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

December 20, 2011

17 - GPS Factual Report

Specialist's Factual Report
by Bill Tuccio

A. EVENT

Location:	Riverwoods, Illinois
Date:	November 28, 2011, 2250 Central Standard Time (CST)
Aircraft:	Piper PA-31-350
Registration:	N59773
Operator:	Trans North Aviation Ltd
NTSB Number:	CEN12FA086

B. GROUP - No Group

C. SUMMARY

On November 28, 2011, about 2250 central standard time (CST), Lifeguard N59773, a Piper PA-31-350, an emergency medical services (EMS) flight, operated by Trans North Aviation Ltd, sustained substantial damage when it impacted trees and terrain in Riverwoods, Illinois. The pilot declared an emergency, reported that the airplane was out of fuel and the flight was coasting direct to the destination airport, Chicago Executive Airport (PWK), near Wheeling, Illinois. The airline transport pilot and two passengers sustained fatal injuries. The pilot-rated passenger and medical crewmember received serious injuries. The non-scheduled domestic, on-demand passenger flight was conducted under 14 Code of Federal Regulations Part 135. Night visual meteorological conditions prevailed at the time of the accident. An activated instrument flight rules flight plan was on file. The flight departed from the Jesup-Wayne County Airport (JES), near Jesup, Georgia, about 1858.

D. DETAILS OF INVESTIGATION

On December 12, 2011, the NTSB Vehicle Recorder Laboratory received the following device(s):

GPS Manufacturer/Model:	Garmin GPSMAP 396
Serial Number:	28215656

Garmin GPSMAP 396 Device Description

The Garmin GPSMAP 396 is a battery-powered portable 12-channel GPS receiver with a 256-color TFT LCD display screen. The unit includes a built-in Jeppesen database and is capable of receiving XM satellite radio for flight information including NEXTRAD radar, lightning, METARs, TAFs, and TFRs. The unit stores date, route-of-flight, and flight-time information for up to 50 flights. A flight record is triggered when groundspeed exceeds 30 knots and altitude exceeds 500 feet, and ends when groundspeed drops below 30 knots for 10 minutes or more. A detailed tracklog – including latitude, longitude, date, time, and GPS altitude information for an unspecified number of points – is stored within the unit whenever the receiver has a lock on the GPS navigation signal. Position is updated within the tracklog as a function of time or distance moved, depending on how the unit has been configured. Once the current tracklog memory becomes full, new information either overwrites the oldest information or recording stops, depending on how the unit is configured. The current tracklog can be saved to long-term memory and 15 saved tracklogs can be maintained in addition to the current tracklog. Tracklog storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile[1] memory. The unit contains hardware and software permitting the download of recorded waypoint, route, and tracklog information to a PC via a built-in serial port using the NMEA 0183 version 2.0 protocol. The unit can also communicate with external devices such as a computer using a built in USB port. An internal button-battery is used to back-up power to the internal memory and real-time clock during those periods when main power is removed.

GPS Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed that the unit had sustained minimal damage (see figure 1). Power was applied to the accident unit and recorded waypoint, route, and tracklog data was successfully downloaded from the unit via the USB port.

In addition to the downloaded data, a selection of device screens were reviewed. Figure 2 shows the startup screen and database installed on the device, with dates from March 12, 2009 to April 9, 2009.

Figure 3 shows the aircraft profile screen for the current aircraft. The current aircraft was labeled as N59773, the registration of the accident aircraft. The fuel flow was shown as “38.0/hr” and cruise speed of 175 knots.

Figure 4 shows a weight and balance screen from the device. The weight and balance indicates an aircraft weight of 4,842 pounds and a total weight of 6,834 pounds, in addition to other weight and balance information.

[1] Non-volatile memory is semiconductor memory that does not require external power for data retention

Figure 5 shows a listing of messages received on the device. The time zone of the message display is not known. Figure 6 shows the filter settings for the message display.

Figure 1. Photo of damaged Garmin GPSMap 396.

Figure 2. Startup screen of device.

