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

June 18, 2019

Multiple Electronic Device

Specialist's Factual Report
By Alice Park

1. EVENT SUMMARY

Location:	Fargo, North Dakota
Date:	November 30, 2018
Aircraft:	Cessna 550
Registration:	N941JM
Operator:	Dirt Dynamics
NTSB Number:	CEN19LA039

On November 30, 2018, about 1353 central standard time, a Cessna 550, N941JM, departed controlled flight while on approach at the Hector International Airport (FAR), Fargo, North Dakota, and impacted the terrain to the right of the runway 18. The airplane was operating under the provisions of the *Title 14 Code of Federal Regulations Part 91* as a business flight. The flight departed from the Sloulin Field International Airport (ISN), Williston, North Dakota about 1250 with FAR as the destination.

2. DETAILS OF INVESTIGATION

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

Device Manufacturer/Model:	Sandel ST3400 Terrain Awareness Warning System
Serial Number:	2390
Device Manufacturer/Model:	Honeywell KLN 900
Serial Number:	1987684620
Device Manufacturer/Model:	Garmin AT MX20 Chart View
Serial Number:	S/W Version 5.7

2.1. Honeywell Memory Card for KLN 900

The database card is an electronic memory containing information on airports, navaids, intersections, and special use airspace displaying output during a flight. See figures 1 and 2.

**Figure 1. Honeywell Memory Card for KLN 900 (front side).**

Figure 2. Honeywell Memory Card for KLN 900 (back side).

2.2. Garmin AT Apollo MX20 Chart View

The database card is an electronic memory containing information on Jeppesen instrument approach chart, airport surface diagram and terrain elevation database. See figure 3.

Figure 3. AT Apollo MX20 Chart View Memory Card.
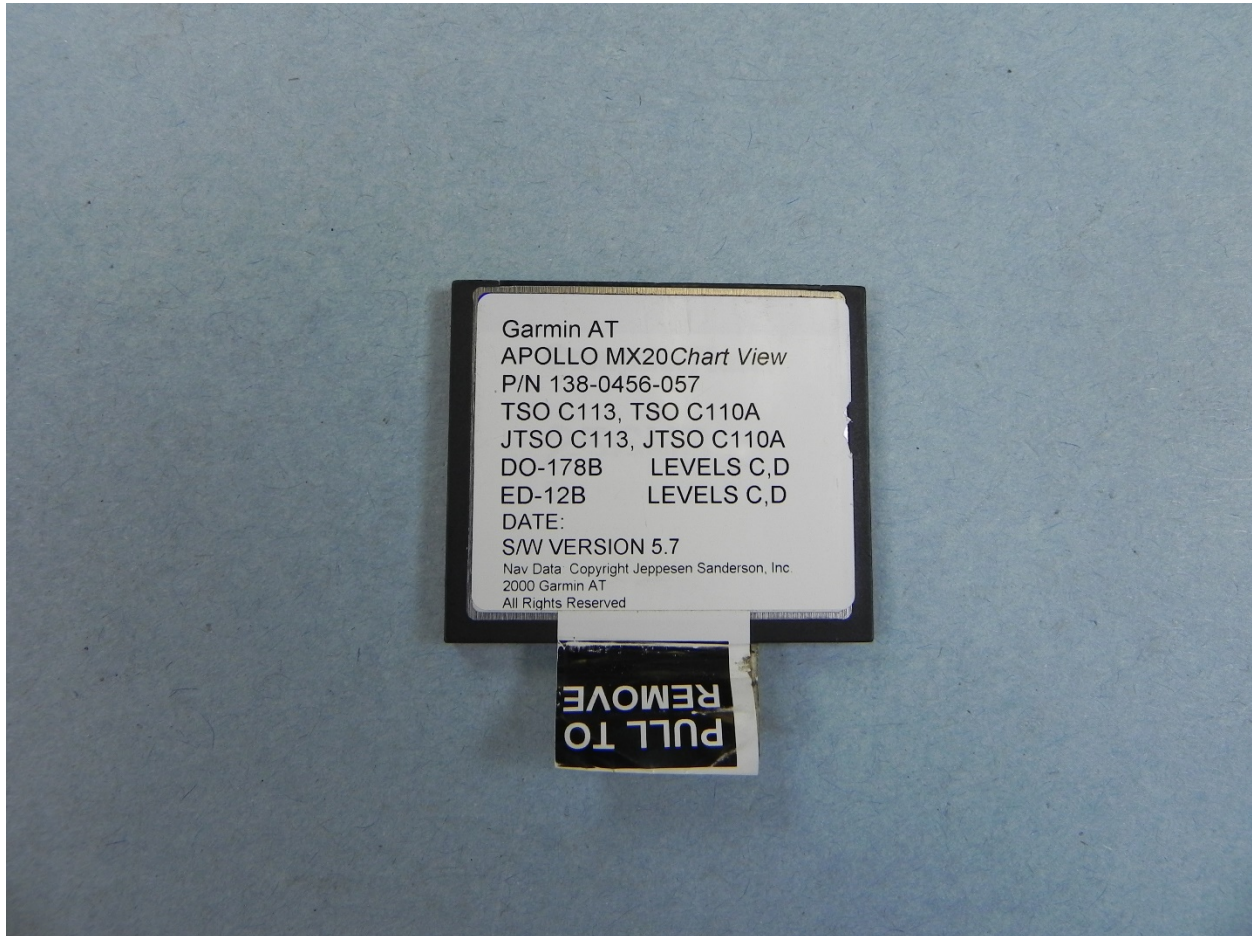
2.3.   Sandel ST3400 Terrain Awareness Warning System Device Description

