

# NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

January 5, 2017

## Global Positioning System Device

### Specialist's Factual Report

By Sean Payne

#### 1. EVENT SUMMARY

Location: Collegedale, Tennessee  
Date: June 11, 2016  
Aircraft: Mooney M20E  
Registration: N7830V  
Operator: Private  
NTSB Number: ERA16FA208

On June 11, 2016, about 1245 eastern daylight time, a Mooney M20E, N7830V, owned and operated by a private individual, was substantially damaged when it impacted terrain while maneuvering after a go-around at the Collegedale Municipal Airport (FGU), Collegedale, Tennessee. The private pilot and two passengers were fatally injured. One passenger was seriously injured. Visual meteorological conditions prevailed and no flight plan had been filed for the personal flight conducted under the provisions of 14 *Code of Federal Regulations* Part 91.

#### 2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following global positioning system (GPS) device:

Device Manufacturer/Model: iFly 720  
Serial Number: FL11B0113

##### 2.1. Device Description

The Adventure Pilot iFly 720 is an externally-powered, multi-function display and GPS receiver with a high resolution, LCD touch screen display. The unit includes a built-in navigational database and is optionally capable of receiving inflight ADS-B information including NEXRAD weather radar, airport weather reports (METARs), weather forecasts, and traffic advisories. The navigational and information features include terrain warnings, airspace alerts, and display of enroute VFR and IFR navigational information and IFR

approach charts. The device is capable of utilizing a Wi-Fi<sup>1</sup> wireless access point<sup>2</sup> to connect to the internet to update its database.

The unit is capable of recording track history to a removable SD card that is compatible with a Microsoft file allocation table (FAT<sup>3</sup>) file system. Track history data are written as National Marine Electronics Association (NMEA<sup>4</sup>) 0183 compatible sentences containing local time (as selected by the user), latitude, longitude, and altitude.

## 2.2. Data Recovery

The device arrived with significant impact damage (figure 1). The device's screen was cracked and disjointed from the unit's associated mounting hardware. The device showed evidence of slight mechanical deformation throughout the surrounding plastic housing. The unit's SD card was extracted from the device and discovered to be in good condition. The SD card was connected to a PC via a USB forensic write blocker<sup>5</sup> and the files were copied normally. The unit contained log files formatted to the NMEA 0183 standard. The NMEA 0183 track history sentences were converted to comma delimited value (CSV) and Keyhole Markup Language (KML) formats using Microsoft Excel.

**Figure 1. The condition of the iFly 720 GPS.<sup>6</sup>**



<sup>1</sup> Wi-Fi – a local area wireless computer networking technology.

<sup>2</sup> Wireless Access Point – A networking hardware device that allows a wireless device to connect to a network.

<sup>3</sup> FAT Filesystem – File Allocation Table (FAT) is the name of a computer file system architecture which is part of an industry standard file system.

<sup>4</sup> NMEA – NMEA 0183 – A data specification typically used in marine electronics.

<sup>5</sup> USB Forensic Write Blocker – a USB device that inhibits a PC from performing writing functions to the connected memory device.

<sup>6</sup> The owner's address information has been redacted from this photo.

## 2.3. Data Description

The track history file contained 50 log files for multiple flights, including the accident flight. The accident flight consisted of two legs with the accident occurring in the second leg. GPS tracks from the first leg began in the air over the town of Pembroke Pines, Florida and ended in the vicinity of a fuel pump at Harris County Airport (KPIM), Pine Mountain, Georgia. The accident leg was from KPIM and ended over airport property at Collegedale Municipal Airport (KFGU), Collegedale, Tennessee.

Two log files, file 20160611034740.log and file 20160611082814.log, had timing and positioning information that matched the two legs of the accident flight. File 20160611082814.log, which was the accident leg, contained 2,088 lines of NMEA data sentences recorded on June 11, 2016.

## 2.4. Time Correlation

Timing information extracted from the GPS NMEA files required a 3 hour offset to display in local time of the accident, EDT. The timing offset applied to both files was as follows:

$$\text{iFly 720 GPS Log Time} + 10,800 \text{ seconds} = \text{EDT}$$

All times in this report are given in EDT.

