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

April 1, 2013

GPS Factual Report

Specialist's Factual Report
by Bill Tuccio

A. EVENT

Location:	East Moriches, New York
Date:	October 20, 2012
Aircraft:	Swift Museum Foundation, Inc. GC-1A
Registration:	N80823
Operator:	Private
NTSB Number:	ERA13FA032

B. GROUP - No Group

C. SUMMARY

On October 20, 2012, about 1504 eastern daylight time, a Swift Museum Foundation, Inc., GC-1A, N80823, registered to and operated by a private individual, impacted the water of Moriches Inlet, East Moriches, New York. Visual meteorological conditions prevailed at the time of the accident and no flight plan was filed for the 14 *Code of Federal Regulations* Part 91 personal flight from Spadaro Airport (1N2), East Moriches, New York, to Republic Airport (FRG), Farmingdale, New York. The airplane was substantially damaged and the private pilot and 1 passenger were fatally injured.

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model:	Garmin GPSMAP 196
Serial Number:	65403695

Garmin GPSMAP 196 Device Description

The Garmin GPSMAP 196 is a portable GPS unit equipped with a detachable antenna, and a 320 x 240 12-level grayscale LCD display. The unit is equipped with a built in base map and internal Jeppesen aviation database. The unit employs a parallel

12 channel WAAS-capable receiver and can be operated using external power, or alternatively by four standard AA-size batteries. The GPSMAP 196 is capable of storing date, route of flight, and flight time information for up to 50 individual flights in the form of a flight log. Flight logging begins when the GPS unit senses a speed increase to greater than 30 knots together with an altitude gain of greater than 500 feet. Recorded flight log data is saved when the speed is sensed to decrease to below 30 knots, and a new log is started if more than 10 minutes passes from this time. A detailed track log – 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. Track log position is updated as a function of time or distance moved, depending on how the unit has been configured. Once the current track log memory becomes full, new information either overwrites the oldest information or recording stops, depending on how the unit is configured. The current track log can be saved to long-term memory and 15 saved track logs can be maintained in addition to the current track log. Track log storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile memory[1]. The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via a built-in serial port using the NMEA 0183 version 2.0 protocol. 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, it was evident that the unit had sustained the effects of saltwater exposure. An internal inspection revealed corrosion, as shown in figure 1. The main board was removed and rinsed in fresh water. After this treatment the board was air dried.

The non-volatile memory chip, an AMD AM29DL323GB, was identified on the main board, as shown in figure 2. The memory chip was removed from the board, the memory image downloaded, and the contents decoded.

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

Figure 1. Photo of corrosion damage.

