

**NATIONAL TRANSPORTATION SAFETY BOARD**  
Vehicle Recorders Division  
Washington, D.C. 20594

October 7, 2004

**Video Study - ADDENDUM**

NTSB Accident Number:  
**DCA02MA001**

by **Douglass P. Brazy**

**A. ACCIDENT**

Location: Belle Harbor, NY  
Date: November 12, 2001  
Time: 9:16 a.m. Eastern Standard Time  
Aircraft: Airbus A300-600, N14053  
Operator: American Airlines

**B. GROUP**

N/A

**C. SUMMARY**

On November 12, 2001, an Airbus 300-600 experienced a loss of control upon initial climb-out and crashed into a residential area in Belle Harbor, New York. Initially, the NTSB had received a VHS copy of video recordings recovered from a local surveillance system that had captured images of the accident airplane during a portion of its flight. This initial copy tape contained demultiplexed video mages from six different cameras. Two of these cameras had captured the airplane while still in flight. Of the remaining four cameras, three of them

had captured images of smoke rising on the horizon. The last camera did not appear to have any information relevant to the accident.

On May 24<sup>th</sup>, 2004, the Federal Bureau of Investigation returned a set of two original VHS tapes<sup>1</sup>, and one 'first generation' VHS copy tape to the owner of the video surveillance system, the Triborough Bridge and Tunnel Authority (TBTA). The NTSB in turn retrieved these three tapes from the TBTA on May 26<sup>th</sup>, 2004. Photographs of these tapes and the accompanying property receipt are in Attachment I.

The original tapes were processed and reviewed in the NTSB Vehicle Recorder laboratory in Washington D.C. The original tapes provided higher quality images than those on the initially received copy tape, which were examined and used in the Video Study Report, dated April 2, 2002. The most apparent difference was in the brightness/contrast levels of the images. See Figures 1 and 2 below.



**Initially received Copy tape**



**Original Tape**

**Figure 1 – Comparison of images from Lane 1 Camera**

<sup>1</sup> The surveillance system uses multiple VCR's, which record different camera views and operate concurrently.



**Initially Received Copy Tape**



**Original Tape**

**Figure 2 – Comparison of Images from Lane 5 Camera**

Figures 1 and 2 are provided as a comparison between the images that were extracted from the initially received copy tape and those extracted from the original tape, from two different camera views.

The location of the airplane is indicated with a white arrow. The timecode in the lower left corner of the images from the original tape was added to each image after it was digitized in the computer. The format is in (hours):(minutes):(seconds):(frames):(field indicator). This timecode is an arbitrary elapsed time indicator used to mark each video field and does not reflect the time of day.

During review of the original tapes, two additional camera views were found to have captured the airplane while in flight. These views were not included on the copy tape initially received by the NTSB in November of 2001. Examples of images from these additional views are in Figures 3 and 4 below.



**Figure 3 – image extracted from additional camera view (Lane 3)**

Figure 3 is an image extracted from the original tape labeled “Multi B”, from a camera that was not included on the initially received copy tape. In this image, the airplane is visible through the window in the tollbooth, and is denoted by the white arrow. In the entire sequence of images from this camera, the airplane can be seen traveling from left to right at a slight upward angle as it traverses the width of the window frame, before it becomes obscured by the tollbooth. Later, the airplane can be seen for two to three successive images in the area denoted by the yellow circle, before it descends behind the building. Shortly thereafter, a small portion of the “streak”<sup>2</sup> can be seen along the roofline of the building. The camera is located in lane 3 of the toll plaza<sup>3</sup>.

<sup>2</sup> The “streak” is documented and described in the [Video Study Report](#)

<sup>3</sup> There are a total of 10 parallel lanes at the toll plaza. Lanes are numbered using odd numbers only (1, 3, 5, etc) with Lane 1 being the most northerly/easterly lane closest to the administration building. Camera locations (lane number) were determined by reviewing several different camera views of specific vehicles as they passed through the toll plaza. A diagram of the toll plaza can be found in Attachment I.



