NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

Aerial Imagery Factual Report
Accident Runaway and Site

11/21/2017

A.	**ACCIDENT**	**DCA17FA076**

Operator:	Ameristar Air Cargo, Inc. dba Ameristar Charters
Location:	Willow Run Airport, Ypsilanti, Michigan
Date:	March 8, 2017
Time:	about 1452 EST
Aircraft:	Boeing MD-83
Registration:	N786TW

B.   PERSONNEL

NTSB:	Michael Bauer
	National Transportation Safety Board
	Washington, D.C.
UAS Operator:	Michigan State Police
	Aviation Division
	Lansing, MI

C.   SUMMARY

On March 8, 2017, about 1452 EST, Ameristar Air Cargo, Inc. dba Ameristar Charters flight 9363, a Boeing MD-83, N786TW, ran off the end of runway 23L after executing a rejected takeoff at Willow Run Airport (YIP), Ypsilanti, Michigan. (The MD-83 was manufactured by McDonnell Douglas, which merged with Boeing in August 1997.) All 110 passengers and 6 crewmembers evacuated the airplane. One passenger was reported to have received a minor injury. The airplane sustained substantial damage (no post-crash fire occurred). The airplane was operating under the provisions of 14 Code of Federal Regulations (CFR) Part 121 as an on-demand charter flight and was destined for Washington Dulles International Airport (IAD), Dulles, Virginia. Daytime visual meteorological conditions prevailed at the time of the accident.

At the request of the NTSB, the aviation division of the Michigan State Police (MSP), provided aerial imaging of the accident site.

D.   DETAILS OF IMAGERY

1.0   Equipment and Procedures

Equipment

Mapping and visual inspection flights were conducted on March 9, 2017, using the MSP Aeryon Labs Inc. Sky Ranger small unmanned aircraft system (sUAS, commonly known as a drone), see Figure 1. The drone is equipped with a GPS receiver which provides georeference information on all still photos. The drone was equipped with an Aeryon Labs Inc. HDZoom30 camera which utilizes the Sony Exmor R CMOS sensor. Still photo resolution is 20.4 megapixels with an output in a JPG file format. Videos were taken in 1080p High Definition resolution at 60 frames per second and provided to the NTSB in a MPEG-TS file format.

Figure 1 - MSP Aeryon Labs Inc. Sky Ranger used in the mapping exercised

Procedures

YIP airport has an associated Class D airspace. The MSP operate under a jurisdictional Certificate of Authorization or Waiver (COA) from the FAA to operate within the controlled airspace at and below 400 feet above ground level (AGL) as coordinated with the air traffic control tower (ATCT) at YIP. In accordance with the COA, a Notice to Airmen (NOTAM) was issued and continuous communications with the ATCT were maintained.

The drone was flown in a series of overlapping grids at two different altitudes of approximately 180 and 275 feet AGL, obtaining still photos to develop a 3D model and an orthomosaic. The coverage area extended from the approximately 2000 ft. from the departure end of runway 23L to the slightly beyond the final resting place of the accident aircraft. Total flight time was less than 2 hours.

Ground Control Points

The Michigan State Police collected 14 ground control points (GCP) by placing labeled black and white placards on a 3000 foot at the crash site.   The center of the placards were measured with a Real Time Kinematic (RTK) GPS unit using the Michigan Department of Transportation Leica network. The crash site was flown with an Unmanned Aircraft System collecting 328 photos. Those photos were merged into a orthomosaic of the crash site with an average ground sampling distance (GSD) of 0.87 inches. Accuracy of the orthomosaic was checked by measuring the distance between 10 pairs of GCP's on the orthomosac and comparing those to the same points collected with the RTK GPS. The average linear measurement error of the 10 pairs of points was 2.16 inches.

Processing

Still imagery was processed using Pix4D photogrammetry software to provide orthomosaic mapping and 3-dimensional (3D) of the accident site, see Figure 2 and Figure 3. Relative accuracy (within the map) was accurate to approximately 1.72 inches (2x average ground sample distance). Multiple ground control points (GCPs) were used around the runway and surrounding terrain, to improve positional (absolute) accuracy.