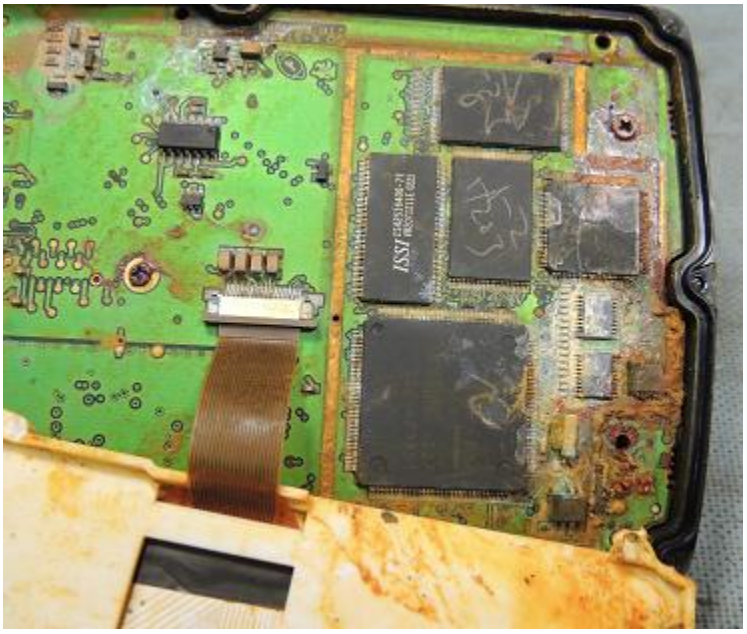
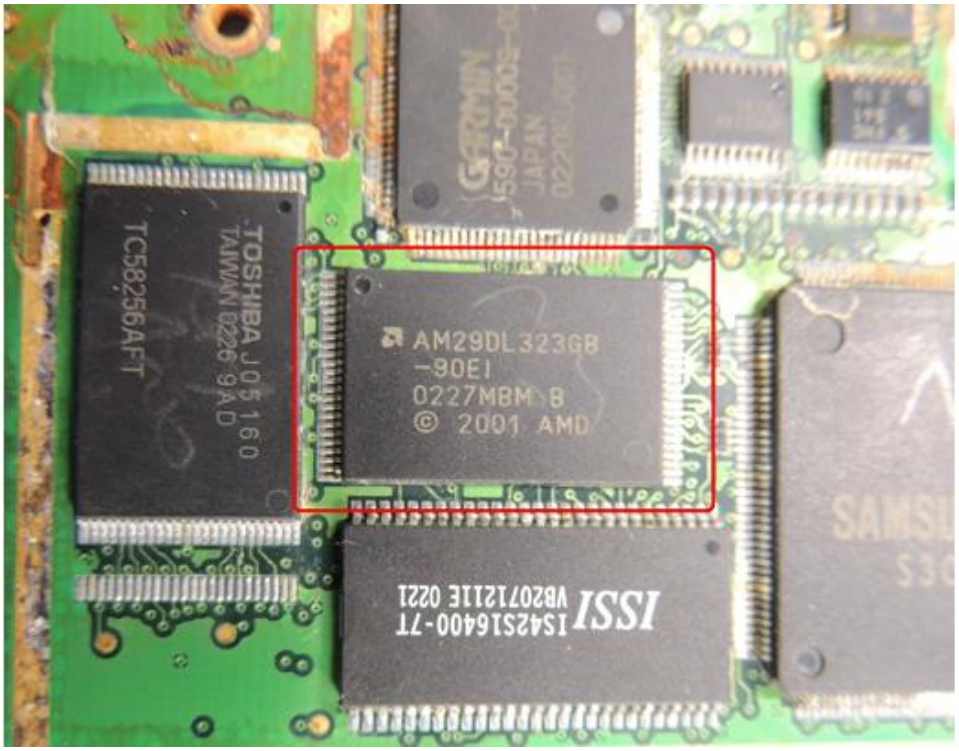


Figure 2. Photo of main non-volatile memory chip after cleaning.



GPS Data Description

The track data extracted spanned the time period from August 26, 2012[2] through October 20, 2012. The accident flight was recorded starting at 18:50:41 UTC and ending at 19:04:22 UTC on October 20, 2012.

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 (above mean sea level) (feet)
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

All overlays were produced using Google Earth. All times are expressed as UTC, and altitudes are GPS recorded altitude.

Figure 3 shows the start of the recording at the 1N2 airport at 18:50:41 UTC. The aircraft departed runway 18 at about 18:54:53 UTC and proceeded southerly. At about 18:57:32 UTC, over the southern coast of Long Island climbing through 1,473 feet, the aircraft began a turn towards the west, parallel to the coast line. The aircraft climbed to a maximum recorded altitude of 2,602 feet at 18:59:10 UTC.

At about 19:00:47 UTC, the aircraft turned right towards the north while descending. At about 19:01:37 UTC, descending through 1,812 feet, the aircraft turned towards the east.

Figure 4 shows flight from 19:01:37 UTC until the end of the recording at 19:04:22 UTC. The calculated groundspeed after 19:04:14 UTC may not be accurate given the sampling rate of the device.

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

At 19:01:37 UTC, the aircraft descended through 1,812 feet at a groundspeed of about 85 knots. The calculated groundspeed varied between 78 knots and 89 knots between 19:01:37 UTC and 19:04:14 UTC. At about 19:02:16 UTC, the aircraft turned easterly, towards the south shore of Long Island. At about 19:03:14 UTC, descending through 592 feet, the aircraft turned northeasterly, towards a track that paralleled the south shore of Long Island. The aircraft continued to descend, paralleling the south shore of Long Island, until the end of the recording near the Moriches Inlet.

