TELEDYNE BATTERY PRODUCTS

INSTRUCTIONS FOR
CONTINUED AIRWORTHINESS and
COMPONENT MAINTENANCE MANUAL

For

TSO-C173/C173a Authorized
Teledyne Battery Products (GILL®) 7000 Series
LT Valve-Regulated Lead-Acid Aircraft Batteries

REFER TO APPROPRIATE AIRCRAFT MAINTENANCE MANUAL FOR ACCESS TO BATTERY AND ASSOCIATED ELECTRICAL SERVICES.

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REVISIONS

Rev. No.	Description	Approved	Date
NC	Initial Release	JMR	3/15/11
A	Revised paragraph 12	JMR	10/28/11
B	Revised to include 12V battery. Deleted Tables 1 & 3 and referenced TD14-8-00 instead. Added paragraph 13.	JMR	11/3/11
C	Added TSO-C173a on pages i and 1. Added NOTE in paragraph 2.	JMR	1/30/13

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1. INTRODUCTION

This manual provides Maintenance Procedures for TSO-C173/C173a authorized TELEDYNE BATTERY PRODUCTS' Gill 7000 Series Valve-Regulated Lead-Acid (LT VRLA) Aircraft Batteries to ensure continued airworthiness of the batteries. The TSO-C173/C173a authorized batteries are listed in Teledyne Battery Products Document No. TD14-8-00, Revision NC or later FAA approved revisions.

2. TSO-C173 DEVIATIONS

TSO-C173 authorized batteries were tested in accordance with DO-293A, with the following exceptions:

- Altitude
  Tested to an altitude of 60,000 feet instead of 55,000 feet.

- Rapid Decompression
  Tested for Rapid Decompression to an altitude of 60,000 feet instead of 55,000 feet.

NOTE: The deviations are not applicable to TSO-C173a authorized batteries.

3. INSPECTION AND MAINTENANCE

3.1 Initial Inspection

Visually inspect the battery to ensure there is no damage. Remove the protective cap over the terminal pins and ensure that the pins are clean and there is no corrosion.

3.2 Initial Maintenance

Check the open circuit voltage. Typical practice should be to recharge the battery at constant potential before placing into service. See section 5 for all charging instructions.

NOTE: GILL 7000 Series LT valve-regulated lead-acid batteries are fully conditioned when they leave the factory. Even so, in order to meet the warranty requirements and improve the reliability and life of the battery, it must be fully charged before placing in service.

3.3 Periodical Maintenance

After the battery has been in service for a period of time, maintenance or recharging may become necessary.

- Check battery capacity by disconnecting the battery from the aircraft electrical system and checking the battery open circuit voltage (OCV). If the voltage is below 13.15 volts for a 12 V battery or 26.3 volts for a 24V battery remove the battery and recharge in a well-ventilated area. To avoid water loss and possible overcharge, the manufacturer recommends a Constant Potential Charge (5.1.2).

- Test the resiliency of the mating surfaces – terminal pins to connector sockets – insert the larger diameter probe of the tool, Teledyne Battery Products (TBP) part number 3600-51 (Go-No Go Gauge), into each helix or socket of the Elcon connector to maximum depth. The fit should be snug and require a removal force greater than one pound. To depict a worn terminal pin, insert the small diameter end of the tool. This should also provide a snug fit, with a nominal removal force greater then one pound. Replace the connector if it shows excessive wear or fails to meet the fit test. Part number 3600-51 (Go-No Go Gauge) can be obtained from TBP.

NOTE: The GILL 7000 Series valve-regulated lead-acid batteries cannot be accessed or opened to add fluid. However, periodic maintenance is still required in the form of boost charging if the battery becomes discharged.

4. INSTALLATION DESCRIPTION

- See Teledyne Battery Products Document No. TD14-7-01 for typical installation procedure for 7600 series battery.

- For detail battery installation instructions see Aircraft Maintenance Manual or STC.

NOTE: The conditions and tests for this TSO approval of this battery are minimum performance standards. Those installing this battery, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR Part 43 or the applicable airworthiness requirements. Nickel-cadmium and lead-acid battery safety concerns include the possibility of fire, and venting violently.

