DRONE USE DURING THE AMTRAK CASCADES DERAILMENT AND RESPONSE

BACKGROUND

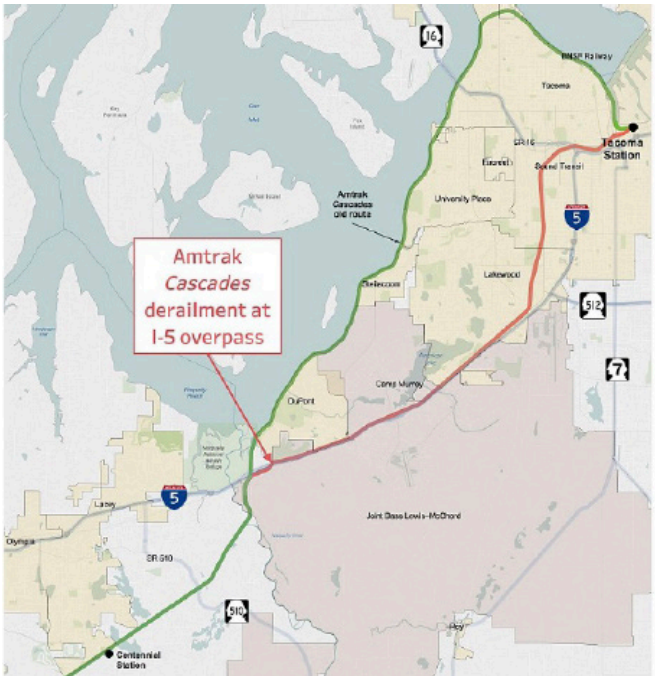
On the morning of December 18, 2017, Amtrak train 501 derailed near DuPont, Washington, causing railcars and one locomotive to fall onto Interstate 5 (I-5), hitting several passenger cars and shutting down the freeway. I-5 southbound was ultimately blocked for 57 hours, an impressive accomplishment considering the necessity of surveying the incident for the investigation by the National Transportation Safety Board (NTSB), the process of removing a 270,000 pound locomotive, and the need for inspections and repairs before the area was cleared to open. Approximately 65,000 vehicles per day had to be diverted on this southbound route and forced onto local roads and highways.

While efficient clearance time was due in large part to the pre-planning and communications efforts by the I-5/Joint Base Lewis-McChord (JBLM) Corridor Joint Operations Working Group (see case study), the use of drone technology to collect crash data significantly reduced the time needed to open up the road.

NTSB ROLE IN INCIDENTS

The National Transportation Safety Board was established in 1967 to conduct independent investigations of major accidents in the United States in all modes of transportation. Investigations commence with the arrival of a "Go Team" that has the ability to investigate a major accident, at the scene, as quickly as possible.

> In the case of rail or highway incidents, the investigative team relies on gathering information at the scene and often no debris can be moved until the scene is effectively mapped and key information is collected. In the case of a derailment onto a major highway, as with the Amtrak 501 derailment on to I-5, the need to quickly and accurately gather evidence is a key component in the ability to clear the roadway and resume normal traffic.



DATA COLLECTION PROCESS AFTER THE CRASH

Following the Amtrak derailment and closure of I-5, the Washington State Police (WSP) utilized unmanned aerial vehicles (UAVs) to collect the information required for the NTSB investigation. Two detectives deployed 1 UAV on a total of 25 missions, collecting 1.1 billion points of data within about 5 hours. Additionally, 3D scanners were also deployed: southbound on I-5 from Highway 116 towards the trestle and then another group ran northbound. The 3D scanners allowed WSP to go under the trestle, between the cars and down the hillside.

A pilot project was started in July 2017, enabling WSP to map collision and crime scenes using this information. Data is gathered in the unit itself, then the detectives download via Pix4D (the point cloud) and then from there they go through the process of turning it into a legible diagram. In this scenario, detectives combined the UAV telemetry and laser points from

the 3D scanners to generate 476 million measurable points. What would normally take a couple of days to investigate, instead took five hours, allowing for the locomotive and debris to be moved quickly and the road to be opened within 57 hours.

The overall activities of the pilot project demonstrated that the average on-scene processing time with the UAV was 36 minutes as opposed to an average of nearly 180 minutes with traditional tools. Additionally, the 3D scanner and UAV gathers not just the evidence assumed to be important but maps the entirety of the crash and provides information that may be deemed useful at a later time.

POTENTIAL UAV DATA USES

The successful deployment of this new technology also yields potential cost savings by using the data set multiple times. After hearing about the WSP deployment, the team at the National Operations Center of Excellence identified the following possible uses for the collected data:

1. Sharing the information with engineers to understand structural needs/damage after the incident
2. Analyzing for design considerations for future projects
3. Augmenting investigation requirements by providing a plethora of data points

The importance of rapidly increasing clearance time and providing detailed evidence is extremely important but widespread adoption of UAV data collection by other agencies will only increase how this technology can be used. Pilot projects, like those undertaken by WSP, not only provide invaluable tools during major incidents, but will also allow for broader understanding of the potential uses of this technology.

FURTHER INFORMATION

WSDOT Q&A Website: www.wsdot.wa.gov/Rail/questions-answers-derailment

NTSB Website: www.ntsb.gov

Case Study: Corridor Wide Planning Ahead of the Amtrak Cascades Derailment

[1] *https://www.ntsb.gov/investigations/process/Pages/default.aspx*