See AP113C-0309-1 not held 'C'



# Chapter 10

## ◄BATTERY, TYPE K, 24-VOLT, 15 AMP. HR., SEMI-OPEN TYPE►

## (SAFT VOLTABLOC 19-VO-15A)

### LIST OF CONTENTS



### LIST OF ILLUSTRATIONS



### LIST OF APPENDICES



### LEADING PARTICULARS

| | |
|---|---|
| ◄**Battery, Type K, 24-volt, 15 amp. hr., semi-open type** ... ... ... ... ... ... | *Ref. No. 5J/3599*► |
| *Capacity at 1 hour rate* ... ... ... ... ... | ◄*15 amp. hr.*► |
| *Altitude rating* ... ... ... ... ... ... ... | 70,000 *ft.* |
| *Temperature rating* ... ... ... ... ... | 20 *deg. C to* 60 *deg. C.* |
| *Used with—* | |
| *Elcon connector* ... ... ... ... ... ... | *Ref. No. 5J/3375* |
| *Overall dimensions of case* ... | 10·125 *in.* × 9·886 *in.* × 7·138 *in.* |
| *Weight* ... ... ... ... ... ... ... ... ... | 41 *lb.* |

### Introduction

**1.** The battery, Type K, 24-volt ◄15 amp. hr. (SAFT Voltablock 19-VO-15A)► is a sintered plate, nickel-cadmium alkaline battery, constructed on the general principle described in A.P.4343, Vol. 1, Sect. 3, Chap. 7. Although used as a main aircraft supply battery, it is of the semi-open type, and is not fitted with thermal control equipment.

### DESCRIPTION

**2.** The battery (fig. 1 and 2) comprises 19 cells, and has a nominal on-load voltage (at the 1-hour rate) of 22·8 volts. It is important that it should not be discharged to a terminal on-load voltage of less than 19 volts, since discharging below this level may lead to excessive gassing of component cells, which is to be avoided.

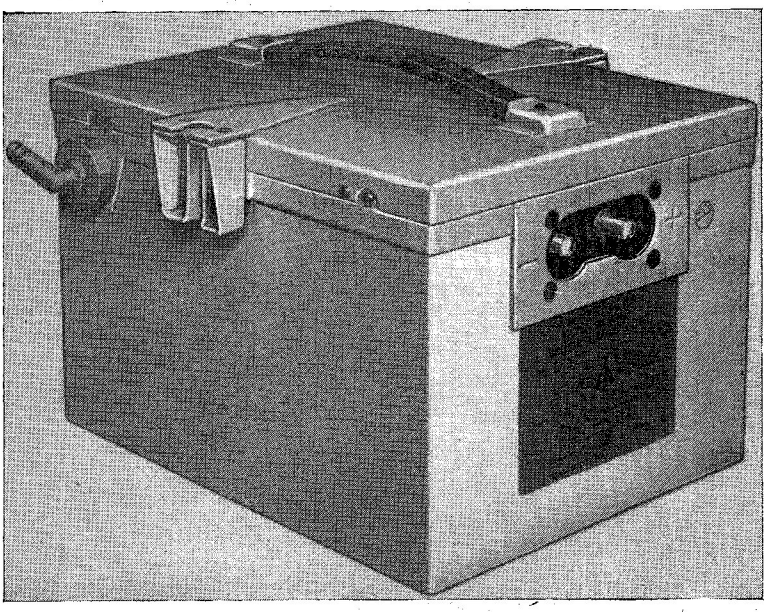

Fig. 1. General view of battery

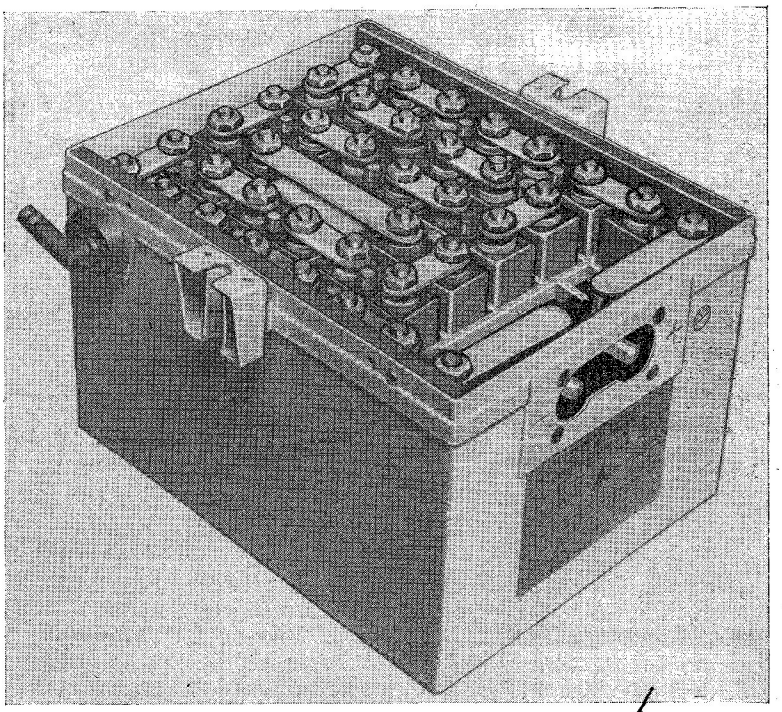

Fig. 2. Battery with cover removed



See AIL #66 1/67

**3.** Each cell is constructed of thin nickel-plated steel plates, impregnated with nickel-hydroxide for the positive and cadmium-hydroxide for the negative, with nylon separators. The whole is fitted into an epicote-painted or plastic-covered steel container.