5. SERVICING

PRECAUTIONS

Basic safety precautions when handling batteries

Batteries that have been discharged to the point where their available power is diminished should not be "jumped" with another power source. The discharged battery IS NOT AIRWORTHY because it will not have the necessary capacity required to operate the aircraft electrical system and avionics required in the event of generator failure.

Always wear eye protection when working with batteries.

Keep sparks, flames, burning cigarettes or other ignition sources away at all times. Batteries generate explosive gases and must be handled with care.

Always use insulated tools.

Follow charger manufacturers' instructions, e.g. Teledyne Battery Products TDMC 90 or TSC-01V 24 volt battery chargers.

Do not allow any untrained personnel to work on batteries.

Do not disconnect live charger cables at the terminals of a battery because sparks will occur at the terminals. Always turn charger off before disconnecting charger leads.

Make certain the charger cables are clean and not frayed. A poor connection could cause localized heating leading to terminal damage/ melting or possible arcing.

Make sure the battery maintenance room is well ventilated and isolated from the main air conditioning system. Gases from batteries are explosive and should not be allowed to blend in with the main system.

Do not touch charger leads while the battery is on charge.

5.1.1 INITIAL CHARGE

All general charging will be accomplished using the Constant Potential Charge. Based on the voltage, the battery should be handled as shown in Table 1 for 12V battery and Table 2 for 24V battery.

Table 1 12V Battery

Battery Voltage	Process
< 12V	Call Tech Support at Teledyne Battery Products
12V – 12.9V	Discharge at one-hour rate to 10 V. Recharge at constant potential of 14.25 V to 14.5 V until charge rate drops <0.5 A
12.9V – 13.1V	Charge at constant potential of 14.1 V to 14.5V until current drops <0.5 A

Table 2 24V Battery

Battery Voltage	Process
< 24V	Call Tech Support at Teledyne Battery Products
24V – 25.8V	Discharge at one-hour rate to 20 V. Recharge at constant potential of 28.5 V to 29 V until charge rate drops <0.5 A
25.9V – 26.2V	Charge at constant potential of 28.2 V to 29 V until current drops <0.5 A

5.1.2 CONSTANT POTENTIAL CHARGE

Charge the battery for a period of 24 hours at 14.1 to 14.5 volts for a 12V battery or at 28.2 to 29.0 volts for a 24V battery. Inrush current can be as high as 100 Amps.

5.1.3 CONSTANT CURRENT CHARGE

Charge the battery at the rates listed in Teledyne Battery Products Document No. TD14-8-00, Table 1, for 10-13 hours unless otherwise stated, or until the battery voltage stabilizes for three (3) consecutive hours, or drops.

NOTE: DO NOT EXCEED THIRTEEN (13) HOURS

ALWAYS CHARGE BATTERIES IN A WELL-VENTILATED AREA

The GILL® 7000 Series valve-regulated lead-acid batteries cannot be accessed or opened to add fluid. There is no battery electrolyte maintenance required for this battery.

5.1.4 CAPACITY TEST

- Connect battery to a capacity tester that incorporates a load resistance, amp meter, voltmeter, and a time clock (timer).

- Discharge the battery at the one hour capacity rate (see NOTE below) to 1.67 volts per cell (10 volts for 12V battery or 20.0 volts for 24V battery). Note the discharge time to end voltage.

  NOTE: The one hour capacity rate (Ah) for the battery is listed in Table 1 of TSO-C173 AUTHORIZED 7000 SERIES BATTERIES, Document No. TD14-8-00, Revision NC or later FAA approved revisions.

- The battery is considered airworthy if it meets 80% of the one hour capacity rating (minimum of 48 minutes to the cut off voltage).

- If the battery fails to meet the minimum run time, recharge using the constant potential method until charge current stabilizes (this could take 10 to 24 hours).

  Allow the battery to stand on open circuit for one hour after recharging. Repeat the above capacity test. If the failure persists, replace the battery.

- If the battery is found to be airworthy as noted above, recharge the battery using Constant Potential Charge prior to re-installing it in the aircraft.

6. INSPECTION/MAINTENANCE SCHEDULE

- Remove the battery from the aircraft and perform capacity test (5.1.4) initially at 1,800 ± 50 flight hours or 18 ± 1 calendar month(s) whichever comes first. After the initial check, perform the capacity test at 900 ± 50 flight hours or 9 ± 1 calendar month(s), whichever comes first.

