NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

November 20, 2014

Electronic Devices

Specialist's Factual Report
by Bill Tuccio, Ph.D.

A. EVENT

Location:	Parsons, Tennessee
Date:	August 20, 2014
Aircraft:	Air Tractor AT-802A
Registration:	N802BB
Operator:	Ag Air, LLC
NTSB Number:	ERA14FA399

B. GROUP

A group was not convened.

C. SUMMARY

On August 20, 2014, about 1500 central daylight time (CDT), an Air Tractor AT-802A, N802BB, registered to Bonne Idee Aero Service Inc. and operated by Ag Air, LLC, was substantially damaged when it impacted trees and a bean field near Parsons, Tennessee. The commercial pilot was fatally injured. Visual meteorological conditions prevailed, and no flight plan had been filed for the flight, which departed Beech River Regional Airport (PVE), Lexington-Parsons, Tennessee. The local aerial application flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 137.

D. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices:

Manufacturer/Model:	Hemisphere AgJunction Satloc M3 Bantam
Serial Number:	1335-HH06129-0047
Manufacturer/Model:	Apple iPad 2
Serial Number:	GB038Z1BETV

In agreement with the Investigator-in-Charge (IIC), the Apple iPad 2 was not considered pertinent to the investigation.

Hemisphere AgJunction Satloc M3 Bantam Device Description

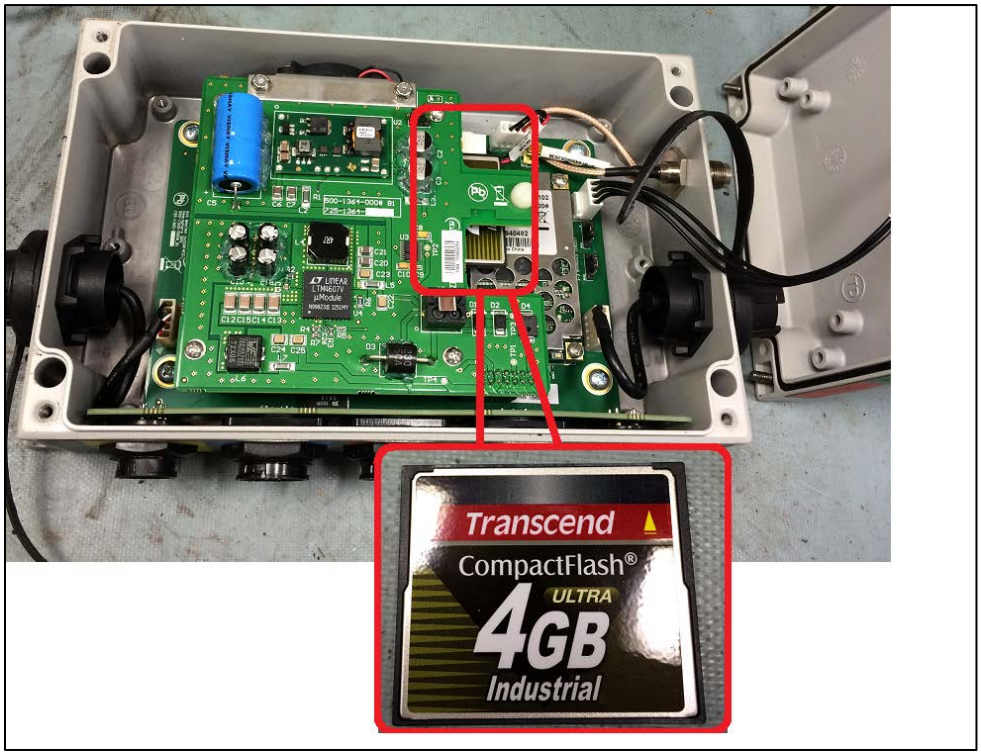
The Hemisphere AgJunction Satloc M3 Bantam is part of an on-board control system designed to programmatically control agricultural, aerial spray operations based on vendor and user specified prescription maps. The Satloc M3 can drive a cockpit mounted lightbar guidance system and a real-time graphic moving map display providing visual guidance to the pilot. Flow rates can be pilot selected or based on mapping created using a proprietary software package called MapStar that runs on a desktop computer. The Satloc M3 is capable of recording historical information to an internal, compact flash (CF) card. The Satloc M3 is supported by the Satloc division of AgJunction, previously known as Hemisphere GPS.