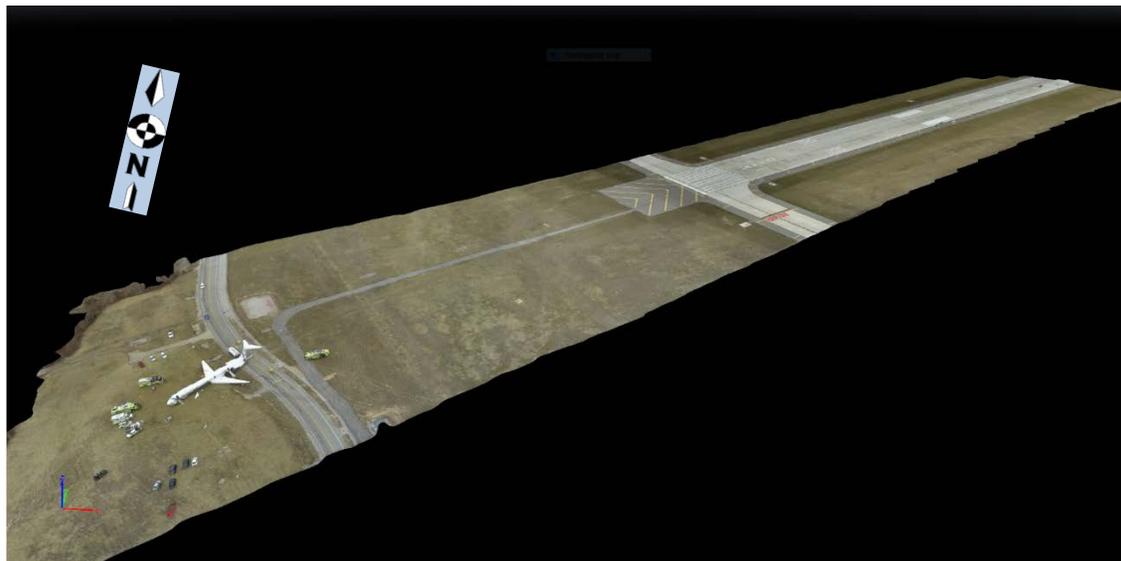**Figure 2 - Snapshot of Orthomosaic output overlaid on Google Earth**

Figure 3 - Snapshot of mapped area 3D model

2.0   Imagery products

Approximately 330 high resolution photos and a video were gathered by the MSP. Select still images and samples of processed products are included in this section and in the docket for this accident.

A full-resolution orthomosaic .kmz file[1] was developed after the on-scene phase and is included as Attachment 1. Figure 2 shows the orthomosaic overlaid on Google Earth.

Figure 4, Figure 6, Figure 7, and Figure 8 are aerial images captured by the drone. Figure 5 and Figure 9 shows the output snapshots from the 3D model.

Figure 4 – Aerial image of accident site looking in a southwesterly direction (courtesy MSP)

