



NATIONAL TRANSPORTATION SAFETY BOARD
Investigative Hearing

Norfolk Southern Railway general merchandise freight train 32N
derailment with subsequent hazardous material release and fires,
in East Palestine, Ohio, on February 3, 2023

GROUP	B
EXHIBIT	
4	

Agency / Organization

NTSB

Title

**Unmanned Aircraft System Aerial Imagery
Group Chair's Factual Report**

National Transportation Safety Board

Office of UAS

Washington, DC 20594



RRD23MR005

UNMANNED AIRCRAFT SYSTEM AERIAL IMAGERY

Group Chair's Factual report

Table of Contents

A. ACCIDENT.....	3
B. UNMANNED AIRCRAFT SYSTEM AERIAL IMAGERY.....	3
C. SUMMARY.....	3
D. DETAILS OF UAS USE - EQUIPMENT AND PROCEDURES.....	3
1.0 EQUIPMENT.....	3
2.0 PROCEDURES.....	3
3.0 PROCESSING MAIN DERAILMENT SITE.....	5
3.1 Processing of Rail Section.....	7

A. ACCIDENT

Location: East Palestine, OH
Date: February 3, 2023
Time: 2054 Local Time (EST)
Train: Norfolk Southern mixed freight train #32N

B. UNMANNED AIRCRAFT SYSTEM AERIAL IMAGERY

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C. SUMMARY

Refer to the *Crash Information and Crash Summary Report* in the docket for this investigation.

D. DETAILS OF UAS USE - EQUIPMENT AND PROCEDURES

1.0 Equipment

UAS flights were conducted on February 5th, 2023, using a DJI Phantom 4 Pro V2 small Unmanned Aerial System (sUAS), which was equipped an FC6310 camera (with the Sony Exmor 1" CMOS sensor with a focal length of 8.8 mm) and a dual GPS/GLONASS receiver, which provided georeferenced information on all still photographs. Each photograph was captured in jpg format with a resolution of 20 megapixels.

2.0 Procedures

The crash was in the town limits of East Palestine, OH located at coordinates 40.836057N and -80.52387W. The crash was in class G airspace, approximately 7.7 nautical miles east-south-east of BVI Beaver County Airport. The derailed portion of the train was on fire with smoke rising from the rail cars. The smoke was a minor

hazard during flight operations; however, mitigation steps were put into place between the RPIC and VO's. **Figure 1** is an overview map of East Palestine depicting the area of derailment involving hazardous materials.



Figure 1. Modified map of East Palestine showing the area of the derailment involving the hazardous materials. (Source: Ohio ArcGis).

There were three flight missions conducted to support the investigation. The first mission was a video mission flown in the area of the main derailment to capture tank location, tank identification information, and damage information for the Hazardous Materials Group. The sUAS was flown at multiple elevations AGL. The second mission was flown to obtain imagery for the orthomosaic map, the sUAS was flown over the area of the wreckage in manual flight mode at various elevations utilizing both VO's. The final flight mission was flown to obtain imagery for an orthomosaic map of the rail portion where the point of derailment (POD) occurred. The final flight was flown manually at various elevations AGL. Total mission flight time was approximately 38 minutes. **Figure 2** is an image captured from the video flight.



Figure 2. Image from video flight showing the resting positions of several tank cars.

3.0 Processing Main Derailment Site

The sUAS captured 219 high resolution, georeferenced photographs, during flight #2 and 191 for flight #3, suitable for processing in the Pix4D photogrammetry software.¹

The photographs taken using the sUAS were processed using Pix4D to create a point cloud of the subject crash scene location. An oblique view of the 3D point cloud can be observed in **Figure 3**. From the point cloud, a high-resolution orthomosaic image was created the area and can be observed in **Figure 4**.

¹ Pix4DMapper is a photogrammetry software package designed to use overlapping photographic images to generate 3D point clouds. Additional outputs from the generated point clouds include 3D models and 2D orthomosaic maps



Figure 4. Generated Point Cloud of the main derailment site.



Figure 3. Generated Orthomosaic Image of the main derailment site.

Because the sUAS images were georeferenced, the orthomosaic was exported in a .kml file which was imported into Google Earth. The orthomosaic image, when imported, is layered atop Google Earth. **Figure 4** is an image of the orthomosaic image overlaid atop Google Earth.



Figure 5. Modified Google Earth image with the created orthomosaic image overlaid on top of the map.

3.1 Processing of Rail Section

The area where the derailment began was identified by NTSB investigators and the sUAS team was requested to document the area. The same process as above was utilized for processing in the Pix4d photogrammetry software. The resulting point cloud of the rail section can be seen in **Figure 6**.

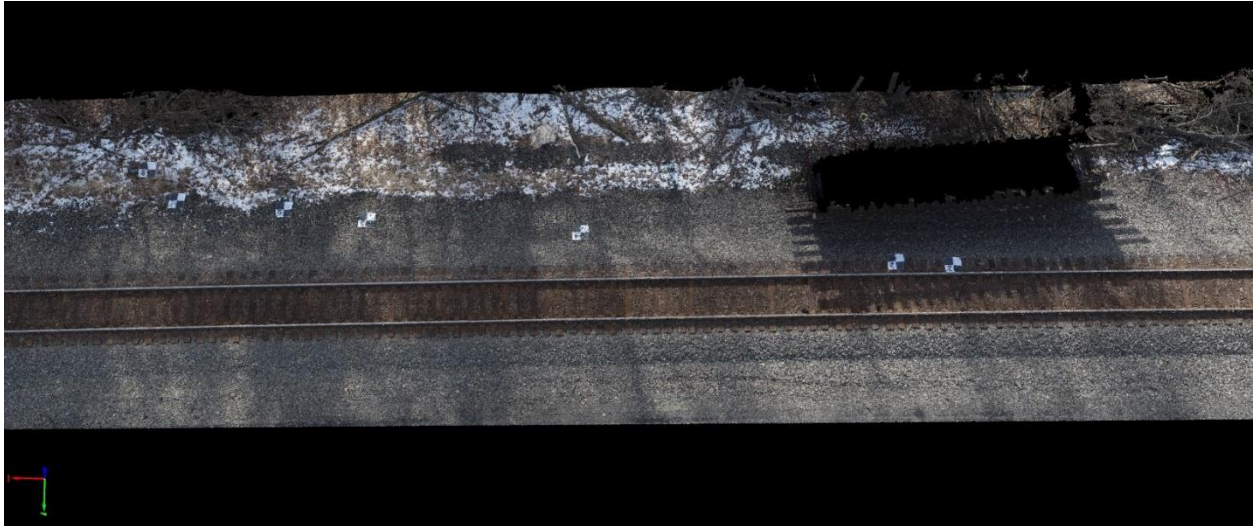


Figure 6. Generated Point Cloud of the section of rail where the derailment started.

Submitted by:

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