**4.** The electrolyte is a solution of potassium hydroxide in distilled water. During discharge, electrolyte is withdrawn into the plates and separators so that when the battery is discharged, there may be no free electrolyte above the plates. This is a normal condition, and does not affect the performance of the battery. During charging, electrolyte is forced out of the plates so that its level rises and is at its highest when the battery is fully charged and the charging current is still flowing. The electrolyte level can therefore be checked or adjusted only when the battery is fully charged and has the charging current flowing through it. Moreover, this condition must have existed long enough for it to have become stable.

**5.** External electrical connection to the battery is made by means of an Elcon quick-release connector. The battery is held in position by slots at each end of a securing bar on the lid, which engage with bolts anchored to the battery crate. Orientable outlets are provided at each side of the case to vent to the atmosphere. This provides a means for removing the very small amount of gas which is produced on overcharge. During normal operation, no gas is produced.

## SERVICING

**6.** The battery should be thoroughly cleaned, and the terminals and connecting links greased very lightly with protective ◄MS4 Ref. No. 0474-942-4829.►

**Note . . .**

*Batteries should never be lifted by means of the vent tubes.*

### Charging

**7.** New batteries are normally delivered filled with electrolyte and in a discharged condition, when initially charging a battery it should be given three charge/discharge cycles to ensure optimum capacity. If when charging a battery and adjusting the electrolyte level it is necessary to add more than 20cc of distilled water to a cell, the battery should be discharged down to 19V and re-charged.

**8.** *Discharged batteries.*—If the battery is completely discharged, it may be charged by any one of the following methods.

◄(1) 1·5 amp for 15 hours.
or

(2) 8 amp. for 1 hour, followed by 4 amp. for 2 hours, then 1·5 amp. for 5 hours.
or

(3) 4 amp. for 4 hours, followed by 1·5 amp. for 5 hours.
or

(4) 27·5 volts constant potential for 5 hours.►

**Note . . .**

*It is important that methods* (1), (2) *and* (3) *should not be used unless the battery is known to be discharged.*

**9.** *Batteries where the state of charge is unknown.*—For these batteries, any one of the following methods may be used.

(1) Charge at a constant current of ◄1·5 amp.► until the battery terminal voltage rises to 28·5V with the charging current flowing then continue the charge with the same current for a further 5 hours.
or

(2) Charge at a constant current between ◄1·5► and 3·5 amp. until the battery terminal voltage rises to 28·5V with the charging current flowing. When the voltage reaches this value the charging must be stopped. If it is continued beyond this point with a current greater than ◄1·5 amp.,► excessive gassing and consumption of electrolyte may occur.
or

(3) Charge at a constant potential of ◄27·5V for 5 hours.►

**Note . . .**

*Charging methods* 8(1), (2), (3) *and* 9(1) *will give a more complete charge than methods* 8(4), 9(2) *and* (3), *but they will also consume more electrolyte.*

**10.** If batteries are to be stored after being in use, they should be discharged until the voltage on a load of ◄15 amps.► is 19V, but not below this level. The metal parts should then be given a light coating of protective ◄MS4.► Before being installed after storage the battery should be prepared for use by being charged at ◄1·5 amp.► for 15 hours.

**Adjustment of electrolyte level**

**11.** With the battery out of the aircraft and the lid removed, remove the valves using the proper insulated key. Examine them visually for obstruction or damage, and place them to soak in distilled water. Examine the battery visually for leaks, corrosion or other damage.

**12.** Charge the battery at a constant current of ◄1·5 amp.► until the battery terminal voltage rises to 28·5V with the charging current flowing, then continue the charge with the same current for a further 5 hours.

**13.** During the last hour of the charge, i.e., during the fifth hour after the voltage rose to 28·5V, adjust the electrolyte level as follows, using the syringe supplied (i.e., having a nozzle 12 mm. in length), a locally manufactured alternative and pure distilled water.

(1) Draw approximately 5 c.c. of distilled water into the syringe and inject it into the first cell.

(2) With the flange of the syringe held against the valve seating, withdraw the plunger so as to remove any surplus of electrolyte, leaving the level of the electrolyte 12 mm. below the valves seating.

(3) If no electrolyte is withdrawn, repeat (1) and (2) until some is withdrawn; the level in that cell will be correct when the surplus has been withdrawn.

(4) Repeat the process for all other cells.

**14.** At the end of the fifth hour after the voltage rose to 28·5V, but not before the adjustment of the electrolyte level has been completed, stop the charge. Replace the valves, using the proper key, and ensuring that the valve washers are correctly positioned.