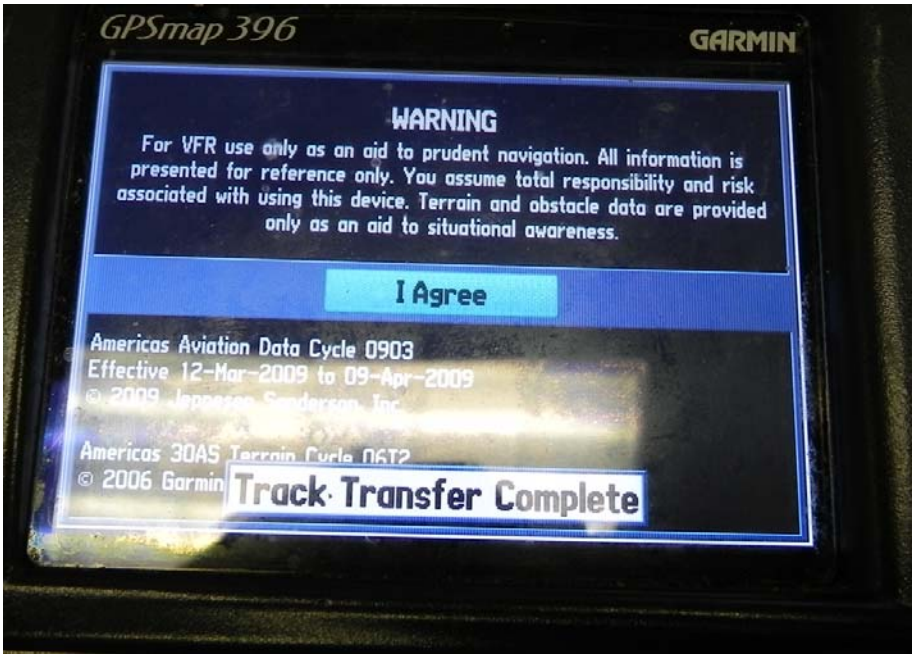


Figure 3. Aircraft profile screen.

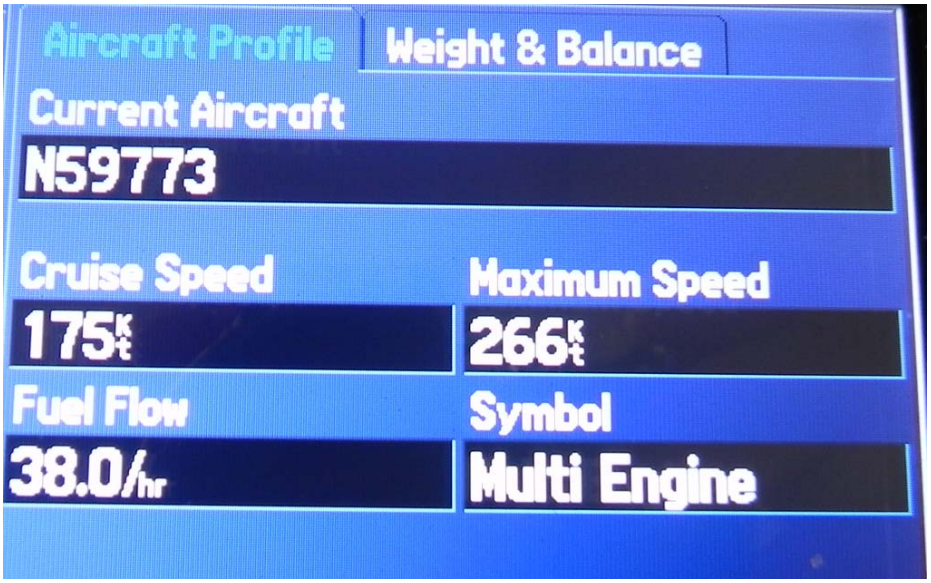


Figure 4. Weight and balance screen.