**Figure 4 - image extracted from additional camera view (Lane 13) at the start of the “streak”.**

Figure 4 is a still image extracted from the original tape labeled “Multi D”, from another camera located in Lane 14 of the toll plaza, that was not included on the initially received copy tape. The view from this camera is similar to the one from Lane 5. In this camera view, the airplane travels from left to right and is descending. Like the view from Lane 5, the streak can be seen trailing behind the airplane as it descends. This camera is located in lane 13 of the toll plaza.

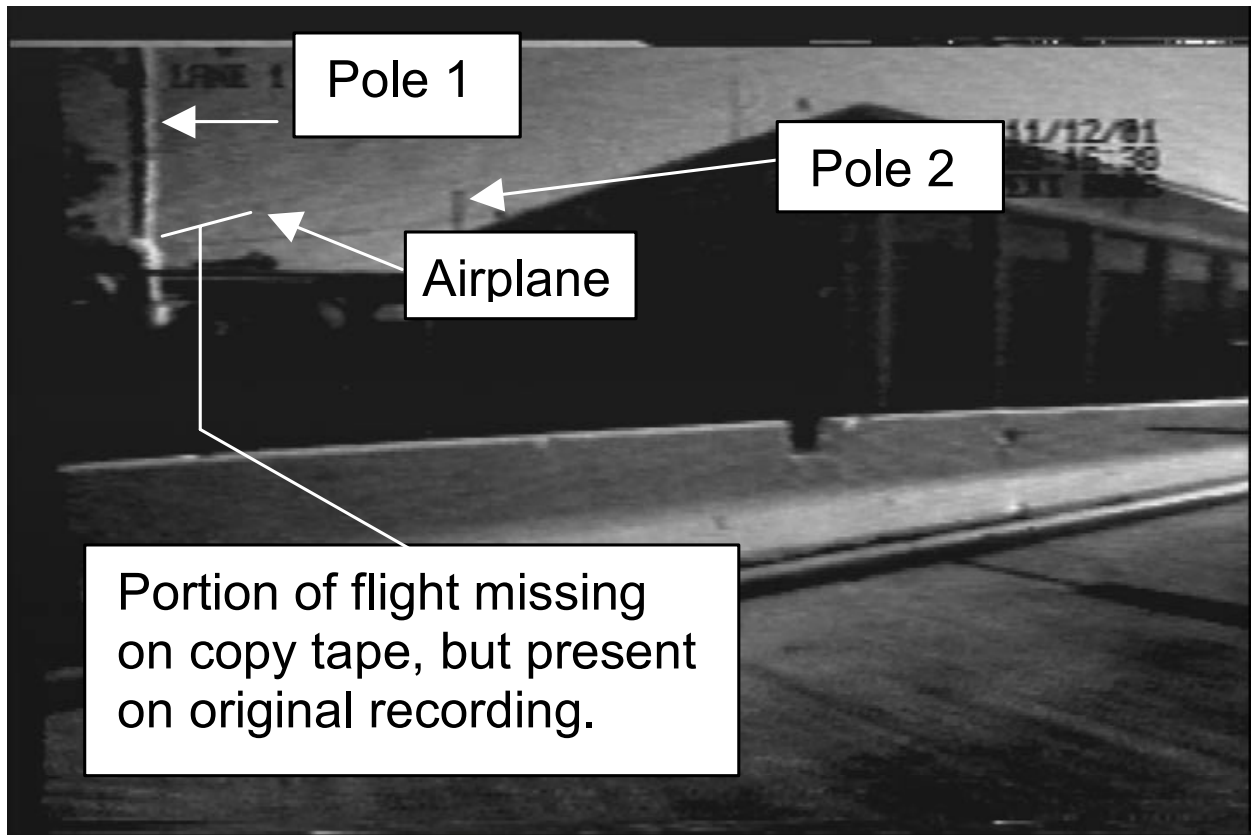
Review of the original tapes revealed that the surveillance system had captured a

longer portion of the flight than was present on the initially received copy tape. See Figures 5 thru 7 below.



