# Chapter 27

# LANDING LAMP, HARLEY, TYPE 11 MK. 11 A.W.A.

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## LIST OF ILLUSTRATIONS



## LEADING PARTICULARS

| | |
|---|---|
| **Landing lamp, Harley, Type 11 Mk. 11 A.W.A.** | **Ref. No. 5CX/5556** |
| *Actuator, Plessey, Type CZ53681/11C* | Ref. No. 5W/2836 |
| *Filament lamp (special cap), double filament 28 volt, 750/260 watt* | *Ref. No. 5L/* |
| *Filament micro switch, Burgess V3* | *Ref. No. 5CW/4615* |
| *Lamp fully open angle* | 87 $\pm\frac{1}{2}$ *deg.* |
| *Weight* | 15 *lb* |
| *Maximum operating frequency (actuator)* | 10 *cycles/hour* |
| *Maximum lighting time (either filament, on ground or in still air)* | 10 *min.* |

## Introduction

**1.** The Harley, Type 11 Mk. 11 A.W.A. landing lamp, shown in fig. 1, is a twin filament, retractable lamp designed for use on the Armstrong Whitworth Argosy but which may be used on other large aircraft. The lamp is fixed into a 14 in. diameter aperture on the underside of the main plane and is controlled by two selector switches in the cabin. One switch controls the Plessey actuator by which the lamp is extended or retracted; the other varies the beam for landing or taxying, by selecting either the 750 watt or 260 watt filament of the filament lamp respectively. The landing lamp also incorporates an automatic filament switch which extinguishes the filament lamp if the lamp is retracted with the filament switched on.

## DESCRIPTION

### General

**2.** The Harley Type 11 Mk. 11 A.W.A. landing lamp consists primarily of two sub-assemblies, the outer frame assembly and the inner frame assembly each carried on a cast alloy ring. The outer frame casting, which is the fixed portion by which the lamp is mounted in the main plane accommodates the terminal block, the back cover, the actuator and the inner frame bearing blocks. The inner frame casting is the moving portion of the lamp in which are mounted the filament lamp, the lens, the front glass, the reflector and the reflector back cover. Cast as part of the inner frame casting are two journals which pivot in the Tufnol bearing blocks on the outer frame casting. The right-hand journal passes through the bearing and carries the actuating lever to which the ram-end of the actuator is secured.

**3.** The front glass, which has a rebated rim so that the face of the glass fits flush with the face of the inner casting, is held in the casting by a retaining ring and sealed by a rubber sealing gasket. The semi-circular lens which is fitted in the upper half of the inner frame assembly has one face fluted, this faces away from the reflector and the filament lamp and is designed to flatten the top of the light beam

Fig. 1. General view of lamp

thus reducing stray light and the associated glare. The lens is carried in four clips secured to a light alloy mounting ring, which is a push fit in the inner frame casting and is retained and located by a single dihedral setting screw. The two upper lens clips have slots into which the lens fits, the two lower lens clips are also slotted but have spring-loaded plungers on to which the lens seats. These allow for the expansion of the lens due to the heat of the filament lamp and also provide some shock protection to the lens.

**4.** The reflector and the lamp holder casting are secured within the reflector cover which is held pressed against the lens mounting ring in the inner frame casting by four spring clips. The lamp holder casting consists of a mounting post and a circular plate, which fits into the rear of the reflector cover and is secured by six screws which engage with threaded holes in the plate. The mounting post incorporates a split clamp in which the filament lamp end-cap is held, one half of the clamp is cast integrally with the post and has a locating hole which accepts the locating spigot of the end-cap. This arrangement locates the two filaments of the filament lamp in relation to the focal point of the reflector to provide the required light for landing or taxying. The position of the reflector assembly is determined by a dihedral setting screw in the inner frame casting which engages with a slot in the reflector cover.