The ST3400 is a multi-function display with a self-contained Terrain Awareness Warning System (TAWS). The ST3400 records data at once per second and derives from two separate channels internal to the unit, P1 and P2. It uses GPS, radar altitude, barometric altitude, and other relevant data in combination with its internal database information to provide terrain display, charted man-made obstacles and airports with runway greater

than 2,500 feet. Terrain and airport database coverage are limited by geographical region to the area between 70⁰N and 70⁰S latitude. An internal recorder automatically records a minimum of ten hours of flight data including alert data. Data may be downloaded via front mounted mini-USB port and requires decoding by the manufacturer.

2.1.1 Sandel ST3400 Data Recovery

The device was on good condition as shown figures 4 and 5. Data was downloaded through USB port to a computer at the Vehicle Recorder Laboratory and was sent to the manufacturer for decoding.

2.1.2 Sandel ST3400 Data Description

All recorded Sandel ST3400 data was decoded successfully. However, NTSB verified and provided only geospatial data to locate the accident flight first. Data was identified with the time and location of the accident. However, there were gaps between times and the data did not contain valid final approach information for this accident flight.

Figure 4. Exterior of Sandel ST3400 (data plate).

Figure 5. Exterior of Sandel ST3400 (rear).

3. SANDEL PARAMETERS PROVIDED

Table 1 lists ST3400 parameters verified and provided in this report. All values were provided by the manufacturer in the engineering units indicated. Data from the accident flight recorded is provided in tabular format as Attachment 1 to this report.

Table 1. ST3400 Verified Data Parameters.

Parameters and Units	Parameter Description
Time (HH:MM:SS)	Universal Standard Time (UTC)
LAT (Deg:Min:Sec)	Latitude in degree
Ground Track (knots)	Ground Speed
Magnetic Heading (Degrees)	Heading
Altitude (feet)	Barometer corrected altitude

4. OVERLAYS AND TABULAR DATA

Graphical overlays in this report were generated using Google Earth Pro. Note that the weather and lighting conditions depicted in Google Earth imagery do not necessarily reflect the conditions present during the accident flight.

Figure 6 shows the accident flight from the Sloulin Field International Airport (ISN), Williston, North Dakota to the Hector International Airport (FAR), Fargo, North Dakota before the flight impacted the terrain to the right of the runway 18.

Two regions were noted where the Sandel ST3400 lost GPS lock. Figure 7 displays the first region of from 19:30:06 to 19:33:03 during which no data was recorded. Figure 8 shows the second region from – 19:46:24 to 19:49:23 – during which the Sandel ST3400 appeared to be in dead-reckoning mode, as evidenced by the fact that the Flight Management System (FMS) ground track is fixed at 218 degrees. The accident flight actually impacted the terrain to the right of the runway 18 (shown in red dot in figure 3) at about 1953 UTC. This data is included in Attachment 1 to this report.

Figure 6. Overview of the accident flight.

Figure 7. Break in data recording from 19:30:06 to 19:33:03.

Recording stopped at 19:30:05

Recording started again at 19:33:04

Google Earth

Figure 8. Last recorded data as Sandel 3400 entered dead-reckoning mode.

◎ 19:46:24, dead-reckoning mode started

Hector International Airport

Impact location

Runway 18

19:48:23, last recorded data

Google Earth