Satloc M3 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the device had not sustained any damage, as shown in figure 1. The unit was opened and the internal CF card removed, as shown in figure 2. The CF card was formatted as a Microsoft Windows file system, and binary log files were copied from the CF card. The log file on August 20, 2014, containing the accident flight was decoded using AgJunction's MapStar software.

Figure 1. Photo of Satloc M3 and dataplate.

Figure 2.CF Card removed from Satloc M3.



Satloc M3 Description

The log files downloaded from the Satloc M3 dated back to July 12, 2014, and extended through August 20, 214. One recording session occurred on August 20, 2014, which recorded multiple airport and spray operations. An overview of all flights on August 20, 2014, is provided with emphasis on the spray operations where the accident occurred. The MapStar program provided an overview of the recorded flight path and spraying operations and also allowed for export of the recorded data in engineering units. The sampling rate of the recording was approximately once per second (1 Hz).

The MapStar export provided a time for each sampling interval precise to the second expressed in Pacific daylight time. Two hours were added to all datapoints to convert to CDT.

The time period of the last recording was from 8:34:38 CDT to 14:55:07 CDT. According to the manufacturer, if power is interrupted to the unit up to 6 seconds of data may not be recorded due to latency in the recording mechanism.

Satloc M3 Parameters Provided

Table 1 describes data parameters provided by the Satloc M3 device validated for this report.

Table 1: Satloc M3 Data Parameters

Parameter Name	Parameter Description
Time	MapStar reported time for recorded data point (HH:MM:SS)
Lat	Recorded Latitude (degrees)
Lon	Recorded Longitude (degrees)
Alt	Recorded GPS Altitude (feet)
Speed	Recorded groundspeed (mph)
Application Rate	Rate of spray value (units undetermined)

OVERLAYS AND TABULAR DATA

Figures 3 through 5 were generated using Google Earth. Weather conditions shown may not be representative of weather conditions at the time of the accident.

Figure 3 shows an overview of all recorded data on August 20, 2014. The recording began at 8:34:48 CDT enroute towards the Parsons, TN area. Prior to the accident, spraying occurred south and west of Darden, TN with at least five takeoff/landings at PVE.

Figure 4 shows the accident flight. The aircraft departed PVE at about 14:39 CDT and performed spray operations about 6 miles southeast of the accident site from about 14:42 CDT to 14:49 CDT. The aircraft then proceeded to the accident spray site, arriving by 14:52 CDT.

Figure 5 shows the arrival of the aircraft at the spray area where the accident occurred; the path is annotated for clarity. The aircraft initially went northwest of the spray area, reversing course towards the south at about 14:52:02 CDT. The aircraft then came over the spray field towards the north at about 14:53:30 CDT. The first easterly pass was the southern-most pass (annotated “1e” in figure 5) followed by a course reversal for the northerly-most westerly pass (annotated “1w” in figure 5). The aircraft then reversed course for an easterly pass (annotated “2e” in figure 5), north of pass “1e,” followed by a course reversal for a westerly pass (annotated “2w” in figure 5), which was south of pass “1w.” The recording ended at 14:55:07 CDT as the aircraft was gaining altitude on pass “1w.”

Figure 6 is an output from MapStar showing information similar to figure 5 with spray information included. Passes 1e, 2e, and 2w recorded spray applications; pass 1w did not record a spray application.

According to the IIC, the aircraft wreckage path was on an easterly track north of pass 2e. The actual path of the aircraft after the last recorded point at 14:55:07 CDT is unknown, likely due to the delay in writing data to the CF card during an abrupt power interruption.

Tabular data used to generate figures 4 through 6 are included as attachment 1. This attachment is provided in electronic comma-delimited (CSV) format.