**Dihedral setting screws**

**5.** The dihedral setting screws, one for the lens and one for the reflector and filament

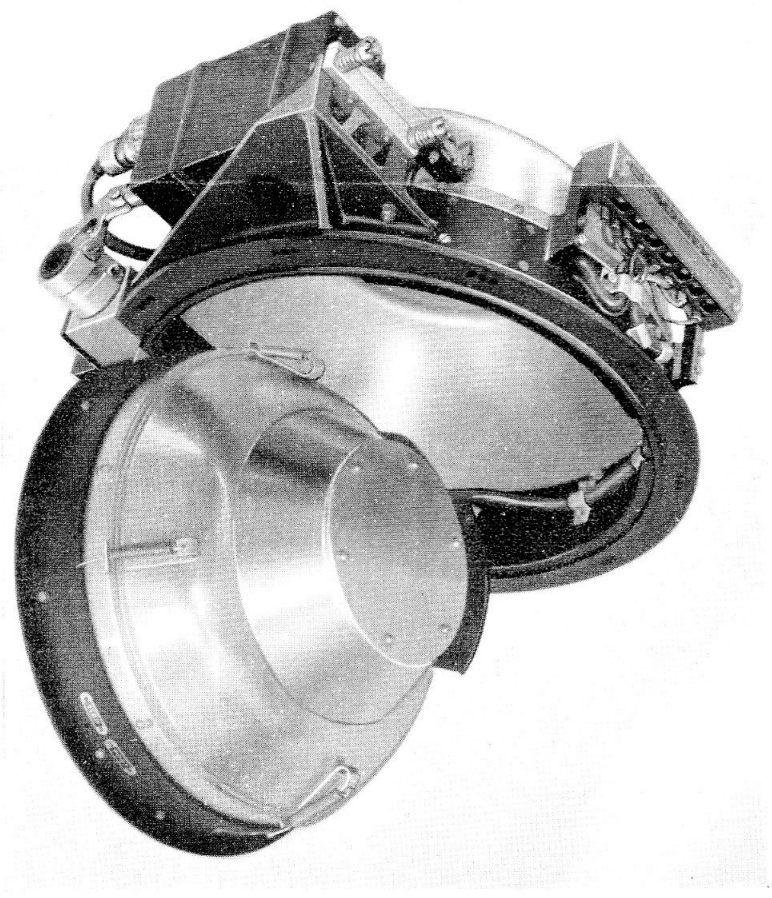

**Fig. 2. Lower view of lamp and dihedral setting screws**

lamp, are positioned in the flange of the inner casting and the lamp must be extended to gain access to them. The screws are used to 'hand' the lamp for port or starboard use, and when it is required to change the 'handing' of a lamp both screws must be re-positioned. When the lamp is extended the screws can be seen positioned at the bottom of the lamp; viewed from the front, the lens dihedral screw is on the right-hand and the reflector dihedral screw on the left-hand. For each screw there are two positions which are marked by PORT and STBD labels, in fig. 1 the lens dihedral screw, secured by a plain nut and spring washer, can be seen fitted in the PORT position.

**Filament lamp and filament switch**

**6.** The 28 volt, twin filament lamp has a special pre-focus cap, the spigot of which engages with the locating hole in the fixed half of the end-cap clamp. The main filament, of 750 watt, is positioned at the focal point of the reflector and provides the main beam for use in landing. The auxiliary filament, of 260 watt, is positioned a little to the rear and above the main filament and produces a more dispersed beam for taxying. The filament lamp end-cap protrudes through the reflector and the reflector cover, and connection to the lamp is made to three terminal studs:—

Red—Main

Yellow—Auxiliary

Blue—Negative.

The terminal studs and the connections are protected by a shroud which consists of a ventilated can riveted to a plate and is secured to the outside of the reflector cover. A Tufnol disc riveted to the plate inside the can insulates the plate from the terminal studs, and the shroud securing bolts also accommodates the split clamp through which the cable is routed. The filament switch is a Burgess Type V3 microswitch fitted on the spring-loaded trunnion block, and extinguishes the filament lamp should the inner frame be retracted with the filament switched on.

