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

April 6,2012

# 17 - GPS Factual Report

**by Bill Tuccio**

## A. EVENT

| | |
|---|---|
| Location: | Waxhaw, North Carolina |
| Date: | March 26, 2012, 1422 Eastern Daylight Time (EDT) |
| Aircraft: | Avid Flyer MK 4 |
| Registration: | N61410 |
| Operator: | Private |
| NTSB Number: | ERA12FA256 |

## B. GROUP - No Group

## C. SUMMARY

On March 26, 2012, about 1422 eastern daylight time, an experimental, amateur-built, Avid Flyer MK 4, N61410, impacted the ground during a balked landing at the JAARS-Townsend Airport (N52), Waxhaw, North Carolina. The certificated private pilot was fatally injured. The airplane came to rest in a nose down attitude at the base of several trees and sustained damage to the fuselage and all flight control surfaces. The airplane was registered to and operated by a private individual under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed and no flight plan had been filed for the flight. The flight had departed from the Fairfield County Airport (FDW), Winnsboro, South Carolina; however, the departure time is unknown.

## D. DETAILS OF INVESTIGATION

On April 2, 2012, the NTSB Vehicle Recorder Laboratory received the following device:

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|---|---|
| GPS Manufacturer/Model: | AvMap EKP IV |
| Serial Number: | 507 2279 |

## AvMap EKP IV Device Description

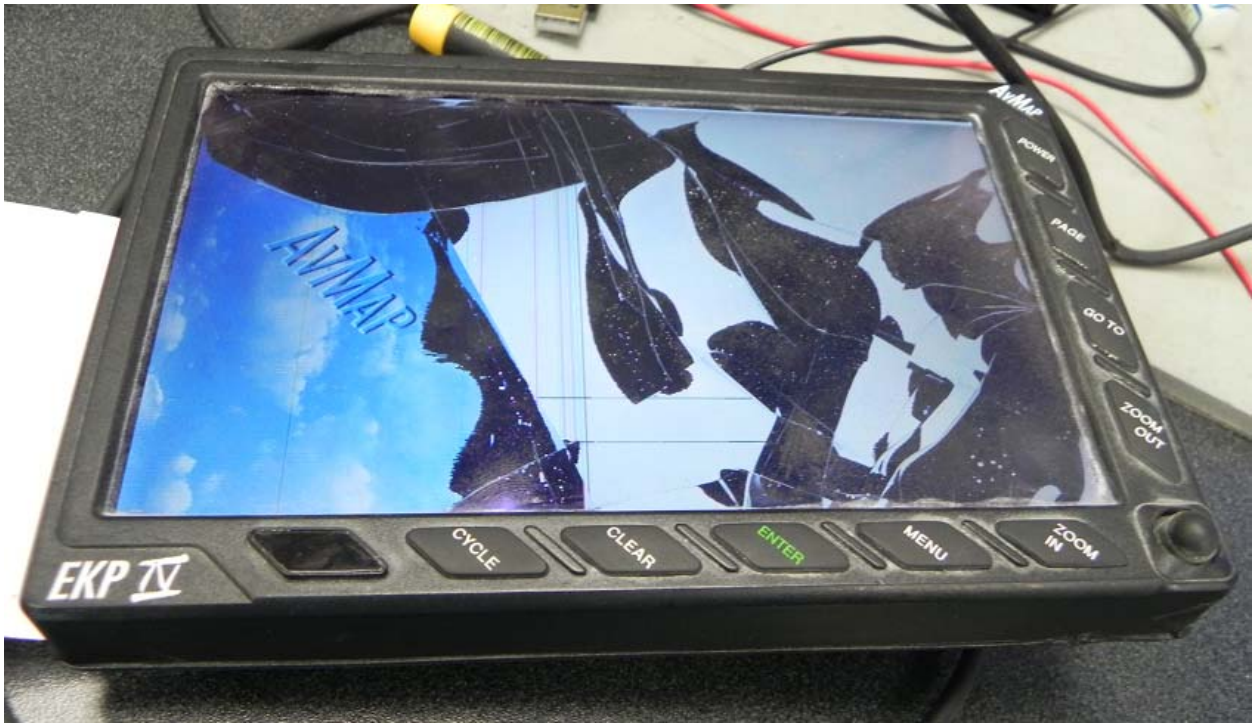
The AvMap EKP IV is a 15-channel, battery operated, DGPS[1] and WAAS[2]-ready GPS receiver equipped with a 7" color LCD TFT display, soft key controls, and a moving map display optimized for aviation. The AvMap EKP IV has a dedicated serial port for communication with an external electronic device. The unit can provide enhanced situational awareness with a TAWS display. A Crossed Airspace Predictor function can provide a preview of the airspaces that the aircraft will cross along it's route of flight, and a Crossed Airspace Advisor provides warnings during the flight on airspaces being crossed. Cartography data preloaded on an internal CF memory card includes the Jeppesen® navigation database with terrain and vertical obstructions. The Map also includes Victor Airways, marine objects, ULM Aerodromes and private airports. The AvMap EKP IV is capable of storing position information for up to 1000 user defined and flight plan waypoints. Fifteen 'flight plans', each representing a linked list of up to 100 waypoints, may also be stored in memory. A track log containing the latitude/longitude coordinates, time, and GPS altitude for thousands of separate data points can also be stored. The update rate for the tracking information may be selected by the user based on time interval, distance traveled, or an internal algorithm designed to save memory by triggering updates based on changes in position and/or direction traveled. Tracking, waypoint, and flight plan data is stored within the unit in volatile memory[3] and may be downloaded via a built-in serial port using NMEA 0183 protocols, or saved to a removable compact flash (CF) card as a data file that can be read using the AvMap Flight Planner, AvMap User Data Converter, or other compatible PC-based software packages. An internal button-battery is used to provide back-up power to the internal memory and real-time clock during those periods when main power is removed. A built-in USB port is employed for factory-use only. The LCD display must be functional in order to access the menu structure and set up the unit for download.

