Angelfire Flight Data

Date: Sept 23, 2006
Location: Black Rock Desert, Nevada
Elevation: 3897 feet MSL
Temp: %RH:
Wind: Approx 5 mph at ground level
Motor: Aerotech M1939W
LO weight: Approx 52 lbs
Liftoff: 20:43:47.0 UTC

Comments: Angled slightly to the southwest.
           Good boost.
           Main chute deployment was very late. (Just in time.)

Flight Event Timeline

<table>
<thead>
<tr>
<th>Time (Sec)</th>
<th>Event</th>
<th>Altitude</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Motor Ignition</td>
<td>0 ft</td>
<td>0 ft/sec</td>
</tr>
<tr>
<td>1.4</td>
<td>Peak Acceleration = 8.6 G's</td>
<td>137 ft</td>
<td>296 ft/sec</td>
</tr>
<tr>
<td>3.3</td>
<td>Altitude = 1,000 feet</td>
<td>1,000 ft</td>
<td>734 ft/sec</td>
</tr>
<tr>
<td>5.9</td>
<td>Peak Velocity = 682 mph</td>
<td>3,257 ft</td>
<td>1000 ft/sec</td>
</tr>
<tr>
<td>5.9</td>
<td>Motor burnout (Accel = 0)</td>
<td>3,257 ft</td>
<td>1000 ft/sec</td>
</tr>
<tr>
<td>13.9</td>
<td>Altitude = 10,000 feet</td>
<td>10,000 ft</td>
<td>637 ft/sec</td>
</tr>
<tr>
<td>25.8</td>
<td>Drogue chute ejection charge fires</td>
<td>14,678 ft</td>
<td>277 ft/sec</td>
</tr>
<tr>
<td>29.3</td>
<td>Barometric apogee detection</td>
<td>15,015 ft</td>
<td>112 ft/sec</td>
</tr>
<tr>
<td>32.3</td>
<td>Accelerometer apogee detection</td>
<td>16,192 ft</td>
<td>1 ft/sec</td>
</tr>
<tr>
<td>186.2</td>
<td>Main chute ejection charge fires</td>
<td>1,089 ft</td>
<td></td>
</tr>
<tr>
<td>190.9</td>
<td>Back up ejection charge fires</td>
<td>749 ft</td>
<td></td>
</tr>
<tr>
<td>201.0</td>
<td>Main chute inflated</td>
<td>110 ft</td>
<td></td>
</tr>
<tr>
<td>203.5</td>
<td>Booster touch down</td>
<td>27 ft</td>
<td></td>
</tr>
<tr>
<td>207.0</td>
<td>All parts at rest on ground</td>
<td>0 ft</td>
<td></td>
</tr>
</tbody>
</table>

Drogue chute sink rate 91.4 ft/sec
Main chute sink rate NA

Time to apogee 29.3 sec 0.49 minutes
Time on drogue 175.2 sec 2.92 minutes
Time on main 2.5 sec 0.04 minutes
Total flight time 207.0 sec 3.45 minutes

NOTE
MissileWorks Altimeter #1: 15,133 feet
MissileWorks Altimeter #2: 16,018 feet
Avg: 15,576 feet

The MissileWorks altimeters were responsible for drogue and main parachute ejection charge firings.
Peak acceleration = 8.6 G's (filtered)

Motor burn out (approx)

Drogue ejection charge fired

Max Baro Alt 15,015 feet

Max Acc Alt 16,192 feet

Accelerometer Data
Barometric Data
Drogue ejection charge marker
Drogue ejection charge fires at 277 feet/sec

Peak Velocity = 1000.0 feet/sec  (682 MPH)
Calculation of drogue parachute descent rate

13,280 feet at 50 sec
4,139 feet at 150 sec
Descent rate = 91.4 feet/sec

Observing from the ground it was obvious the main chute took a long time to get fully deployed. Angelfire continued to descend at the same rate as on drogue until about 200 feet to go. At 110 feet the main chute was fully inflated with less than 3 seconds to spare until the booster touched down!

Main chute deployment charge was set for 1000 feet. This shows it fired at 1089 feet.

Backup deployment charge was set for 800 feet. The acceleration data shows it fired at 749 feet.
Angelfire Acceleration  Sept. 23, 2006  M1939 motor

Peak Acceleration = 8.6 G's (averaged value)

Accel = 0 G's

Motor Burnout (Approx)

AeroTech M1939 Nominal Thrust Curve

Motor Burnout (Approx)
Angelfire Acceleration       Sept. 23, 2006       M1939 motor

Main chute begins to inflate

Main chute inflated

Booster touch down

Backup ejection charge fires

All stop

Body tube touch down