## 2.5. 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.

**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)                        |
| Altitude       | Recorded GPS Altitude (feet)                        |
| Groundspeed    | Average derived groundspeed (knots)                 |
| Track          | Average derived true course (degrees)               |
| Sat            | Number of satellites received (number)              |
| hdop           | Horizontal dilution of precision (number/ratio)     |
| fix            | Fix quality; 1 indicates the device has a valid fix |

## **2.6. OVERLAYS AND TABULAR DATA**

Figure 2 is a graphical overlay generated using Google Earth for the flight first leg of the accident flight. The recording began over the town of Pembroke Pines, Florida at 0647:40 and ended in the vicinity of the fuel pumps (figure 3) at KPIM. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

The second leg departed KPIM at approximately 1128:14 EDT and the aircraft made a climbing right turnout on a heading in the general direction of KFGU. Figure 4 is a graphical overlay generated using Google Earth showing the departure and turnout from KPIM.

Figure 5 is a graphical overlay generated using Google Earth showing the overall route of flight between KPIM and KFGU. The aircraft circles twice in the vicinity of the town of Armuchee, Georgia around 1214:01 and 1222:40, respectively.

Figure 6 is a graphical overlay generated using Google Earth showing the aircraft's ground track in the vicinity of KFGU.

Figure 7 is a graphical overlay generated using Google Earth showing detail of the aircraft's final ground track in the vicinity of KFGU. The last recorded point showed a GPS altitude of 971 feet and a groundspeed of 64 knots. The GPS track indicates the aircraft was airborne at that time. The ground impact location was not recorded.

Tabular data used to generate figures 2 and 3 are included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

Tabular data used to generate figures 4 through 7 are included as Attachment 2. This attachment is provided in electronic comma-delimited (.CSV) format.