**Note . . .**

*It is important that the correct key should be used. If the valves are tightened with any other key than the one supplied for the purpose, they are likely to be overtightened. This leads to broken and distorted washers.*

**15.** Dry the tops of the cells, using an absorbent material. Re-grease the terminal posts and connecting links with a light smear of protective ◄MS4.► Replace the lid and check for security of attachment.

**Capacity test**

**16.** The capacity of the battery is tested by discharging it from the fully charged condition at a constant current of ◄15 amp.,► and noting the time taken for the terminal on-load voltage to fall to 19V. As soon as this level of discharge is reached, the discharge must be stopped, as undesirable gassing of the component cells may be caused if it is prolonged beyond this point.

**17.** A discharge time of 60 min. indicates 100 per cent capacity, while 48 min. indicates 80 per cent. A battery which fails to give 80 per cent on a capacity test should be given two repeat tests before being rejected. For each of these tests it should be charged and have its electrolyte level adjusted according to the instructions contained in para. 12 and 13. If it still fails to give 80 per cent, the battery should be rejected.

**Storage**

**18.** Should batteries need to be stored after being in use, they should be discharged at 15A until the terminal ON-LOAD voltage has dropped to 19V and all metal parts then lightly smeared with MS4.

# Appendix A

## STANDARD SERVICEABILITY TEST

## for

## BATTERY, TYPE K, 24 VOLT, 15 AMP. HR. (SAFT VOLTABLOC 19-VO-15A)

### Introduction

**1.** The tests detailed in this appendix may be applied to the battery before it is put into service, or at any time when the serviceability is suspect.

### TEST EQUIPMENT

**2.** The following test equipment, or suitable equivalents, are necessary:—

(1) Testmeter (AVO), Type D1, Ref. No. 5QP/10610.

(2) Variable resistive load, 2·4 ohm, 20A, Ref. No. 5G/4021.

(3) Single pole, ON/OFF, switch, 25A.

(4) Syringe, 10cc, Ref. No. 5J/3562 and syringe nozzle, Ref. No. 5J/3565.

(5) 250V insulation resistance tester, Type C, Ref. No. 5G/152 (0557/AP5074, R.N.).

(6) Torque wrench, 20-100 lb. in., N.A.T.O. Stock No. 5120-99-120-2793 and 8 MM socket.

(7) Valve spanner, Ref. No. 5J/3566.

(8) Battery connector, Elcon, Ref. No. 5J/3375.

### TEST PROCEDURE

### General

**3.** Examine the battery visually for mechanical damage and corrosion. Remove the top cover and clean off any light corrosion with distilled water, using a stiff brush on the battery terminals if necessary.

**4.** Remove the valves, using the valve spanner, taking care to avoid shorting the terminals with the tool. Remove the valve seating washers, discard any washers which are distorted or damaged. Place the valves and the washers in distilled water to soak.

### Capacity test

**5.** Discharge the battery at a constant current of 15A and note the time taken for the terminal, on-load, voltage to fall to 19V. A discharge time of 60 minutes indicates 100% capacity, while a time of 48 minutes indicates 80% capacity. A battery which fails to give 80% capacity should be subjected to two charge/discharge cycles, if then the 80% capacity state is not achieved the battery should be rejected as unserviceable for aircraft use. On satisfactory completion of a capacity test the date should be recorded on the side of the battery and all previous dates should be deleted.

**WARNING . . .**

**At no time must the on-load terminal voltage be allowed to fall below 19V.**

### Charging

**6.** The battery should be charged at a constant current of 1·5A until the terminal voltage rises to 28·5V, then continue charging at the same rate for a further 5 hours. The cells should be checked periodically by hand for temperature rise, a hot cell denotes lack of electrolyte and the need to add approximately 10cc of distilled water. If the cell remains hot at the end of the charging cycle the battery must be considered as unserviceable.

### Electrolyte level adjustment

**7.** During the last hour of the charge draw approx. 5cc of distilled water into the syringe and inject it into the first cell, the syringe should be fitted with a 12mm nozzle. Hold the flange of the syringe against the valve seating and draw off any surplus electrolyte, this will leave the electrolyte level 12mm below the valve seating.

If no electrolyte is withdrawn repeat the above steps until electrolyte is withdrawn. Repeat all of this para. above for each cell in turn.

**8.** On completion of the charging cycle replace the valve washers and valves using only the valve spanner provided, taking care not to over-tighten the valves. The tops of the cells, terminals and inter-cell connectors should now be dried and MS4 (silicone grease) lightly smeared on all exposed metal parts (if MS4 is not available PX7, Ref. No. 34B/9100-487, may be used). Replace the battery lid and check that it is secure. Ref. No. of MS4 is 0474-942-4829.

**Insulation test**

**9.** Using a 250V insulation resistance tester, check the insulation resistance between the battery terminals and the metal case; the reading obtained should be not less than 0·5 megohm. Zero or a very low reading indicates a cell leak, a low reading necessitates the battery to be dismantled, washed and cleaned and the test repeated. The torque loading of the terminal nuts is 60 lb. in.

**Note . . .**

(1) *Discharge the battery before cleaning.*

(2) *Remove the polythene jacket from the cells and replace with new items.*