**Actuator**

**7.** The linear actuator is a Plessey, Jaquar, Type CZ53681/11C actuator, and consists of a split field series motor which drives the ram lead-screw through a clutch, and incorporates an electro-magnetic brake and reduction gearing. Further details of the actuator may be found in A.P.4343D, Vol. 1, Book 3, Sect. 14. The trunnion end of the actuator is secured to a spring-loaded block which is carried on two $\frac{1}{4}$ in. B.S.F. bolts in a bracket on the outer frame casting. The ram end of the actuator has a self aligning eye-end attachment which is secured to the actuating lever on the inner frame journal. The travel on the actuator is controlled by internal limit switches.

**Electrical connection**

**8.** Connection to the landing lamp is made to a 7-way terminal block, shown in fig. 2, which is secured to brackets on the inner frame casting and the 2B.A. terminal studs are protected by a 'U' shaped cover. The cover is marked with the terminal identification which is identical to that given in the circuit diagram in fig. 3.

## OPERATION

**9.** The circuit diagram in fig. 3 shows a landing lamp connected in a typical installation, in which the lamp is controlled by two switches, one for position selection and one for beam selection. The beam selector switch, which is connected in series with the filament switch on the lamp, controls two relays which when energized operate to light the appropriate filament. When the lamp position switch is operated the actuator motor is energized via one limit switch, and will then extend or retract until the appropriate limit switch is operated to break the supply to the motor. When the actuator is fully extended the lamp is in the closed position and in this position the final movement of the actuator moves the trunnion mounting block against the tension of the springs on the block bearing bolts. This movement of the mounting block carries the filament switch away from the fixed striker post on the casting and breaks the filament relay coil circuit.

## INSTALLATION

**10.** When installing the lamp in the aircraft care should be taken that the lamp is correctly 'handed' for the position in which it is to be fitted. If it is necessary to change the 'handing' of the lamp both dihedral setting screws must be re-positioned as given in para. 20.

## SERVICING

**11.** The lamp should first be functionally checked, and then with the filament switched off the lamp should be extended and inspected for freedom from damage and corrosion. The glass of the filament lamp should be