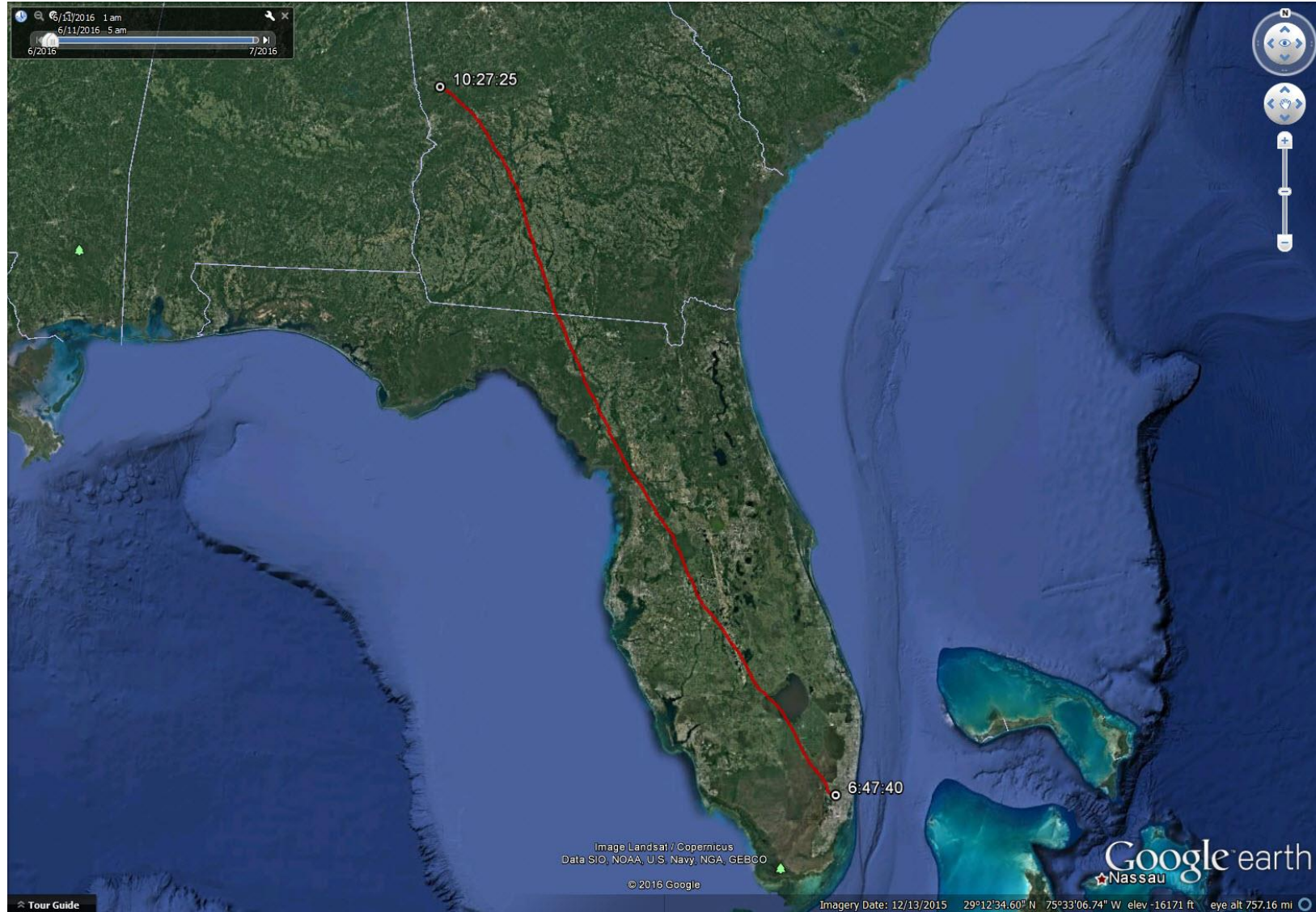


Figure 2. Google Earth overlay showing the first leg of the accident flight from the south Florida region to KPIM.



**Figure 3 Google Earth overlay showing the ground track of the first leg of the accident flight ending in the vicinity of fuel pumps at KPIM at 1027:25 EDT.**