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[1] A .kmz file is a compressed (zipped) file that contains imagery and corresponding keyhole markup language (KML) files in order to view the imagery an associated file information on Google Earth. Pix4D generates a collection of KML files based on the collected drone imagery.
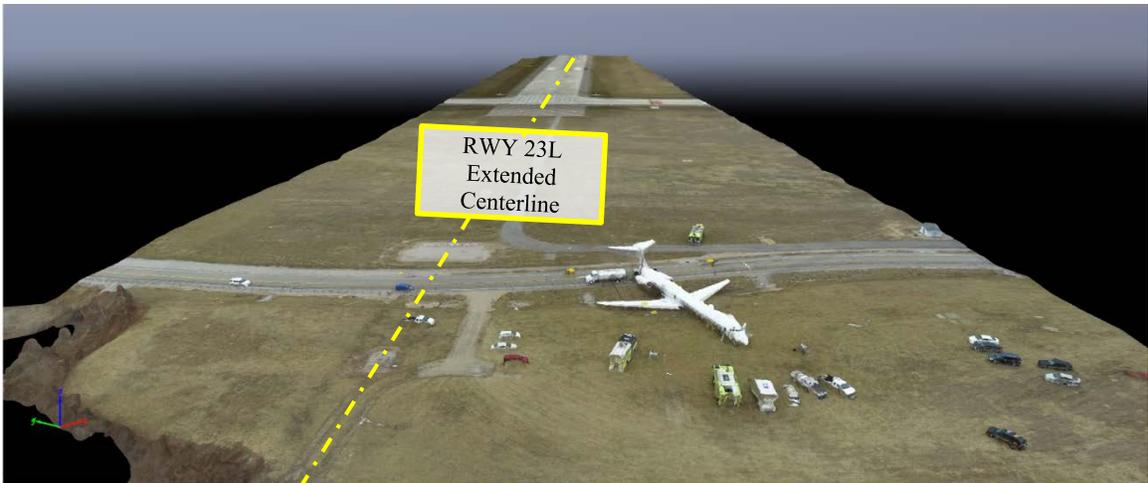
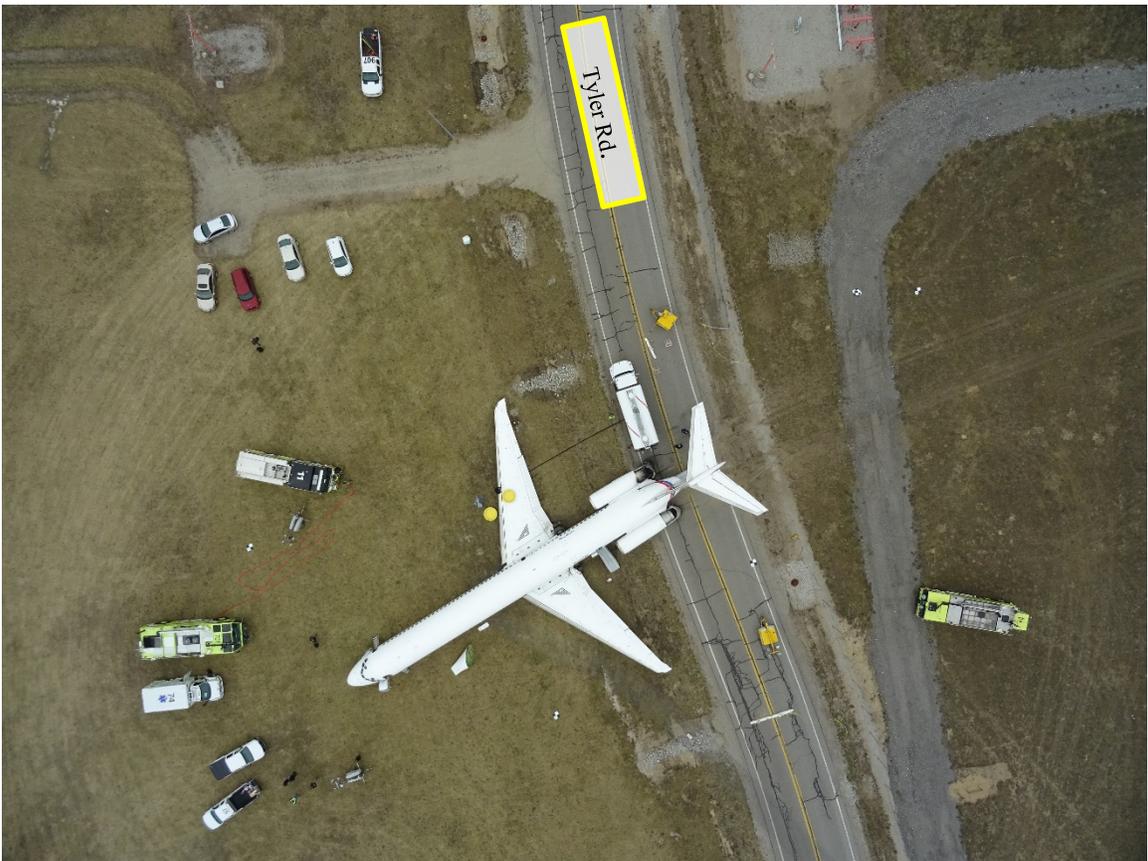**Figure 5 - Snapshot from 3D model of accident site**

Figure 6 - Overhead aerial image of accident site (courtesy MSP)