Tabular data used to generate figures 3 and 4 are included as Attachment 1. This attachment is provided in electronic comma-delimited value (.CSV) format.

Figure 3. Google Earth overlay of the entire accident flight recording.

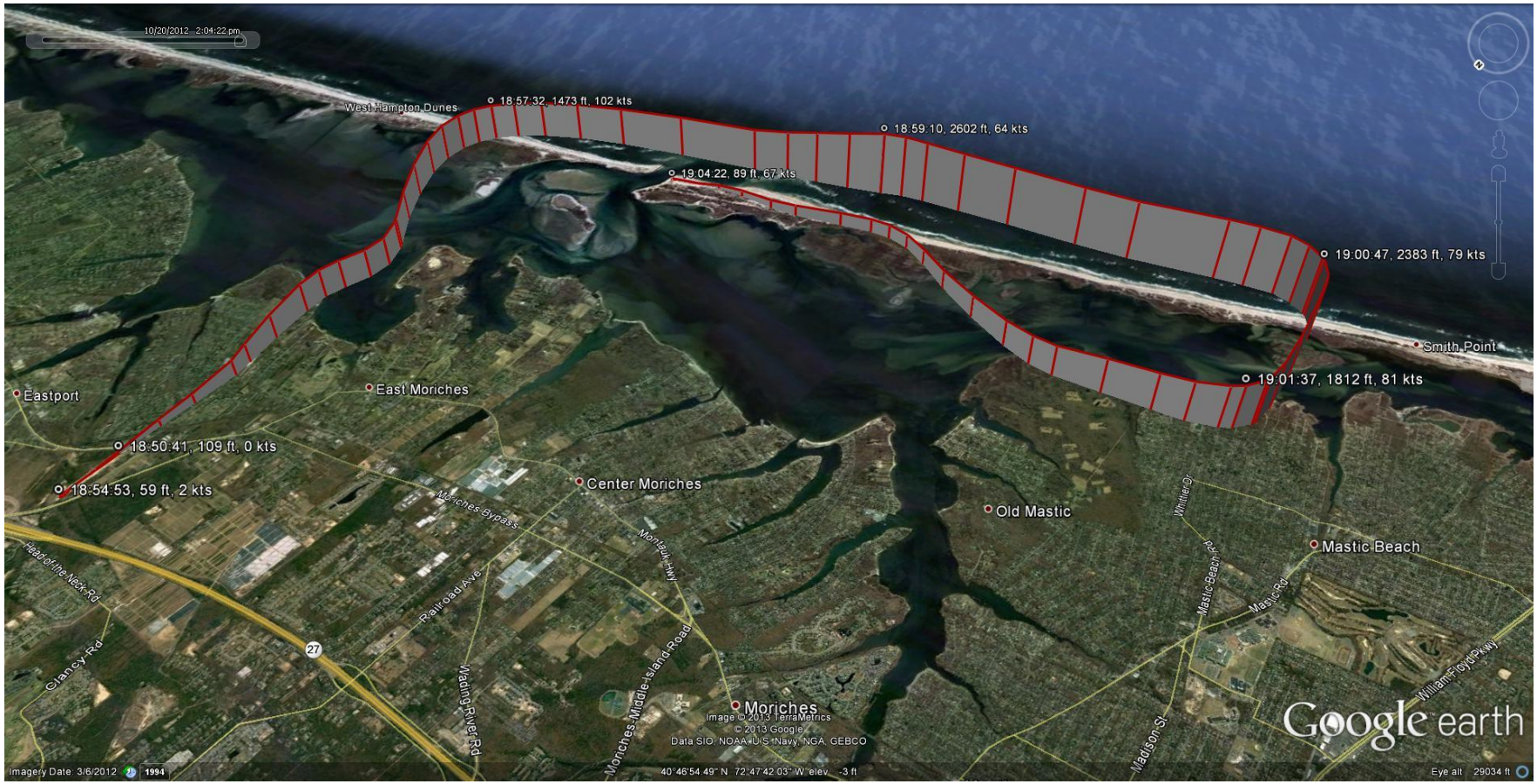


Figure 4. Google Earth overlay of the end of the accident flight recording.