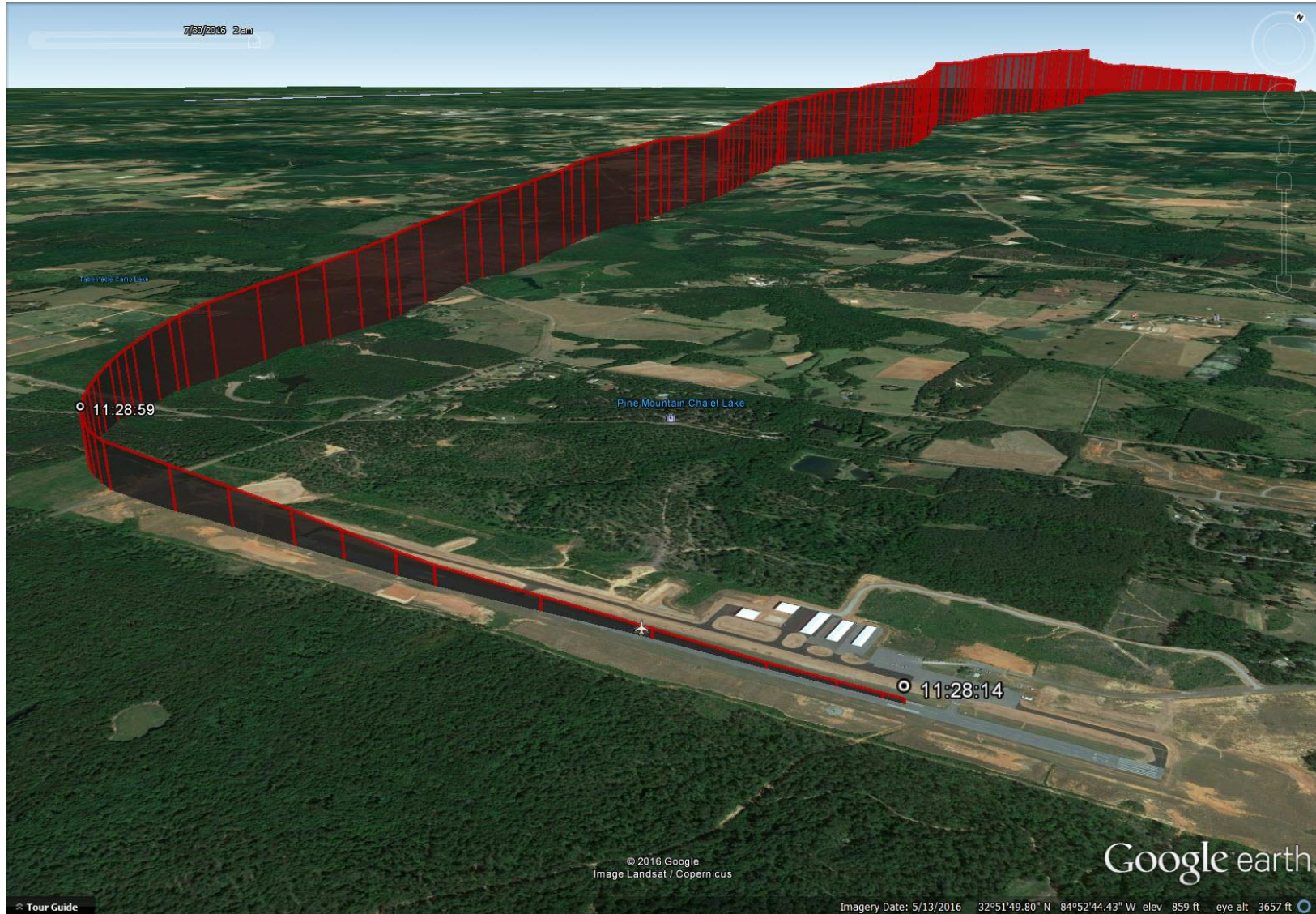


Figure 4. Google Earth overlay showing the aircraft's departure on the accident leg from KPIM.