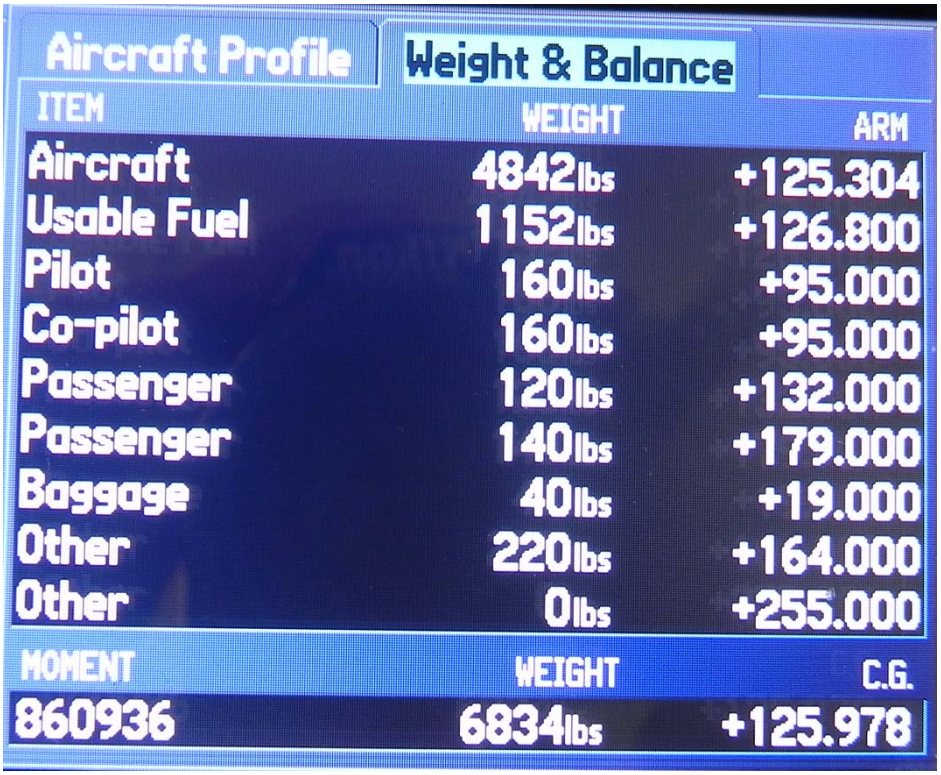


Figure 5. Message history on device.

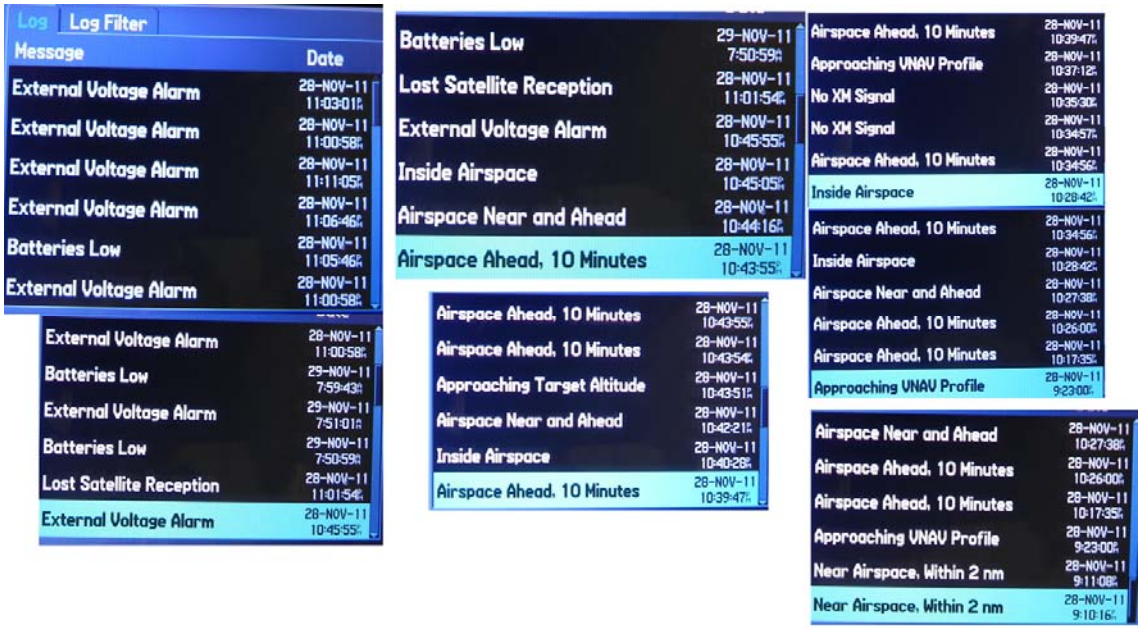
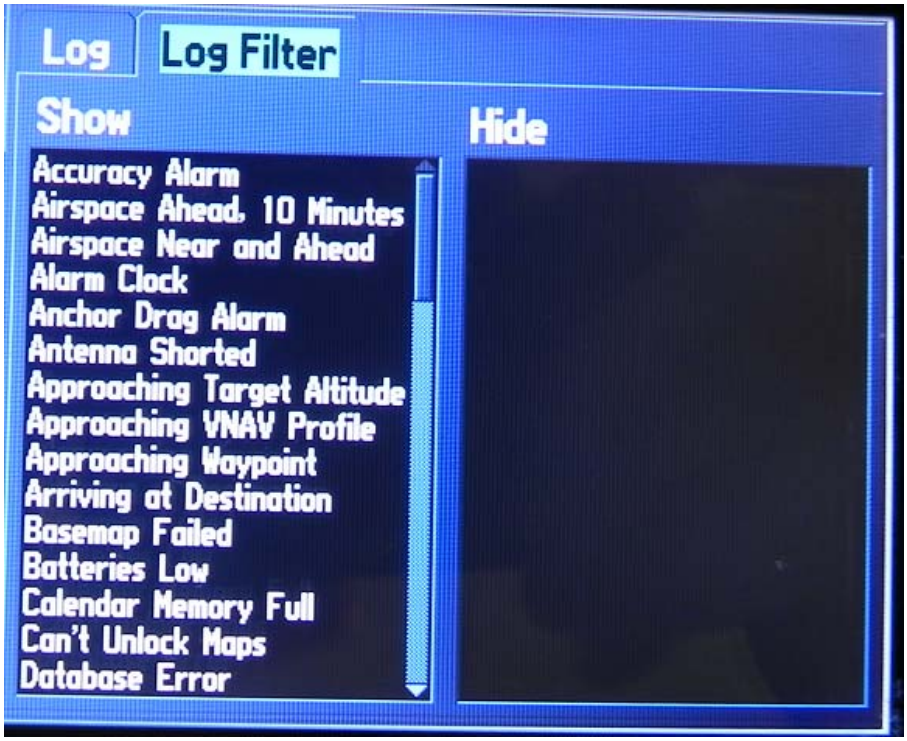


