



MiniSShot

Avionics Ground Testing Guide

Rev. 2010/01/27

Introduction

This document is intended as a guide to performing the Work Package relating to integrated ground testing of the MiniSShot avionics (WP24).

Purpose

The purposes of this testing are:

1. Individually verify each avionics system is functioning properly
2. Verify that all avionics systems, as an integrated unit, work properly without interference or other anomalous behaviour.
3. Familiarize team members with setup and operating procedures of the avionics.
4. Review instruction/checklist documents for accuracy and procedural content.

Systems to be tested

- Chute Controller (CC)
- Main Computer (MC)
- Featherweight Parrot altimeter
- Beacons with amplifier
- Telemetry (ATV/MiniTrak/GPS)
- DTMF backup deployment system
- Vibration Sensor

Accomplishment

Allow plenty of time to perform these tasks. Once basic setup has been accomplished, such as wiring the avionics and power supplies, the actual checkout testing could take 12 hours or more, assuming a minimal number of minor glitches. This assumes all reference material has been reviewed beforehand and is basically understood.

Primary Reference Documents

- 1) MiniSShot Chute Controller Instructions (rev. January 24, 2010)
http://sugarshot.org/downloads/MiniSShot_chute_controller_instructions_20100124.pdf
- 2) MiniSShot Main Computer Instructions (rev. January 23, 2010)
http://sugarshot.org/downloads/MiniSShot_main_computer_instructions_20100123.pdf
- 3) Featherweight "Parrot" Configuration & Checklist (rev. January 10, 2010)
http://www.sugarshot.org/downloads/parrot_checklist_a.pdf
- 4) MiniSShot Telemetry Instructions (rev. TBD)
- 5) Big Red Bee "BeeLine" Configuration Checklist (rev. January 10, 2010)
http://www.sugarshot.org/downloads/beeline_checklist.pdf
- 6) TBD
- 7) TBD
- 8) MiniSShot Avionics Block Diagram: Version 5
<http://sugarshot.org/MiniSShot%20Block%20Diagram%20V5.pdf>

Additional Reference Documents

- 9) MiniSShot Chute Controller Manual
http://sugarshot.org/downloads/MiniSShot_chute_controller_manual_20091222.pdf
- 10) MiniSShot Main Computer Manual
http://sugarshot.org/downloads/minisshot_main_computer_manual_20090419.pdf
- 11) DTMF Based Recovery Backup System
http://sugarshot.org/downloads/ssts_dtmf_recovery_rev0.pdf

General information

- Review all reference documents beforehand and make sure all needed test equipment is available. PRINT OUT HARD COPIES OF ALL PRIMARY REFERENCE DOCUMENTS, PREFERABLY IN COLOR.
- Wiring of all systems including power supplies will need to be completed prior to start of testing. Battery assignment is shown in Appendix A.
- Ensure all batteries are fully charged.
- Record the voltages of each battery (see Appendix B) prior to and after testing system.
- Appendix C contains notes related to the mounting of the avionics units, such as how to remove units, accessibility, wiring, etc.
- Record any anomalous behaviour arising from testing. Use the form in Appendix D or write comments down on the appropriate sheets in Part A and Part B of this document.
- Make note of any issues that arise with Instruction/checklists including suggestions for improvements or corrections needed. Use the form in Appendix E.
- Prior to start of integrated testing, a tbd electric match is to be connected to each of the igniter leads and left connected until end of testing. Purpose is to record any false triggering (locate & shield igniters to eliminate fire hazard in case of initiation).
- A decision needs to be made beforehand whether to ARM each deployment device (CC, Parrot, DTMF) as called out in the individual checklists, or to leave arming of all deployment devices collectively as a final step. If the latter approach is adapted, a final vehicle pre-launch checklist must include arming. Make note of this in Appendix E.

Part A: Integrated Testing of devices in Forward Avionics Bay

1. Chute Controller

The CC will need to be programmed with the flight events required for MiniSShot. The specific events are detailed in the appendix of Reference 1. The CC will need to be removed from its mounting to access the connector port, as described in Appendix C.

Follow the Chute Controller Instruction/checklist (Ref. 1) and perform all four steps required to prepare CC for flight:

1. Setting up the events.
2. Erase the flash memory.
3. Physical and electrical connection(s).
4. Launch preparations.

2. Main Computer

A decision will need to be made whether to use the MC currently mounted (s/n 008), or to use alternate MC (s/n ???). If the alternate is used, the Netburner module will need to be programmed.

The MC will need to be connected to a PC to erase the flash memory. As such, the CC will need to be removed from its mounting to access the connector port, as described in Appendix C.

Follow the MC Instruction/checklist (Ref.2) and perform all 3 steps required to prepare CC for flight

1. Erase the flash memory.
2. Physical and electrical connection(s).
3. Launch preparations.

3. Featherweight Parrot

The Parrot will need to be connected to a PC to program the events and charge the built-in battery. To accomplish this, the Parrot will need to be partly dismounted to access the USB port, as described in Appendix C.

Follow the Parrot Instruction/checklist (Ref.3) and perform all steps required to prepare CC for flight.

4. Telemetry

Follow the Telemetry Instruction/checklist (Ref.4) and the 5 steps to the Telemetry for flight:

1. Setting up TinyTrak.
2. Setting up GPS.
3. Setting up Patch Antenna
4. Setting up ground station.
5. Launch preparations.

5. Radio Beacon

Follow the Big Red Bee "BeeLine" Configuration Checklist (ref.5). Range Check is optional.

Part B: Integrated testing of devices in Aft Avionics Bay

1. Vibration sensor

TBD

2. DTMF

TBD

3. Radio Beacon

Follow the Big Red Bee "BeeLine" Configuration Checklist (ref.5). Range Check is optional

Appendix B

Use this table to record status of each battery before and after testing:

Battery Description	Avionics system	Nominal voltage	Initial voltage	Final voltage	Comment

Appendix C

Notes on avionics mountings

1. Remove CC from mounting rack for programming or downloading.
2. To remove CC, first remove ATV module, held in place with two Phillips head screws. Next, remove two hex nuts attaching CC circuit board to upper bracket. Then, remove two screws attaching lower bracket to mounting rack.
3. Remove MC from mounting rack for programming or downloading.
4. To remove MC, first remove CC and GPS antenna. Then remove four screws attaching MC upper and lower brackets to mounting rack.
5. To recharge the Parrot battery, remove the upper mounting screw, and loosen the lower mounting screw, to gain access to the USB connector.
6. Power switches have been added for:
 - a) CC
 - b) MC
 - c) Beacon /Amplifier (DPDT)
7. Safe/Arm switches have been added for CC and Parrot.
8. Beacon/Amplifier to be ty-rapped or taped to 1/8" post at top of a mounting rack. Enclosure screws extra length will need to be cut off.
9. Wire from GPS unit should be shortened to remove redundant length.
10. Note that Parrot is mounted with terminal block at bottom.
11. Mounting rack may be modified as needed (holes drilled, enlarged, slots cut, etc.). Do not use friction blade to cut laminate.

Appendix D

Use this sheet for recording anomalous behaviour of any unit or system.

Appendix E

Use this sheet for recording general notes or observations.