

# National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials Investigations

Washington, DC 20594



RRD25FR006

## **UNMANNED AIRCRAFT SYSTEM AERIAL IMAGERY**

Specialist's Factual Report

February 20, 2025

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sensor<sup>3</sup>. Videos are captured in MP4 format and photographs in JPEG. A 4K UHD resolution is standard for both photos and video application.

## 2.0 Procedures

A total of four missions were conducted utilizing the sUAS to capture the incident scene. The incident occurred on February 6, 2025 at about 5:56 p.m. just south of the Crum Lynne SEPTA station platform on Amtrak's Northeast Corridor, dedicated SEPTA track, Track 4. The fire on the regional rail train was discovered moments after the train had departed the station to continue southbound towards Newark, New Jersey. At the time of the incident, there were 350 passengers and 4 crew members on board.

The drone flights were conducted in a combination commercial-residential area adjacent to the railroad property and commercial warehouses. The incident location was located at coordinate system 39.86963193 Easting, -75.33241123 Northing. The area of Ridley Park is located approximately 4 miles away from Philadelphia International Airport, within Class B airspace. A Low Altitude Authorization and Notification Capability (LAANC) was available and requested by the RPIC. The LAANC, authorization number ALTLJQ1QD7P0, was approved for February 8, 2025 with a time period from 8:15 a.m. to 10:15 a.m. with clearance to fly at an altitude no higher than 200 feet above ground level (AGL). See **Figure 1** below.



**Figure 1** Aeronautical chart depicting the incident area in relation to the airport, PHI. (Source: FAA Sectional chart)

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<sup>3</sup> CMOS (complementary metal-oxide semiconductor) converts light into electrical signals to create digital images.

The day before the aerial operations, The RPIC met with representatives from Amtrak and SEPTA to discuss the upcoming aerial operations. During the meeting, the parameters of the missions were discussed, as well as any hazards and areas of concern. A canvass of the scene was performed to verify the location of the points of interests and to pre-plan the mission in Pix4D Capture Pro, the autonomous mapping software program used by the sUAS. On the scene, the RPIC confirmed that the overhead Catenary system would not cause any undue hazard to the operation. The Catenary system is a system by which overhead wires supply electricity to the train as it passes by use of a pantograph, a roof mounted apparatus, designed to collect electricity. The system uses an elevated metal platform, to suspend the high tension wires overhead. It was determined that neither the overhead wires nor the catenary support structures created any safety concerns for the missions. There were no significant terrain or environmental conditions.

The night before the mission, the RPIC and the Senior RPIC received a weather briefing from the NTSB Drone Team's Meteorologist. The weather forecasted for the morning was cloudy, with a ceiling of 10,000 feet down to 3,000 feet with winds, 5- 10 miles per hour gusting to 15 miles per hour above 100 feet until 1:00 p.m.

On the scene, the day of the mission, a crew briefing was held to go over the mission parameters, intended outcome, time allotted, emergency procedures and the identification and confirmation of the hazards present. As well as verification of flight authorization (LAANC) and any applicable restrictions. Earlier, members of the NTSB investigative team and party members toured the scene. These individuals left the scene prior to the commencement of any sUAS flights. The sUAS was not flown directly over any persons, not related to the operation, or vehicles. The flights were conducted under 14 CFR 107.

### **3.0 Processing**

To obtain the aerial imagery, the flights were conducted in several segments. The first two segments were flown in a double grid autonomously using Pix4D Capture Pro to capture images for the 2D orthomosaic and 3D point cloud. The third mission was flown in a double grid pattern but manually to capture additional images for a more detailed diagram. The camera was set to nadir, which is a 90 degrees down angle to capture more ground level detail. Lastly, a video was captured showing the incident area to include the location of the final rest position of the train and back to the Crum Lynne SEPTA station platform. A total of 244 images were captured along with 251,754 KB of video, lasting one minute which showed an aerial view of the scene.. During all phases of the flights, the Senior RPIC acted as the visual observer.

After the images were captured, the RPIC used a EmLid Reach RX GNSS device to obtain GPS/Real Time Kinematics (RTK) data. **Table 1** details the ground control points (GCPs), their coordinate location, ellipsoid height<sup>4</sup> and reference notation. The images were loaded into Pix4D Matic software program to create the point cloud and an overall 2D orthomosaic of the incident area. The scene encompassed the Crum Lynne SEPTA station platform and the approximately 1,800 feet in about 1 minute, the train traveled before coming to a stop and the fire was discovered. The evacuation of the train passengers was performed just south of the railroad bridge overpass for West Chester Pike in Crum Lynne, Ridley Park, PA. **Figure 2** is a screen capture of the 2D orthomosaic with the GCPs displayed. The ground control points (GCPs) displayed in yellow note basic landmarks used to gather RTK data. GCPs in red show the locations where emergency responders accessed the track area. The blue GCPs identify specific locations relative to the lead train car and the fire.

