



Servicing Hawker Vehicle Batteries with Standard Battery Charging and Test Equipment



Mr. Fred Krestik
TARDEC

2007 Joint Service Power Expo

Research, Development, and Engineering COMmand

UNCLAS: Dist A. Approved for public release

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 25 APR 2007		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Servicing Hawker Vehicle Batteries with Standard Battery Charging and Test Equipment				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Krestik, Fred				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) USA TACOM 6501 E. 11 Mile Road Warren, MI 48397-5000				8. PERFORMING ORGANIZATION REPORT NUMBER 17040	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S) TACOM TARDEC	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S) 17040	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 18	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



The Hawker Battery



Hawker Armasafe Plus Battery NSN 6140-01-485-1472

*Absorbent
Glass
Mat (AGM)
technology*



Research, Development, and Engineering COMmand

UNCLAS: Dist A. Approved for public release



Recoverability



Hawker batteries have proven to be *highly* recoverable using standard charging equipment:

- Ft. Drum March 2006: >90% of Hawkers sent to DOL shop were successfully recovered using standard battery shop buss bar charging equipment.
- Ft. Hood May 2006, 2 pallets of Hawker batteries from DRMO were sent to TACOM for analysis: $\approx$ 90% were recovered using std. chargers/methods.



TB 9-6140-252-13



The technical information presented is taken from
Technical Bulletin TB 0-6140-252-13 titled:

Field and Sustainment
Maintenance and Recovery Procedures
For
Automotive HAWKER ARMASAFE Plus Battery
NSN 6140-01-485-1472



Required Equipment



Test Equipment:

1. Multimeter or voltmeter: any type that reads in 1/10th volt increments. (Clamp-on ammeter function a plus.)
2. Battery analyzer (e.g. Midtronics or PulseTech) or heavy duty Load Tester.



Required Equipment



Charging Equipment:

- Any charger with constant voltage output (rated at 12VDC or 12/24VDC) that can apply a charge to one or more batteries at a time using alligator clamps or NATO slave connector.
- Most modern chargers have settings/capabilities for AGM batteries.
- If in doubt, test charge voltage.
- Constant current chargers are not recommended.



Charge Voltage Test



To Verify Charger Output Voltage:

- 1. Attach charger to any fully charged (6TMF or Hawker) battery.*
- 2. Apply power and wait a few minutes until ammeter reads ≈ 1 amp, and measure voltage across battery.*
- 3. If voltage reading is > 15 VDC (> 30 VDC across series pair/NATO connector) do not use on Hawker batteries.*



Pre-Charge Inspection



1. Check top, sides, and bottom for damage.
(i.e. cracks, dents, leaks, or swelling)
2. Check that the battery case and lid are sealed.
3. Make sure terminals aren't melted, bent or damaged.
4. Check for missing vent caps.

Mark and immediately dispose of batteries damaged as listed above.



Pre-Charge Inspection



Cell Vent Caps

Check that all vent caps are in place (flush) and do not appear to be elevated. Gently tap any elevated vent caps back into place and mark them with an “R” with a permanent marker. If a marked vent cap elevates again during charging or operation, dispose of the battery.



Pre-Charge Testing



- 1. Clean corrosion from battery terminals with a wire brush.*
- 2. Using a voltmeter set to the lowest voltage range above 15 VDC, test the Open Circuit Voltage (OCV) and mark the OCV in pencil or chalk on the top of the battery.*
- 3. If a battery analyzer is available, use it to determine if any internal damage exists. Many analyzers will not operate if the battery voltage is very low. If no reading is given or no internal damage is indicated, charge the battery for 24 hours and retest.*

Research, Development, and Engineering COMmand

UNCLAS: Dist A. Approved for public release



Charging Procedures



Charging Procedures Overviews:

- Buss Bar Charging Multiple Batteries
- Single Battery or “Roll Around” Chargers

WARNING:

The Charging Procedure Overviews that follow are overviews only. They do not include safety related information. Refer to TB 9-6140-252-13 for more detailed information and procedures.

Research, Development, and Engineering COMMAND

UNCLAS: Dist A. Approved for public release



Overview: Buss Bar Charging Procedures



Checklist summary:

- 1. Never mix battery types on a buss bar.*
- 2. Group batteries by OCV ranges: 0 – 5.9V, 6.0 – 9.9V, 10V and up.*
- 3. Set buss bar voltage between 14.7V and 15.2V.*
- 4. Allow at least 10 Amps per battery, e.g. 100 Amp buss bar charger can support 10 batteries max.*



Overview: Buss Bar Charging Procedures



1. *Connect the batteries to the buss bars*
2. *Charge the batteries at least 24 to 48 hours*
3. *Check daily (recommend more frequently) for excessive heating, gassing, leaking, and proper voltage applied.*
4. *Immediately remove any battery that shows signs of excessive heat, gassing, leaking, or swelling during charging. Battery should be marked with date and "Charged Tested Bad", and disposed of.*
5. *Batteries are finished when charge current drops to approximately 1 Amp per battery.*



Overview: Single Battery & “Roll Around” Chargers



- 1. Use only chargers that are compatible with AGM batteries. (Refer to charger instructions and the Charger Output Voltage test)*
- 2. Set charger to appropriate settings for battery type and voltage. (Refer to charger instructions and instructions in the TB)*
- 3. Connect charger to battery posts or NATO slave receptacle.*
- 4. Turn on charger and monitor batteries for excessive heat and gassing during the charge cycle.*



Overview: Single Battery & “Roll Around” Chargers



5. *Some chargers automatically turn off at end of charge cycle. Some of these chargers require multiple cycles to fully charge batteries.*
6. *Batteries are finished when charge current drops to approximately 1 Amp.*
7. *“Rest” the batteries for 8 hours and test using a battery analyzer or load tester.*
8. *OCV of “rested” battery may also be used as an indicator of battery state of charge.*



Rested OCV and State of Charge (SOC)



- > 12.9 Volts OCV: 95% - 100% SOC
- 12.7 Volts OCV: about 80% SOC
- 12.5 Volts OCV: about 60% SOC
- 12.3 Volts OCV: about 50% SOC
- 12.1 Volts OCV: about 35% SOC
- 11.9 Volts OCV: about 20% SOC
- 11.7 Volts OCV: about 10% SOC
- 11.5 Volts OCV: about 5% SOC
- < 11.4 Volts OCV: 0% SOC

If the battery hasn't "rested" sufficiently after charging, the voltage reading will be a bit higher than normal. If it hasn't "rested" sufficiently after discharging, the voltage reading may be a bit lower than normal.



Servicing Hawker Vehicle Batteries with Standard Battery Charging and Test Equipment



2007 Joint Service Power Expo

Research, Development, and Engineering COMmand

UNCLAS: Dist A. Approved for public release



Thank-you!



For further information refer to

TB 9-6140-252-13

Or contact: Boyd Dial or
DSN 786-2629
586-753-2629
dialb@tacom.army.mil

Fred Krestik
DSN 786-8000
586-574-8000
krestikf@tacom.army.mil

Research, Development, and Engineering COMmand

UNCLAS: Dist A. Approved for public release