a dry air blast.

9. Brush spring pressure should be measured using a tension gauge of the appropriate range; available gauges are as follows:—

<i>Ref. No.</i>	<i>Range</i>
1H/57	4– 24 gm.
1H/58	10– 80 gm.
1H/59	50–250 gm.
1H/86	100–500 gm.

Note . . .

1 oz. is equivalent to 28.352 gm.

10. The commutator should be examined for scores and burns. If its condition is such that commutation is likely to be impaired, the actuator must be considered unserviceable and be returned for repair in accordance with current authorized procedure.

Insulation resistance test

11. The insulation resistance, when measured with the appropriate insulation resistance tester between all live parts and the frame, should not be less than 0.05 megohm.

General

12. A general examination of the actuator should be made for freedom from mechanical damage and security of electrical connections. All covers and cover plates should be in place, and all external locking devices secure.

Chapter 2

LINEAR ACTUATORS

LIST OF CONTENTS

	Para.		Para.
Introduction	1	Servicing	6
Description	2	Brushgear	7
Installation	5	Insulation resistance test	11
		General	12

LIST OF APPENDICES

	App.		App.
Rotax, Type A0100 series	1	Plessey, Jaguar series	9
▶ ◀		Plessey, Cub Puma series	10
Rotax, Types A1100, A.1200 and		▶ ◀	
A.1400 series	5	Plessey, Cougar series	12
Rotax, Type A1300 series	6	English Electric, Type AE4010	
Western, in-line, Type EJ series... ..	7	series	13
Western, off-set, Type EOJ 150 series. .	8	Plessey, twin-motor, Jaguar series	14

Note . . .

General information on various series of linear actuators, e.g. Rotax A0100 series, will no longer be issued in Appendices to this Chapter. Existing Appendices will gradually be deleted, as they are transferred to the appropriate Section in A.P.4343D, Vol.1, Book 3, until only chapters of a purely general nature remain.

Introduction

1. Since linear actuators produced by different manufacturers vary considerably in design, this chapter will not attempt to

describe any one actuator in detail, but will confine itself to general principles. More detailed information on the different types of linear actuators will be given in Chapters in the appropriate Sections of A.P.4343D, Vol.1, Book 3; where there are several variants within a series, these will be covered in Appendices to the Chapter concerned.

DESCRIPTION

2. Linear actuators have many applications in aircraft installations where re-

RESTRICTED

mote control of certain equipment can be effected by extension and retraction of the plunger of an actuator. They are used for such purposes as operation of valves, retractable landing lamps, air intakes, flaps and shutters. They incorporate a small alternative-field, series wound motor, operating from the main aircraft supply, which transmits the drive through a gear train and lead screw to the ram or plunger. Limit switches are fitted to control the plunger at each extreme of its travel, while certain actuators also have a mid-position limit switch, whereby the plunger can be stopped at an intermediate point. In some applications the limit switches also control remote indicating lamps.

3. An electro-magnetic brake is a common feature of linear actuators; the brake coil is connected in series with the armature of the motor, and the brake is released when the motor is energized. The action of the brake when the electrical supply to the actuator is switched off prevents overtravel of the plunger.

4. Electrical connection to the actuator is normally made at a multi-pole plug and socket connection. Circuit diagrams for each actuator appear in the individual chapters in A.P.4343D, Vol.1, Book 3. Different end fittings are employed according to the particular function of the actuator, whereby it can be secured to the aircraft structure at one end, and at the plunger end to the component to be actuated.

INSTALLATION

5. The chapters in A.P.4343D, Vol.1, Book 3, give general installation details only, with any precautions that may be necessary for a particular type. For details relating to a particular aircraft instal-

lation, reference should be made to the relevant Aircraft Handbook.

SERVICING

6. The following general examination will normally be required for all linear actuators; details of further servicing procedure will be given in the relevant Chapters in A.P. 4343D, Vol.1, Book 3, and should be undertaken in accordance with the appropriate Servicing Schedule.

Brushgear

7. After removal of the brush cover plates, the brushes should be examined for cracks, security of flexible connections and wear. Brushes should be renewed at the periods prescribed in the relevant Servicing Schedule, and whenever examination reveals that they will not remain serviceable for the period that must elapse before the next servicing.

8. Brushes should be free, but not slack in their boxes. If they are tight as a result of carbon being deposited in the boxes, the deposits should be removed using a dry air blast.

9. Brush spring pressure should be measured using a tension gauge of the appropriate range; available gauges are as follows:-

Ref.No.	Range
1H/57	4 - 24 gm.
1H/58	10 - 80 gm.
1H/59	50 - 250 gm.
1H/86	100 - 500 gm.

Note . . .

1 oz. is equivalent to 28.352 gm.

10. The commutator should be examined for scores and burns. If its condition is such that commutation is likely to be impaired, the actuator must be considered unserviceable and be returned for repair in accordance with current authorized procedure.

Insulation resistance test

11. The insulation resistance, when measured with the appropriate insulation tester (250-volt for 28-volt equipment, and

500-volt for 112-volt equipment and above), between all live parts and the frame, should not be less than 50,000 ohms for satisfactory aircraft service.

General

12. A general examination of the actuator should be made for freedom from mechanical damage and security of electrical connections. All covers and cover plates should be in place, and all external locking devices secure.