Figure 6. Message filter settings.



GPS Data Description

The data extracted included 73 sessions from July 21, 2011[2] through November 29, 2011. The accident flight was recorded starting 01:00:19 UTC and ending at 04:57:49 on November 29, 2011. In addition, three previous flights on November 28, 2011, starting at 12:39:26, 16:52:49, and 22:40:00 were determined to be of interest and are included in this report.

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.

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)
Groundspeed	Average groundspeed between current and previous data point (knots)
Track	Average course between current and previous data point (degrees)

OVERLAYS AND TABULAR DATA

Figure 7 is a graphical overlay generated using Google Earth for the accident flight. The landing in Jessup, Georgia prior to the accident flight was at about 00:29:10 UTC on November 29, 2011, with nine more data points recorded on the device until 00:33:16. The next point recorded after the 00:33:16 point was at 01:00:19. The flight departed Jessup, Georgia at approximately 01:10:48. The last point recorded on the device was at 04:57:49.

Figure 8 is a graphical overlay generated using Google Earth of the last six points recorded by the device for the accident flight. At 04:45:50, the aircraft was about 957 feet from the next recorded point at 04:46:52. The distance from the 04:46:52 point to the next recorded point at 04:57:49 was about 77 feet. The total time from departure in Jessup at approximately 01:10:48 until 04:46:52 was about 03:36:04.

Figure 9 is a graphical overlay generated using Google Earth showing the aircraft in the vicinity of the Riverwoods accident site. At about 04:40:22, the aircraft was parallel to runway 16/34 at the PWK airport.

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

Figure 10 is a graphical overlay generated using Google Earth showing the prior three flights. The departure times summarized for the three flights are based on the time the recorded data shows the aircraft accelerating and climbing consistent with a take-off; and the landing times are based on the recorded data showing the aircraft decelerating and descending consistent with a landing. On November 28, 2011, the device recorded a flight from the Crawfordsville Municipal Airport (CFJ) in Crawfordsville, Indiana to the Perry-Houston County Airport (PXE) in Perry, Georgia. The flight departed CFJ at about 12:50:14 and arrived at PXE about 16:24:27, an elapsed time of 03:34:13.