## AvMap EKP IV Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained minimal damage. An internal inspection was performed, discovering no apparent damage. The internal backup battery was not tested due to its position in the unit, but later recovery steps indicated it had maintained sufficient voltage to preserve volatile memory. Power was applied to the accident unit and the screen indicated significant damage as shown in figure 1. All interface controls worked properly on the device. With phone assistance from personnel at AvMap, the necessary menus were traversed to successfully download recorded tracklog data to the units CF card as an AvMap "USERIMG.BIN" file. The file was converted to industry standard format using AvMap User Data Converter software.

[1] DGPS means Differential Global Positioning System
[2] WAAS means Wide Area Augmentation System
[3] Volatile memory requires a constant application of power to retain data. The instant power is removed from a volatile memory device, all stored data is lost.

**Figure 1. Photo of damaged screen after power up.**




## GPS Data Description

The data extracted included 14 sessions from January 6, 2012[4] through March 26, 2012 (a total of 4,966 data points). The accident flight was recorded starting at 1736:19 UTC and ending at 1822:13 UTC on March 26, 2012 (a total of 710 data points).

## GPS Parameters Provided

Table 1 describes data parameters provided by the GPS device. Date, Time, Latitude, Longitude, and GPS Altitude are recorded by the device. Groundspeed and Track are derived from the recorded parameters.

[4] All dates and times are referenced to Coordinated Universal Time (UTC).

**Table 1: GPS Data Parameters**

| Parameter Name | Parameter Description |
|---|---|
| Date | Date for recorded data point (MM/DD/YYYY) |
| Time | Time (UTC) for recorded data point (HH:MM:SS) |
| Latitude | Recorded Latitude (degrees) |
| Longitude | Recorded Longitude (degrees) |
| GPS Alt | Recorded Altitude (feet), above Mean Sea Level (MSL) |
| Groundspeed | Average groundspeed between current and previous data point (knots) |
| Track | Average true course between current and previous data point (degrees) |

## OVERLAYS AND TABULAR DATA

The overlays that follow were created using Google Earth. All times are expressed as UTC and altitudes as MSL.

Figure 2 is a graphical overlay for the accident flight. The flight first began recording track at 1736:19, prior to take-off at FDW. The track continued until the last recorded point at 1822:13 at N52.

Figure 3 shows a graphical overlay of the departure from FDW. The aircraft began recording points at 1736:19, followed by a take-off at about 1740:32 on runway 22. The aircraft made a right turn after take-off and proceeded northwest towards N52.