Figure 3. Google Earth overlay of August 20, 2014 recorded data.

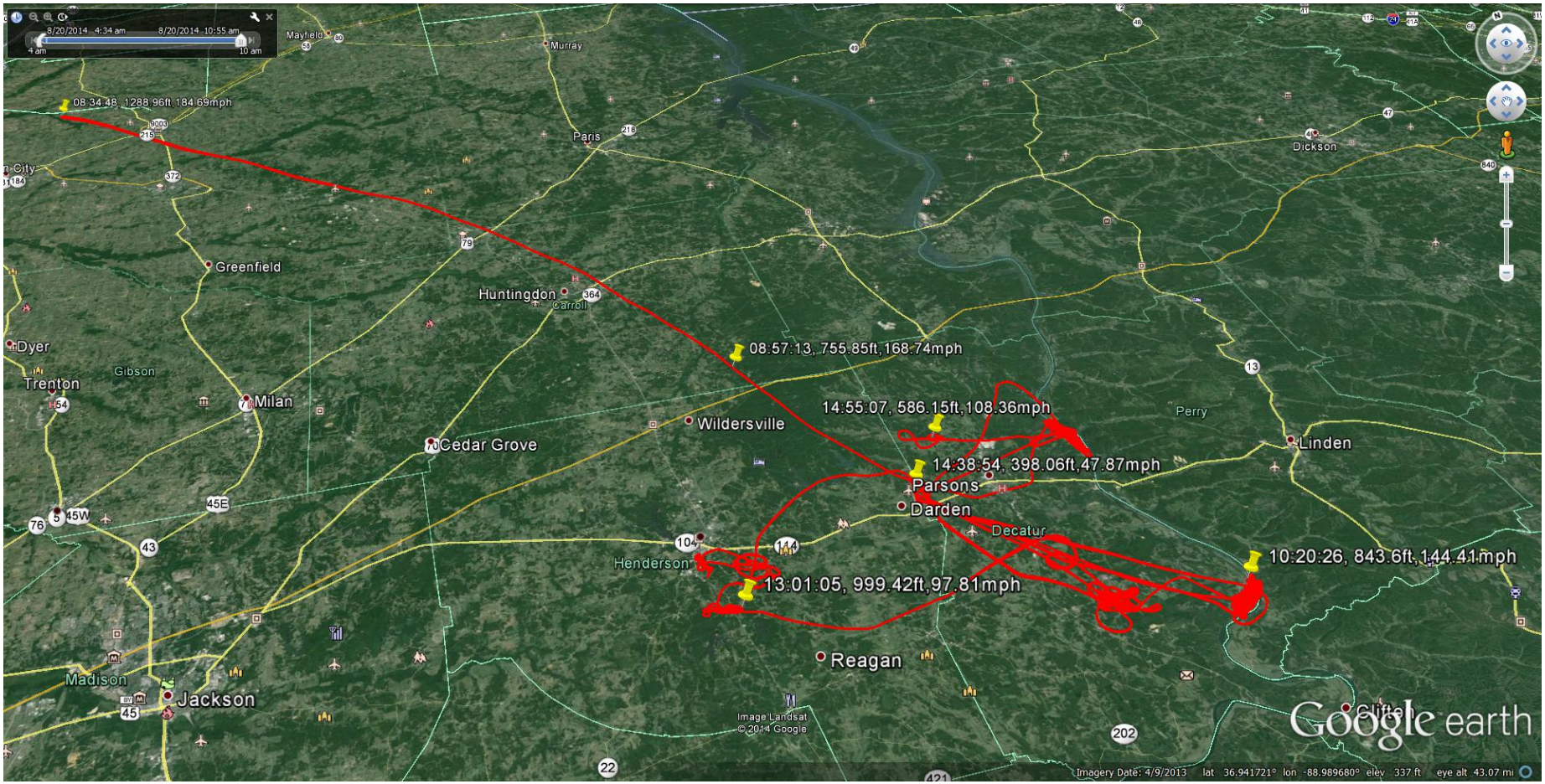


Figure 4. Google Earth overlay of accident flight.