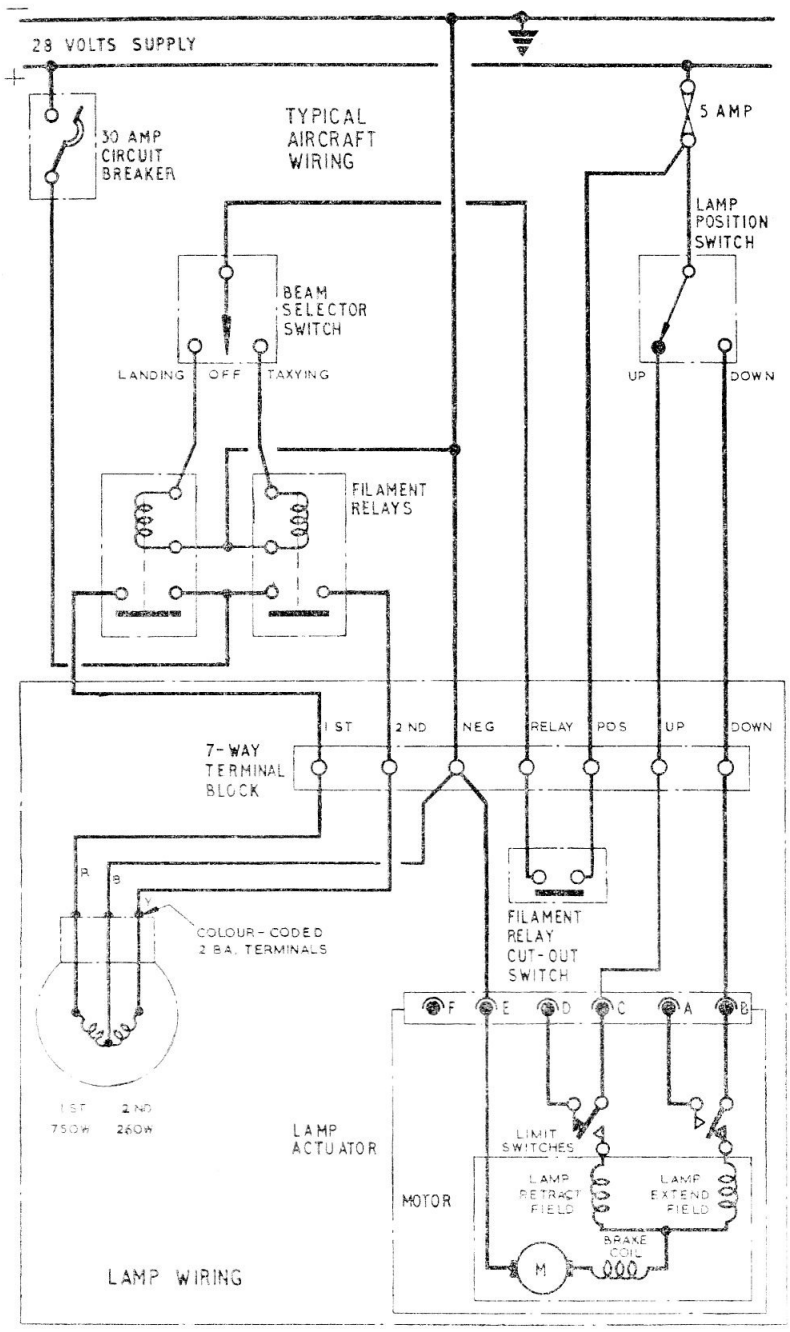


**Fig. 3. Typical circuit diagram**

inspected for signs of blackening or white streaks and where blackening or white streaks are apparent the filament lamp should be renewed; as this indicates a partial failure of the filament lamp glass seal. The visible cable of the lamp should be checked for deterioration, especially at the filament terminal studs where more rapid deterioration may occur due to the heat of the filament lamp. The front glass, the lens, and the reflector may be

cleaned using warm soapy water and then dried with a soft cloth. Where a defective component on the inner frame assembly, other than the filament lamp, is to be renewed it may more conveniently be renewed with the lamp or sub-assembly (reflector assembly) on the bench, but with care it may be done *in situ* on the aircraft.

Note . . .

*No polish, or abrasives of any kind, should be used for cleaning any part of the lamp. Throughout the servicing of the lamp extreme care must be taken to avoid scratching or scouring of the reflector, and handling or fingerprinting of the reflector should be kept to a minimum. The lens mounting ring, which is a light alloy spinning must also be handled with care to avoid distortion of the mounting ring.*

**Filament renewal**

**12.** With the lamp extended first remove the 2B.A. nuts securing the filament terminal shroud, and then remove the terminal shroud and the top half of the cable clamp. Disconnect the filament lamp and release the four spring clips securing the reflector assembly to the inner frame, and then withdraw the reflector assembly from the lamp. The two securing screws for the lamp holder clamp should then be unscrewed and the top half of the clamp and the filament removed. A new filament may then be fitted, and the reflector assembly replaced, in the reverse order of the removal procedure.

**Lens renewal**

**13.** The dismantling procedure detailed for filament renewal should be completed up to the removal of the reflector assembly, which should then be placed face downward on a clean soft cloth to keep the reflector clean and dust free. The two dihedral setting screws should then be removed and the damaged lens and the lens mounting ring carefully withdrawn from the inner frame casting. One of the lower lens clips may now be removed from the ring and if the lens is whole it should be rotated out of the remaining lower clip until it is free to slide out of the upper clips and the mounting ring. Before fitting the new lens, inspect the mounting ring and the spring-loaded plungers of the lower clips ensuring that the plungers move freely in the clips. The new lens should now be fitted into the upper clips with the fluted face towards the front glass and rotated into the lower clip, when the lens is in position the other lower clip should be refitted to the mounting ring. At this stage the clearance of the lens in the spring-loaded clips should be checked, and with the plungers depressed should be between 0·030 in. to 0·040 in. The mounting ring and the lens should then be replaced in the inner casting and the lamp reassembled.