- Check battery integrity by visually inspecting the battery for any signs of cracks, corrosion, unusual terminal pin wear or discoloration.

7. TROUBLESHOOTING

Trouble Shooting Chart:

TROUBLE	**POSSIBLE CAUSE**	**REMEDY**
Battery under capacity	Battery life is beyond warranty or worn out	Replace with new fully charged battery.
Will not come up to charge – (will not hold charge)	Aircraft charging rate may be rated lower than required for application.	Check and correct the setting in accordance with instructions applying to regulating equipment. (Aircraft Maintenace Manual).
	Flight legs too short to charge battery sufficiently.	Remove battery from aircraft and charge.
	Short circuit, short to ground in wiring or other electrical component problem.	Check wiring and rest of electrical system. Correct problem. Recharge battery.
	Loose connections, corrosion, etc.	Tighten, clean and neutralize connections.
	Battery quick disconnect worn beyond tolerance.	Check battery quick disconnect and replace as needed. Recharge battery.
	Battery may be shorting under load.	Perform airworthy test on battery, see section 5.1.4
	Battery may be self discharging due to sulfation trace build up.	Charge battery as directed in section 5.
Battery life too short, (less than battery warranty period).	Overcharge.	Check and correct adjustment in with instructions in aircraft service manual.
New battery under capacity.	Battery may not have received a full initial charge.	Charge battery as directed in section 5.

Call Teledyne Battery Products Technical Support at 1-800-456-0070 for additional assistance.

Disposal:

All parts of spent lead-acid batteries are recyclable. Generally, batteries are collected by retailers and wholesalers who send large quantities to battery brokers for reclamation. Battery brokers are permitted hazardous waste treatment recycling facilities. Contact your local battery retailers or wholesalers for proper disposal of batteries in your area.

8. REPAIRS

Any repair to the battery must be accomplished at Teledyne Battery Products approved battery facility.

9. SPECIAL TOOLS

- Go-No Go Gauge Part Number 3600-51
- Battery Charge Part Number TDMC 90
- Battery Charge Part Number TSC-01V
- Capacity Tester Part Number TCT-1000

10. CONFIGURATION CONTROL

The battery configuration is controlled by its serial number. Teledyne Battery Products have records, including the configuration, of each of the battery that is shipped from our facility.

11. STORAGE INSTRUCTIONS

- Teledyne's 7000 series valve-regulated lead-acid batteries can be stored between – 20° F and + 110° F. (store ideally at 80° F.). Storage at temperatures outside these temperatures can lead to permanent damage. Storage temperatures will determine inspection requirements.

- Teledyne's 7000 series valve-regulated lead-acid batteries have a maximum of 24 months of inspection-free storage life, if stored at temperatures between 40° F and 80° F.

- Storage of batteries at high temperatures will only serve to discharge the battery faster. For every 18° F increase in temperature, the discharge rate will double. If the battery is severely discharged (typically 1.9 volts per cell, 11.4 volts for 12V battery or 22.8 volts for 24 V battery) it will sustain permanent damage.

- If the aircraft is not going to be used for a period of time, the battery will need to be correctly maintained for continued service. The battery should be removed from the aircraft and either:

    - Kept on trickle charge,

    - Or recharged every 90 days. Always recharge the battery as directed in paragraph 5.1.2 of this manual after storage and before re-installing in aircraft.

12. AIRWORTHINESS LIMITATIONS

No airworthiness limitations associated with GILL 7000 Series valve-regulated lead-acid batteries. (See Doc. # TD14-8-00 for the battery Part Numbers).

The Airworthiness Limitations section is FAA-approved and specifies maintenance required under Sec. 43.16 and 91.403 of the Federal Aviation Regulations, unless an alternative program has been FAA approved.

13. ICA REVISONS

Review our website at www.gillbatteries.com for updates to this and other key documents. These updates can be found under the following link:
Under the “Company Info” section, select Documentation – which leads to the “Maintenance Center”. In the “Maintenance Center” page, under “Technical Guides”, link is available to review any document that has been changed. Follow the instructions on that page in order to obtain the necessary change/s.