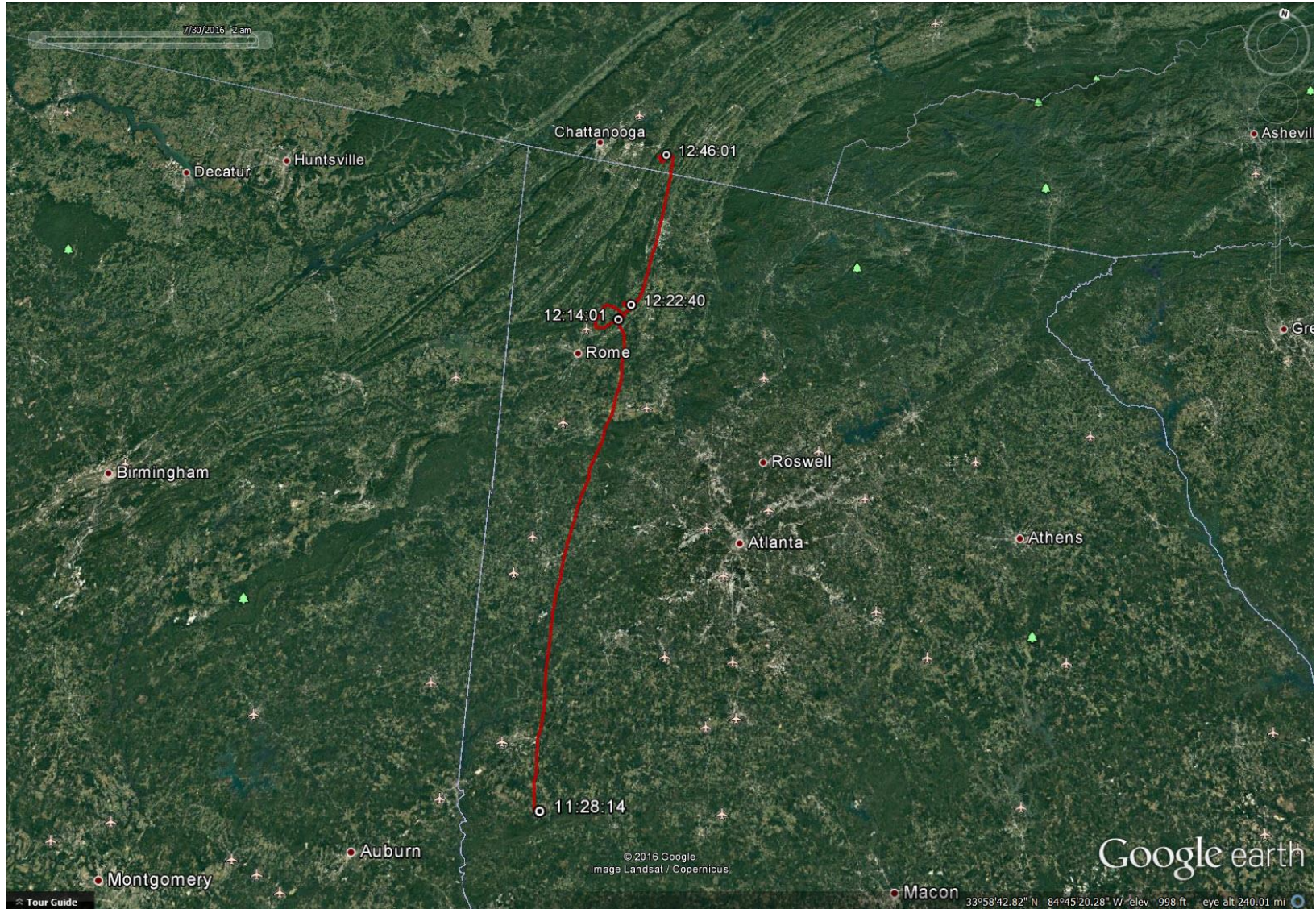


Figure 5. Google Earth overlay showing the aircraft's overall ground track from KPIM to KFGU.

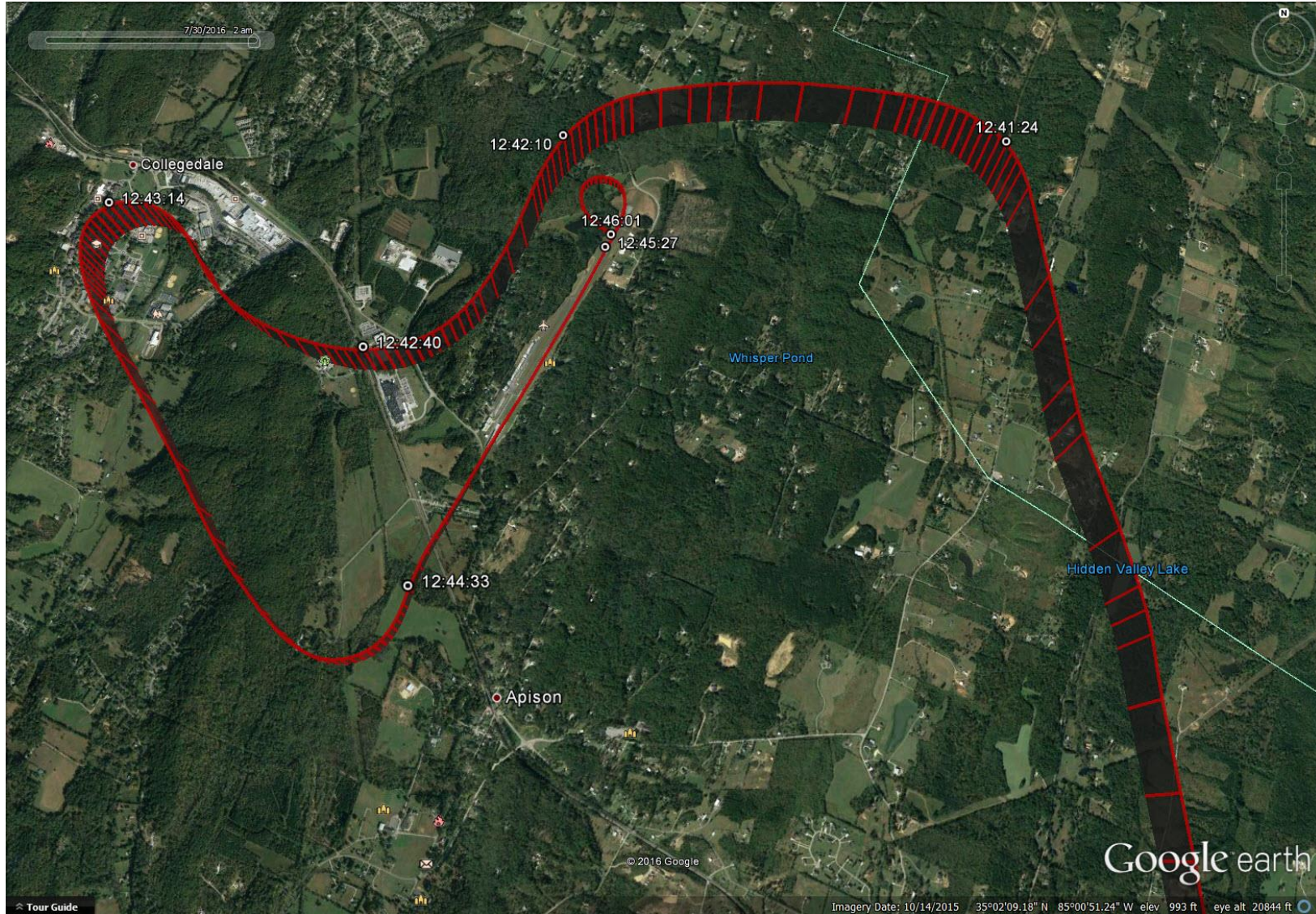


Figure 6. Google Earth overlay showing the aircraft maneuvering in the vicinity of KFGU.