**Front glass renewal**

**14.** To renew the front glass the dismantling procedure for renewing the lens should be completed up to the removal of the lens mounting ring. The lens and the lens mounting ring should then be placed, with the reflector, on a clean soft cloth in a place of safety. The six screws, nuts and spring washers securing the front glass retaining ring should then be removed and the rubber sealing gasket, retaining ring and the damaged front glass pushed out of the inner frame casting. The new glass may then be fitted and the lamp re-assembled in the reverse order.

**Reflector renewal**

**15.** The reflector may be renewed by dismantling the lamp as for filament renewal up to the removal of the filament lamp and then removing the six 4B.A. screws and nuts holding the reflector to the reflector cover. When fitting the new reflector care must be taken not to scratch or scour the reflector with the spanner used to hold the securing nuts.

**Actuator renewal**

**16.** To renew the actuator the lamp should be removed from the aircraft to the bench, and if possible opened to the fullest extent which will relieve the spring pressure on the trunnion end bolts. The ram end should then be disconnected from the actuating lever by removing the split pin and pushing out the lever pin. The two $\frac{1}{4}$ in. B.S.F. bolts securing the trunnion end mounting block, and their split pins, plain washers and loading springs should then be removed permitting the actuator and the trunnion end block to be withdrawn from the fixed bracket. Care must be taken not to pull on the filament switch leads. The trunnion end pin should then be pushed out freeing the actuator from the trunnion block. Before fitting the new actuator to the lamp the distance between the centres of the eye end attachment and the trunnion end fitting should be set to match those of the old actuator. The new actuator should then be fitted to the lamp in the reverse order to that for removal.

**Actuator travel setting**

**17.** With the lamp connected to a test circuit similar to that given as a typical circuit in fig. 3, operate the lamp to the fully open position and using a suitable protractor measure the open angle of the lamp, which should be 87 deg. Close the lamp and check that the gap between the spring-loaded trunnion block and the fixed bracket is between 0·030 in. to 0·040 in. Should either of these settings require adjustment the actuator should be removed from the lamp and the covers removed to gain access to the internal travel limit switches.

**18.** With the covers removed, temporarily refit the actuator to the lamp and make the necessary travel adjustment by moving the travel limit switches as required. Do not attempt to adjust the limit switches by large increments, as damage can result to the actuator due to the inner frame casting reaching its physical limits before the limit switches operate. After setting the travel of the actuator to the figures given, the actuator should be removed from the lamp and the covers refitted. The assembled actuator should then be fitted to the lamp and the travel limit again checked during a number of lamp operations.

**Filament switch adjustment**

**19.** The operations of the filament switch may be checked by extending the lamp with the filament switched on and inserting a 0·015 in.–0·018 in. gauge between the spring-loaded trunnion block and the fixed bracket, this should cause the lamp to be extinguished. If this setting requires adjustment the striker-arm (a 4B.A. screw) in the striker post should be moved in or out as required.

**Dihedral setting**

**20.** To change the dihedral setting of the lamp, the lamp should be opened to the fully open position and the reflector assembly removed. The two dihedral screws should then be removed and the lens mounting ring rotated to the new position to align it with the alternative dihedral setting hole of the inner casting. The two dihedral setting screws should then be repositioned in the new dihedral holes and the reflector refitted in the new position.

**Insulation resistance tests**

**21.** The insulation resistance of the lamp should be measured using a 250 volt insulation resistance tester between each terminal and the case, the reading obtained should be not less than 5 megohms.