

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

April 26, 2018

Onboard Image Recorder

Specialist's Factual Report
By Jane Foster

1. EVENT

Location: Chattanooga, TN
Date: November 11, 2016
Aircraft: 2008 Thomas Built Industries School Bus,
Operator: Durham School Services LP of Warrenville, IL
NTSB Number: HWY17MH009

2. GROUP

A group was not convened.

3. SUMMARY

For a summary of the accident, refer to the *Crash Summary Report*, which is available in the docket for this investigation.

4. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following device:

Recorder Manufacturer/Model: **Seon Hard Drive Image**
Recorder Serial Number: **n/a**

4.1. Recorder Description

The Seon Image Recorder had three interior facing cameras on the school bus. Camera one was on the front of the bus facing back, camera two was over the driver facing the door of the bus, and camera three was on the rear of the bus facing forward. After the accident, camera one was damaged and the other two cameras remained functional.

4.2. Video Files

Three video files were found to be pertinent from the three interior cameras. The videos show the occupants getting on the bus, the accident trip, and the response

of emergency personnel. They also show a lot of activity while the bus is moving: occupants crawling around, hanging or reaching across the aisle, standing up, facing the back of the bus, kneeling, facing out the window, sitting inward and backwards, laying down in the seats, and some sitting forward. During the evacuation sequence, smaller occupants exited through the rear window, and larger occupants exited through the roof hatch.

4.3. Timing and Correlation

The video time was correlated to the GPS time based on when the door opened and closed. The time offset was 1:42:16 (HH:MM:SS). Time was aligned using the formula below:

Incident Video Time – 1:42:16 = Actual Time EST

Possible timing errors include the delay of the recording of the GPS and +/- 1 second for visual error in recording of the doors opening and closing.

4.4. Summary of Recording Contents

In agreement with the Investigator-In-Charge, a video group did not convene, and a summary report was prepared with a transcript of pertinent events. A seating chart showing the locations of the occupants prior to impact can be found in the *Survival Factors Factual Report*.

4.4.1. Video Transcript of Accident Sequence

Two separate video transcripts were prepared. Table 1 specifically documents when the driver’s cell phone was visible. Table 2 documents activities determined to be part of the crash sequence and initial emergency response.

Table 1. Cell phone visibility during video.

Time (EST)	Activity
15:10:13	Video starts, driver has iPhone in his hands horizontally with two hands on either side of the screen, with the screen facing him, consistent with viewing or recording, during the student boarding process
15:10:29	Phone and driver’s hands depart the viewing area
15:11:49	Phone and driver’s hand return to viewing area holding screen horizontally facing the driver, students have loaded on the bus, door is still open
15:11:50	Phone and driver’s hand depart the viewing area
15:14:20	Bus stopped with doors open, driver stopped with hand up to face consistent with holding phone to his face
15:14:52	Driver removes hand from face, bus is still stopped with doors open
15:15:04	Driver walking towards back of bus with phone in his left hand, held in front of his waistline

15:15:30	Phone leaves field of view
15:15:53	Driver seated with phone in hand vertically with screen facing driver, manipulating phone
15:16:15	Phone exits field of view
15:16:23	Corner of Phone enters field of view for one frame
15:16:28	Corner of Phone enters field of view for one frame
15:16:29	Phone held to the right of driver's head away from ear
15:16:32	Phone exits field of view

Table 2. Video Transcript of accident sequence and initial emergency response.

Time (EST)	Activity
15:18:45	One occupant's hands start to go up
15:18:51	Three occupants' hands are up
15:18:55	First movement of occupants in the front of the bus towards the right side of the bus
15:18:56	First movement of occupants in the back of the bus towards the right side of the bus
15:18:57	Occupants shift towards the left
15:18:58	One occupant sits down in the aisle in the seventh row
15:18:59	Occupants shift towards the right
15:19:00	Occupants shift towards the left
15:19:01	Occupants shift towards the right
15:19:05	Significant, forceful shift of occupants to the left
15:19:06	Fourth frame: girl seated in 9D gets thrown into aisle Sixth frame: 9D thrown to floor in aisle Seventh frame: boy seated in 10D thrown to seat 10C across aisle Ninth frame: 10D now in 10A
15:19:07	Several occupants cross the aisle
15:19:08	One occupant remaining on the left side of the bus sitting upright facing forward, one occupant remaining on the left side of the bus sitting backwards, everyone else slumped or on right side of bus
15:19:09	Camera 1 Second frame: camera freezes, approximately 5 occupants in aisle, about 6 occupants remaining in the left side seats, rest on right side seats Camera 2 Door facing camera shifts viewpoint (potential first impact with pole), Second frame: driver thrown to right edge of seat Third Frame: camera freezes Camera 3

	Second frame: approximately 5 occupants in aisle, others shifted from their seats towards right side of bus Third Frame: approximately 4 occupants in aisle, others shifted to the left side of the bus Fourth frame: approximately 5 occupants in aisle, shifting back to right side bus
15:19:10	Cameras 1 and 3 stop working due to impact.
15:19:12	Camera 3 starts working
15:19:13	Some seat cushions displaced, roof exit hatch open
15:19:18	Driver still belted
15:19:19	Driver releases belt and egress from vehicle begins
15:19:37	First occupant successfully exits rear roof hatch
15:19:39	Driver returns to bus through front windshield
15:19:46	Last occupants exit the front of the bus (11 passengers 1 driver), driver remains in front of bus
15:20:11	Bus driver leaves front of bus
15:20:35	Last occupants (9 occupants: four via window, five via roof hatch) exit the rear of the bus that do not need formal extrication from the rear exit
15:20:50	Bus driver enters through rear emergency exit (first use of rear exit door)
15:21:34	Driver exits rear of bus, tries and cannot extricate any remaining occupants
15:23:25	Driver enters front of bus through windshield
15:23:27	Bystander 1 with medical gloves enters rear of bus
15:23:33	Driver exits front of bus through windshield
15:24:07	Bystander 2 enters rear of bus
15:24:11	Two law enforcement officers enter front of bus
15:24:35	Bystander 3 enters rear of bus
15:25:37	One law enforcement officer enters rear of bus
15:25:46	One law enforcement officer enters rear of bus
15:27:31	One law enforcement officer exits rear of bus
15:27:37	One law enforcement officer enters rear of bus
15:27:49	Bystanders 2 and 3 exit rear of bus
15:29:32	One law enforcement officer exits front of bus through windshield
15:30:03	One law enforcement officer exits front of bus through windshield
15:30:08	One law enforcement officer enters rear of bus
15:31:10	One EMS person enters through roof hatch
15:31:46	One firefighter enters front of bus through windshield
15:32:24	One law enforcement officer enters front of bus through windshield

	One law enforcement officer exits rear of bus
15:33:46	One law enforcement officer exits front of bus through windshield
15:33:49	One firefighter exits front of bus through windshield
15:33:53	One firefighter enters front of bus through windshield
15:34:09	Pediatric sized cervical collar handed through rear roof hatch
15:35:09	Firefighter enters rear of bus
15:35:22	Cutters handed to Fire Department through rear of bus
15:44:49	First passenger evacuated on backboard through front windshield by emergency personnel
16:01:02	Fatality freed from intrusion zone
16:01:05	Second occupant evacuated on backboard through rear exit door by emergency personnel
16:15:30	Video ends for cameras 2 and 3