**Figure 5 – First time the airplane is in view in the *original recording* (view from Lane 1)**

Figure 5 is the first image in which the airplane is visible on the *original recording*. It is just emerging from behind Pole 1 in the view from Lane 1 at this time. In comparison, Figure 5a below is the first image in which the airplane is in view on the *initially received copy tape*.



**Figure 5a – First image recovered from *initially received copy tape* (view from Lane 1)**

Figure 5a is the first image present on the initially received copy tape. The airplane is traveling from left to right in the view, and is already about 1/3 of the way between Pole 1 and Pole 2.

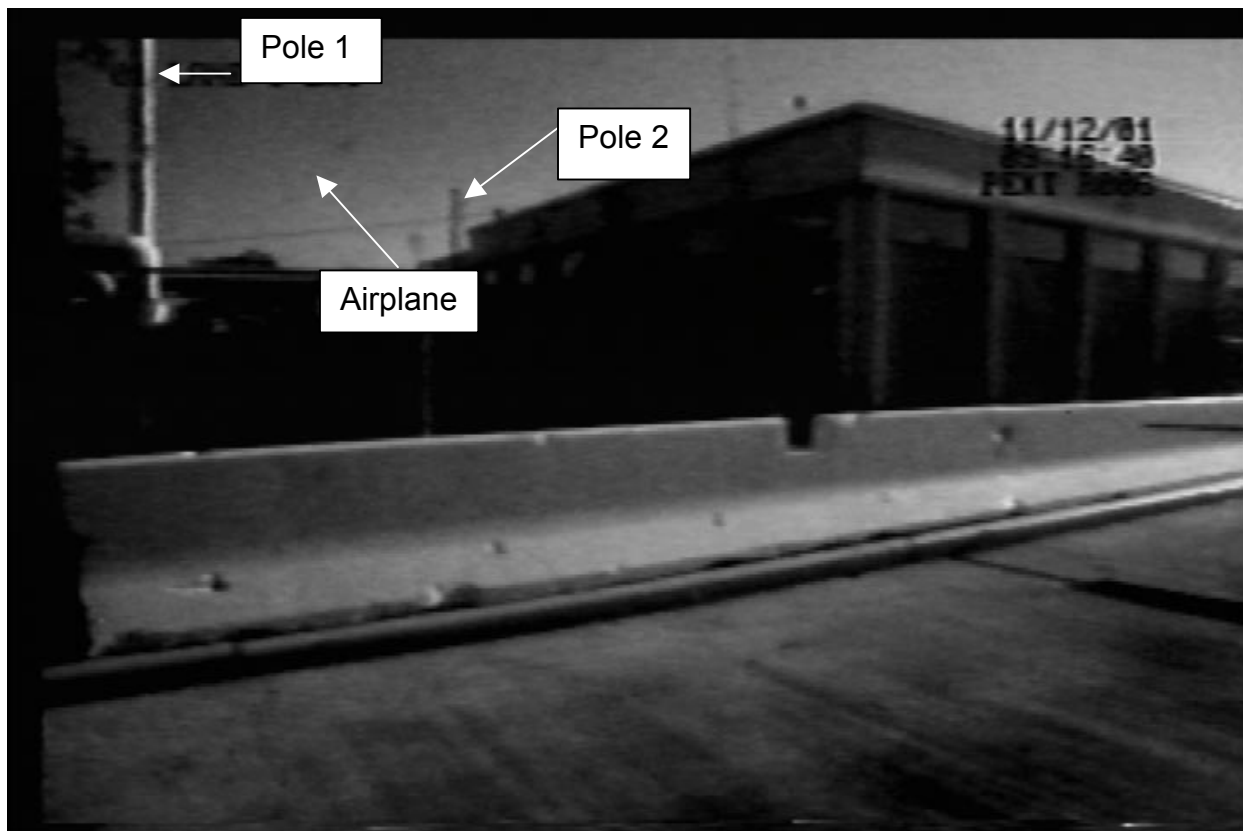
The initially received copy tape also contained some noise/distortion starting immediately after the image in Figure 5a, and lasting about 2 seconds. An example of the noise can be seen in Figure 6 below. This distortion was not present on the original recording.