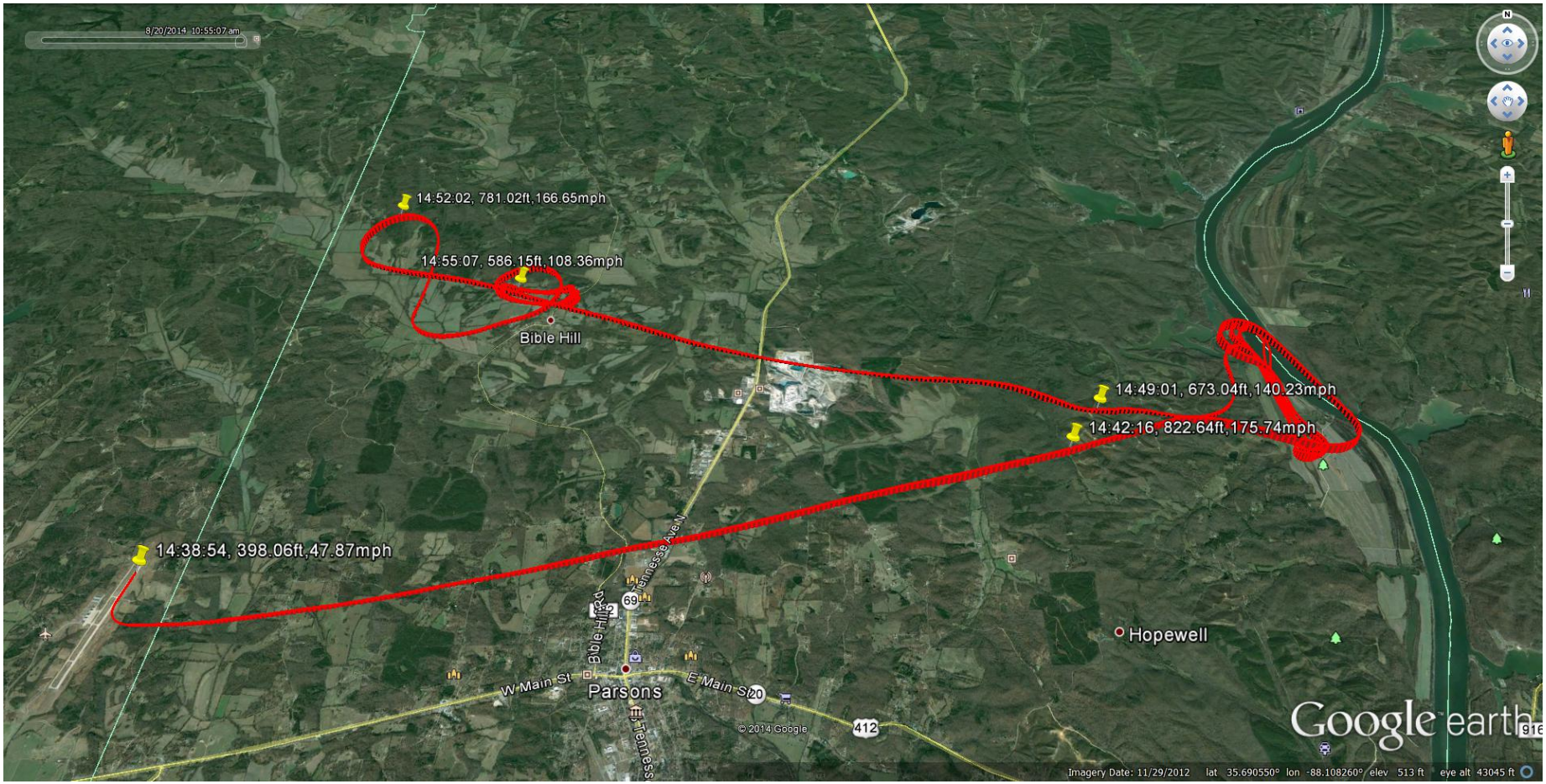


Figure 5. Google Earth overlay of accident site activity.