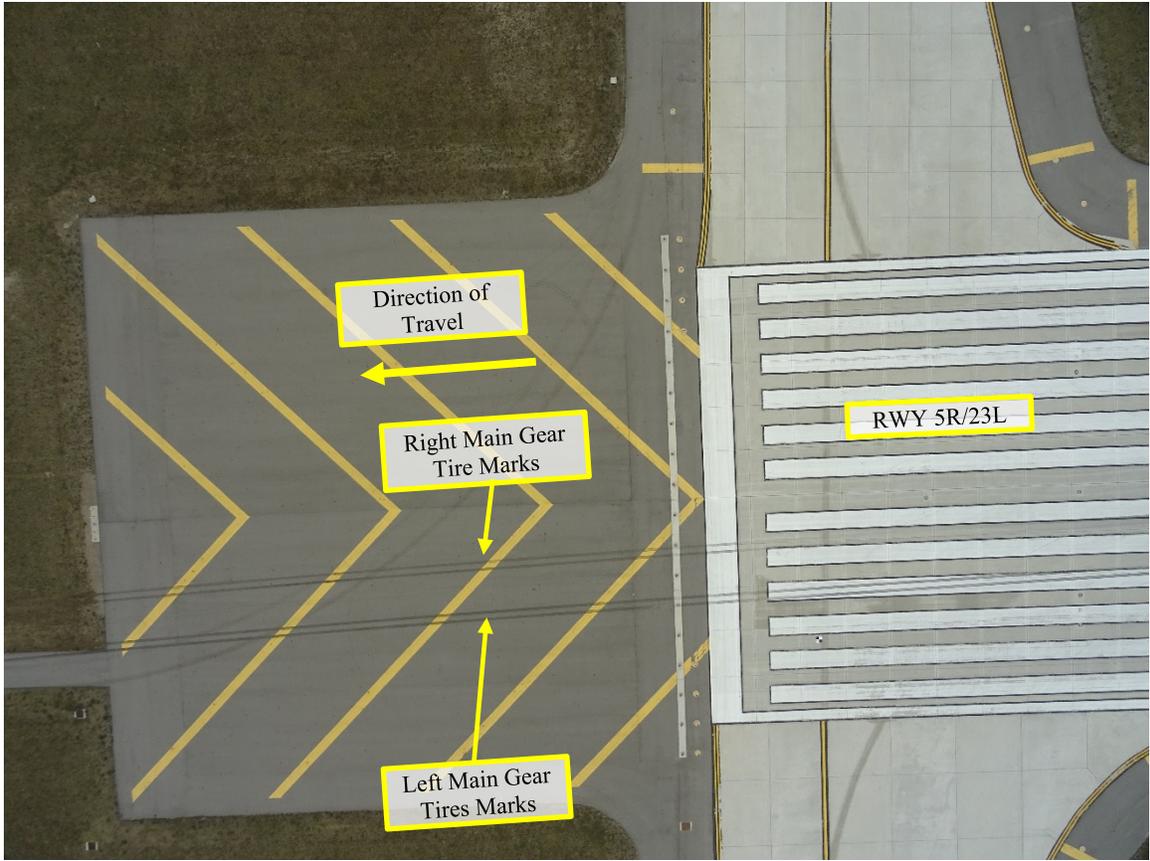**Figure 7 – Aerial image looking southeasterly at accident site**

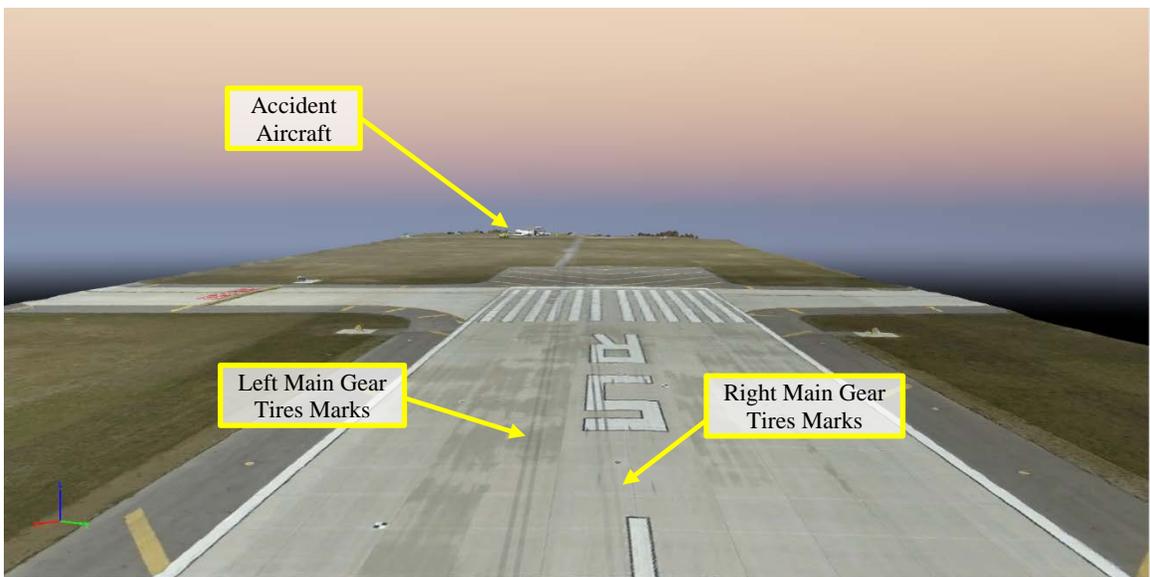**Figure 8 - Aerial image of departure end of RWY 23L and tire marks (courtesy MSP)**

Figure 9 - Snapshot from 3D model of departure end of RWY 23L

3.0   Attachments

Attachment 1 – Accident site Google Earth .kmz export

Attachment 2 – MP4 video of runway and accident site

Attachment 3 – Original Source Image for Figure 4

Attachment 4 – Original Source Image for Figure 6

Attachment 5 – Original Source Image for Figure 7

Attachment 6 – Original Source Image for Figure 8