**Figure 6 – Example of video noise on initially received copy tape (view from Lane 1)**

After the 2 seconds of distortion, the airplane then becomes visible again, and is about  $\frac{1}{2}$  of the way between Pole 1 and Pole 2. See Figure 7 below.





**Figure 7 – First image after the noise/distortion ceases on the initially received copy tape (view from Lane 1)**

Figure 7 is the first image available on the initially received copy tape after the period of noise/distortion ends. Comparing Figure 7 to Figure 5, the airplane can first be seen about 9 ½ seconds earlier on the original recording (in Figure 5), as it emerges from behind Pole 1. (see the Video Study Report, Page 8, figure 3 for landmark references).

Review of the original recording revealed a newly discovered camera view from Lane 13 (Figure 4 above). In the initial copy tape, the airplane was last seen as it descended behind a building in the Lane 5 camera view. In newly discovered Lane 13 view, the airplane is visible for about 1 ½ to 2 additional seconds before it is obscured by a traffic light in the foreground. See Figure 8 below.



**Figure 8 – Airplane descends behind traffic light in the foreground (view from Lane 13)**

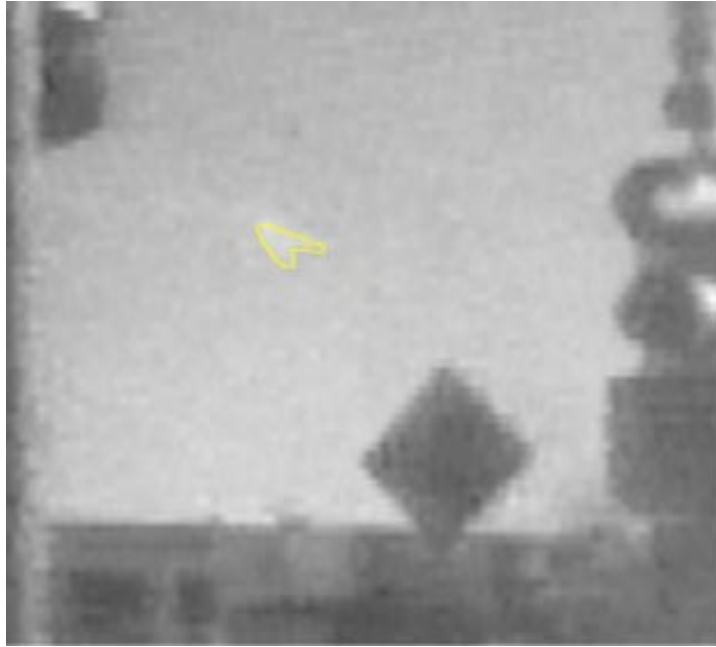
The review of the original tapes, including the additional camera views and the increased duration of time during which the airplane was visible, did not reveal any new information that would affect the results previously set forth in the Video Study. One of the newly discovered camera views (Lane 13 view) provides a somewhat 'better' view of the streak than did the Lane 5 view from the initially received copy tape. The start of the streak is more defined in terms of the contrast difference between the streak and the background of the sky (as seen in Figure 4). Further, as the streak initially develops, it briefly appears as if it may be forming a bifurcation (see figures 9, 9a, and 9b below).



**Figure 9 - image extracted from additional camera view (Lane 13)**



**Figure 9a – 200% zoom /crop of image in Figure 9**



**Figure 9b – same image as figure 9a, with streak shape outlined in yellow**

#### **D. DETAILS OF INVESTIGATION**

##### **Multiplexed and demultiplexed recordings**

Multiplexed recordings combine the video from many sources and assemble them into a single video signal that can be recorded on standard video equipment. A single image is sampled from one camera, then the next camera, and so on. The sampling order (for example camera 1, then camera 6, then camera 2, etc) and frequency at which each image is recorded can be either constant or varying. The resulting recording appears “jumbled” when played back on standard video equipment, as each sampled camera view flashes by in  $1/30^{\text{th}}$  of a second (duration of a video frame) or  $1/60^{\text{th}}$  of a second (duration of one half of a video frame, called a field), in what appears as some random order. These types of recordings can be demultiplexed using special equipment. Often the same device that was used to multiplex the multiple sources can be used to demultiplex the video signal. The demultiplexing device can be configured to display only those images from a single camera,