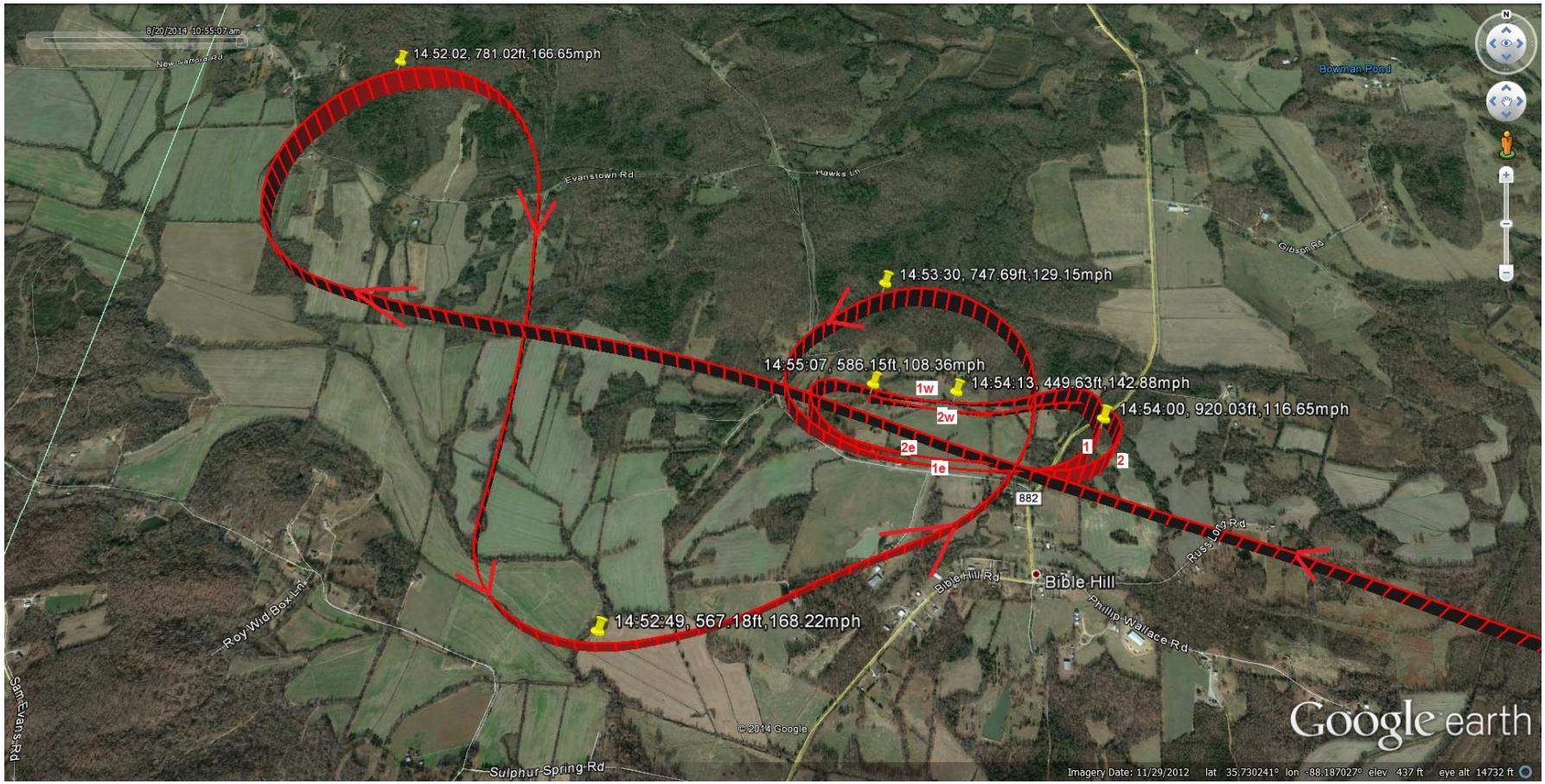


Figure 6. MapStar depiction of accident site activity.