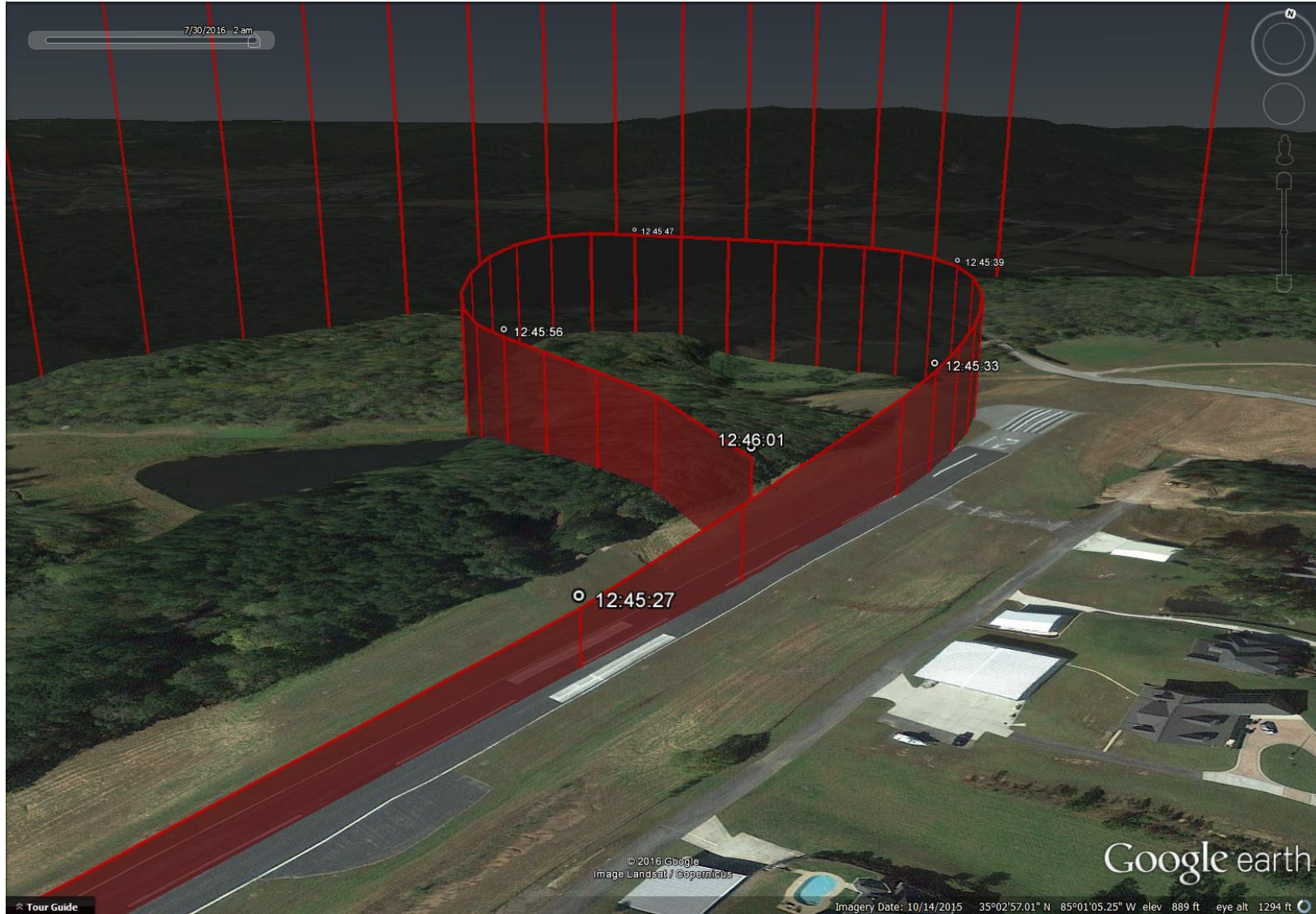


Figure 7. Google Earth overlay showing the final ground track of the aircraft in the vicinity of KFGU.