The next flight on Figure 10 was from PXE to the Palm Beach International Airport (PBI) in West Palm Beach, Florida. The flight departed PXE at about 16:58:19 and arrived at PBI about 19:51:39, an elapsed time of 02:53:20.

The last flight on Figure 10 was from PBI to JES, departing at about 22:51:14 and arriving at about 00:31:06, an elapsed time of 01:39:52.

Tabular data used to generate figures 7 through 10 are included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

Figure 7. Google Earth overlay of accident flight.

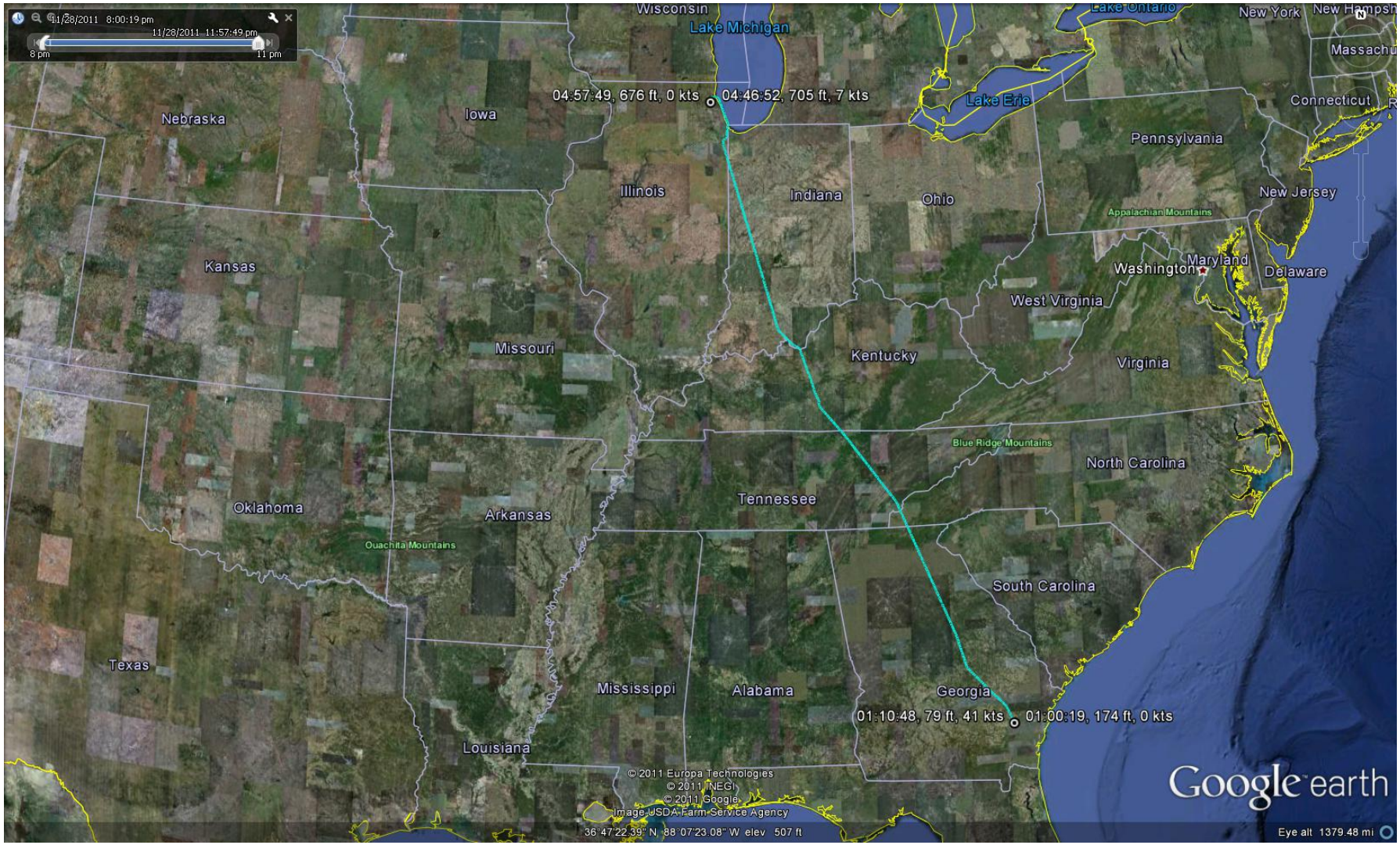


Figure 8. Last six points of accident flight.