Figure 4 shows a graphical overlay of the enroute portion of the flight from FDW to N52. The aircraft flew northwesterly with altitudes varying from about 1,600 feet to 2,000 feet prior to descending into the traffic pattern at N52.

Figure 5 shows the traffic pattern entry and attempted landing at N52. The aircraft flew left downwind and base to runway 22 between about 1,330 and 1,570 feet. The aircraft started the final approach to runway 22 at about 1821:24 at about 1,286 feet.

Figure 6 shows all recorded points from the final approach at 1821:46 through the last recorded point at 1822:13. The aircraft descended at about 60 knots groundspeed until about 696 feet while over the runway. As the aircraft lateral track veered to the left, the altitude descended slightly to about 663 feet and then remained in near level flight at about 44 knots ground speed until the last recorded point at 1822:13.

Tabular data used to generate figures 2 through 6 are included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format].

**Figure 2. Google Earth overlay showing accident flight.**

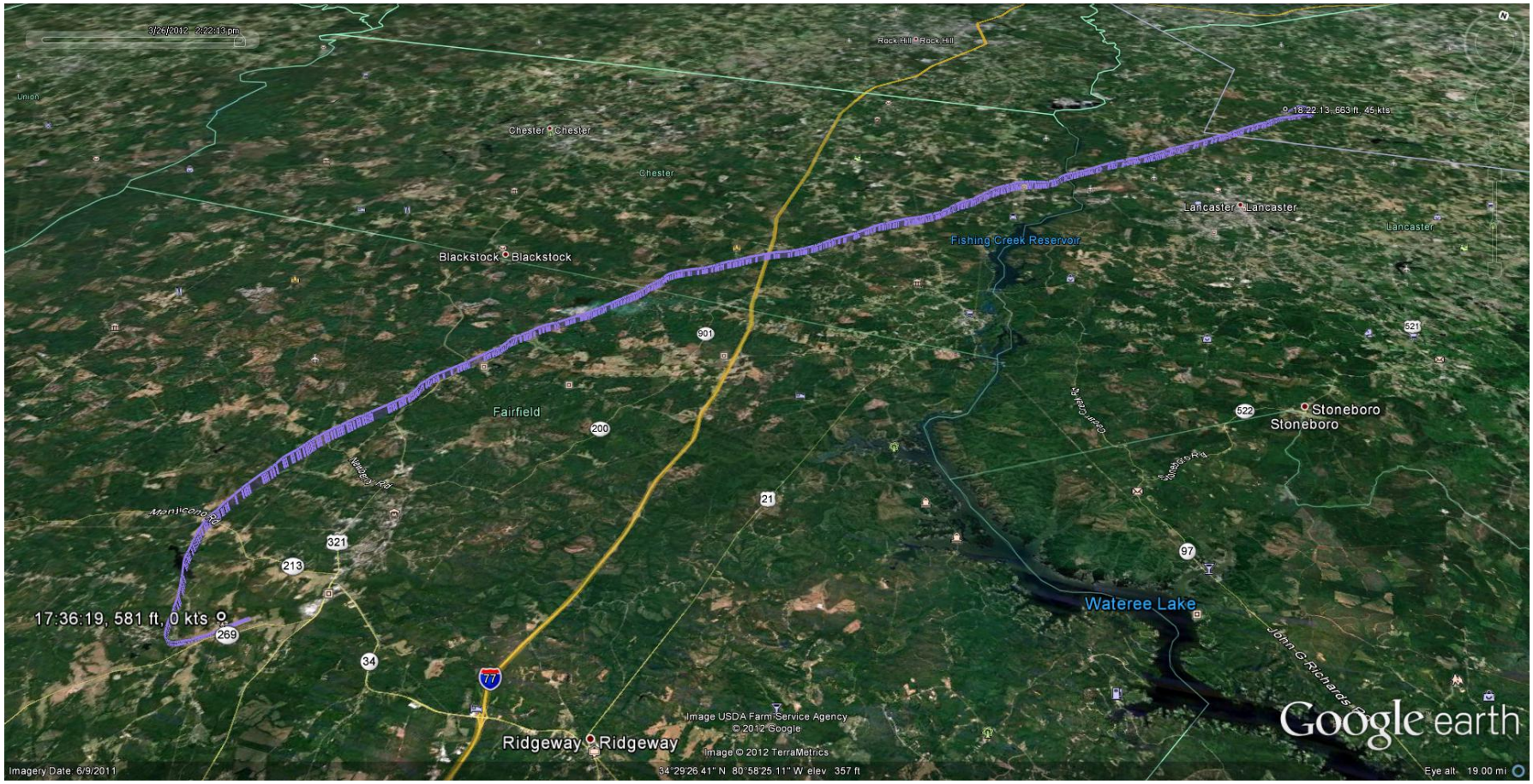


**Figure 3. Google Earth overlay showing take-off from FDW.**

**Figure 4. Google Earth overlay showing enroute portion from FDW to N52.**

**Figure 5. Google Earth overlay showing traffic pattern and attempted landing at N52.**

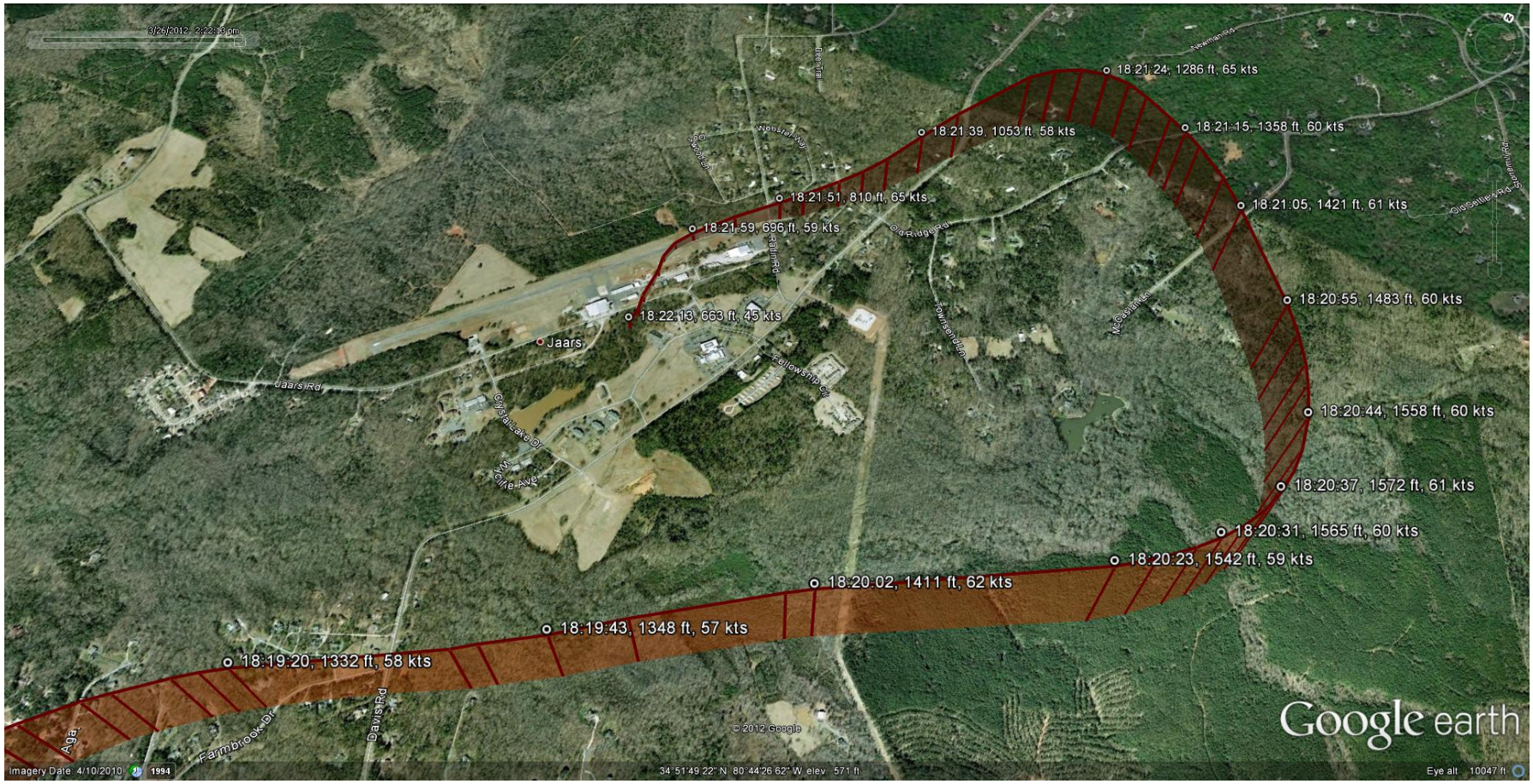
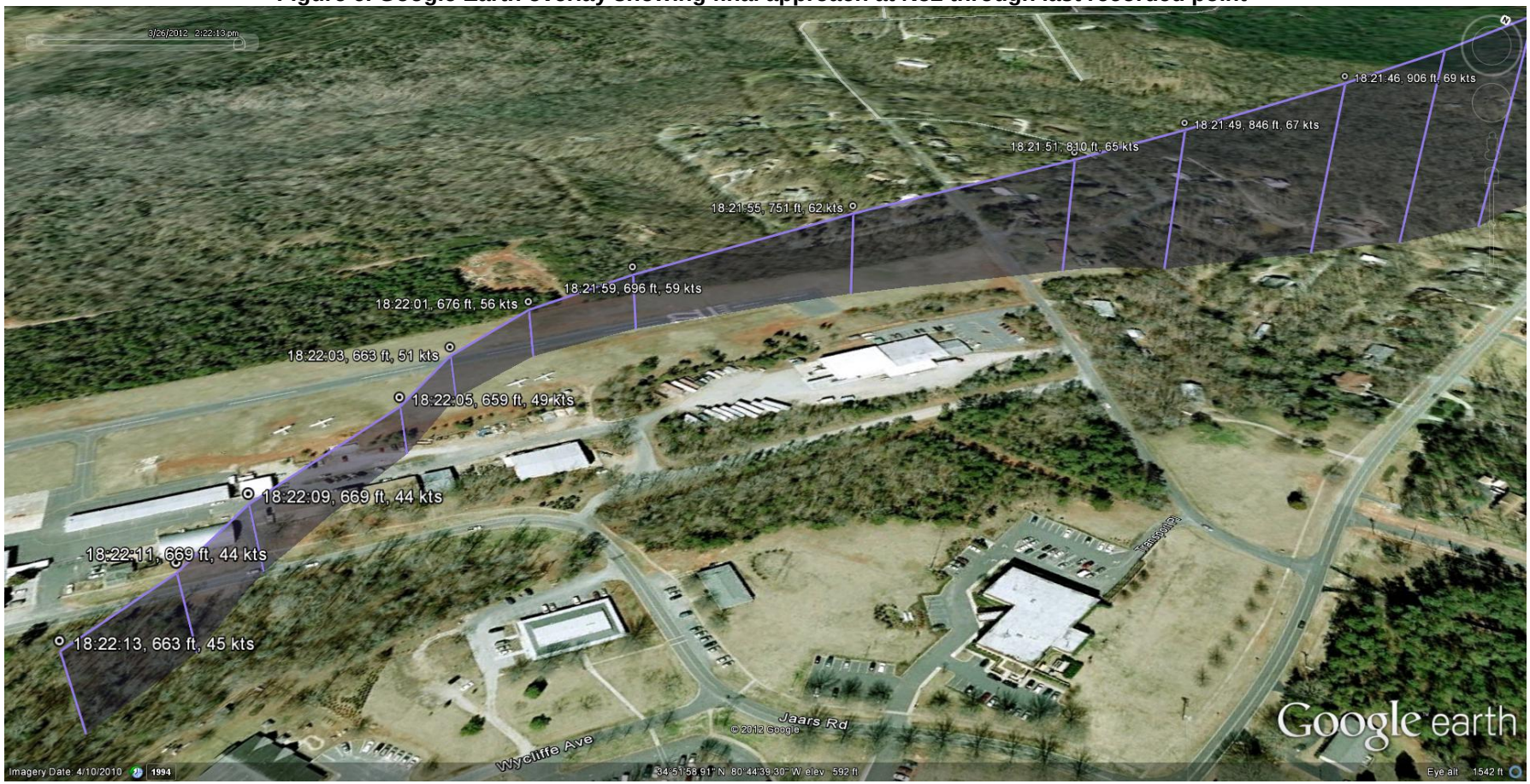


**Figure 6. Google Earth overlay showing final approach at N52 through last recorded point**

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