**Table 1 GPS/RTK Data**

GCP	Easting	Northing	Ellipsoid	Description
1	2647431	205595.7	-59.14	NW End
2	2647309	205315.7	-61.235	W stair
3	2647504	205577.2	-61.211	NE End
4	2647439	205444.8	-60.354	E stair
5	2647362	205161.2	-76.752	Ketcham
6	2647186	204763.3	-79.819	S Ketcham patch
7	2647191	204756.6	-79.824	S arrowhead corner
8	2647205	205111.1	-65.131	N fence hole
9	2647064	204746.5	-64.669	S fence hole
10	2647046	204696.9	-65.049	Blower
11	2647027	204660.7	-64.982	L fence mark
12	2647028	204654.9	-65.291	Front of train

<sup>4</sup> Ellipsoid height is the vertical distance between a reference and the hypothetical shape of the earth at means sea level (MSL).

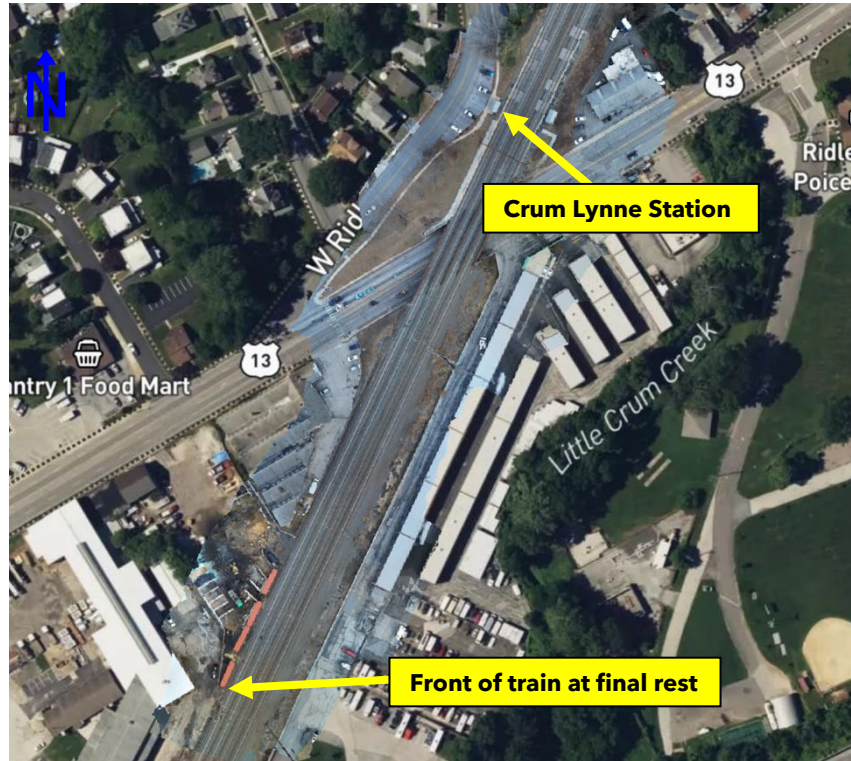


**Figure 2** Screen capture of two-dimensional orthomosaic showing the location of the ground control points within the incident scene.

The process of orthorectification<sup>5</sup> was achieved by overlaying the 2D orthomosaic onto a Google Earth image to provide an accurate depiction of the incident scene with map references to landmarks such as major state roadway. **(see Figure 3)**

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<sup>5</sup> Orthorectification- the process by which an imagery is corrected for optical distortion and the effects of terrain.



**Figure 3** Two-dimensional orthomosaic overlaid onto a Google Earth image of the area with points of interest highlighted.

A three-dimensional point cloud was also generated to show the scene from the height and in the direction of travel for the Septa train. (see **Figure 4**)



**Figure 4** Screen capture of the three-dimensional point cloud of the scene shown in the direction of travel of the incident train, with the southbound Crum Lynne SEPTA train station on the right side in the foreground and the final rest position for the train in the background.

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