Figure 9. Approach to accident site.

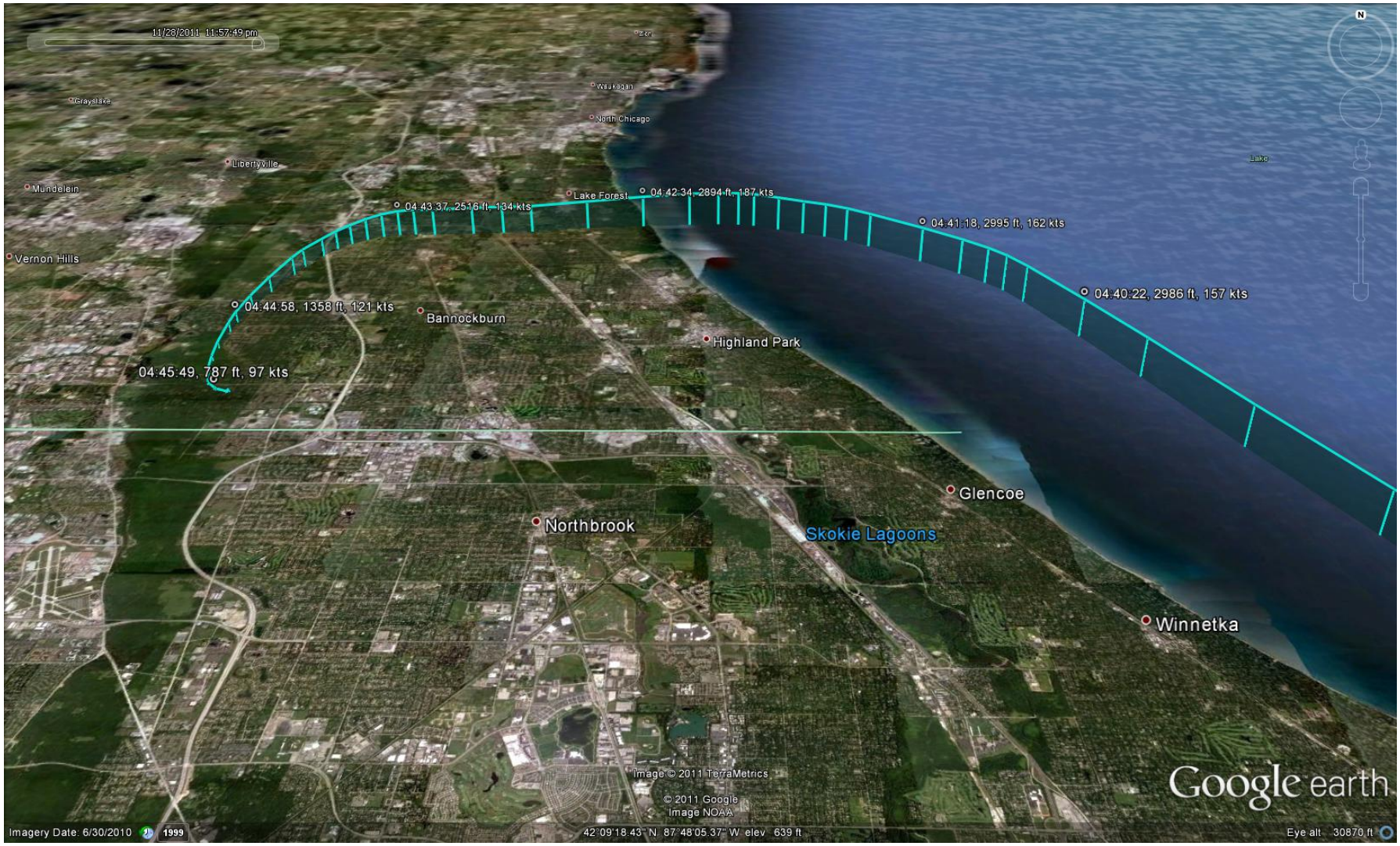


Figure 10. Prior three flights (CFJ-PXE, PXE-PBI, PBI-JES).