and output only those images to another VCR for recording. Typically when this is done, each image is repeated or held until the next “new” image is detected in the multiplexed stream, creating a “stop motion” type effect as the video is viewed. This maintains the correct elapsed time or “real time” as the stream is viewed or dubbed onto another tape.

The Vehicle Recorders Division received three VHS videotapes from the TBTA. Two of them were original tapes (one from Multiplexer “B”, the other from Multiplexer “D”, at the Marine Parkway Bridge). Each original tape contained multiplexed images from 16 different cameras (for a total of 32 unique cameras). The third tape was a demultiplexed copy tape containing views from 6 selected cameras. All three tapes were T-160 length.

### **Original Multiplexed Tapes**

Labels on both original tapes indicated that they captured video between times 0645 and 1500 on November 12, 2001. One tape was labeled “MPB Multi B”, the other “MPB Multi D”.<sup>4</sup> Both original tapes were recorded at the “SLP” VHS tape speed. About 1 hour of elapsed time (about half an hour before through half an hour after the accident) from each tape was extracted in the NTSB laboratory, and digitized in an uncompressed video format to a computer-based video processing workstation. The analog video signal from the VHS playback machine was not adjusted for the copy process, other than passing through a time base corrector to ensure signal stability.

Each 1 hour long segment was further narrowed down to a window of about five minutes of elapsed time surrounding the time of the accident, in order to reduce the computer processing time for the demultiplexing process. This particular surveillance system records a total of 60 images per second in a multiplexed stream of NTSC video fields, sampled from the set of 16 different cameras, for each VHS tape. A five-minute segment of video from one tape equates to about 18,000 images. A software based demultiplexing tool was used to sort the recordings into individual camera views. This tool indexes each individual video field image in sequence and sorts them based on similarity of content within

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<sup>4</sup> This nomenclature is consistent with information documented in the Video Study, identifying video surveillance equipment (Multiplexers ‘B’ and ‘D’) in use at the Marine Parkway Bridge.

the image. A sample image is selected from each unique camera view as a reference, and the tool compares each image to the reference set, and attempts to sort them accordingly.

All of the camera views recorded on the “Multi B” tape were recorded in black and white. Most of the cameras views from the “Multi D” tape were recorded in black and white, but a few were in color. Since the two cameras of interest (new views capturing the airplane in flight) were both black and white, both original tapes were transferred to the uncompressed digital video format using the black and white setting on the playback VCR.

### **Demultiplexed copy tape**

The demultiplexed copy tape received in May 2004 was essentially a duplicate copy of the same excerpts that were on the initially received copy tape (the original recordings noted above were used for all analysis). All images on this tape were black and white. The demultiplexed tape was recorded at “SP” speed.

## Timing

Prior to demultiplexing the video from both original tapes, an arbitrary elapsed time clock was added to the lower left corner of both the digitized uncompressed video files (one file for each original tape). This clock can be used to uniquely identify each video image. The clock format is:

hours:Minutes:Seconds:Frames [field indicator].

The field indicator is a small triangle icon that indicates which video field (upper or lower) the image was stored in. Two fields comprise one video frame. The triangle points down for the lower (first) field, and up for the upper (second) field. The clock assumes that the multiplexed video signal conforms to the standard NTSC frame rate.

Additionally, the two separately recorded original tapes were synchronized using the elapsed time clock, by comparing an event common to both recordings. Two separate cameras, one on each recording, captured the “streak” at the time that it first became visible. The elapsed time clock in the lower left corner of the video images was offset so that the streak first appears at precisely the same time in both camera views, effectively synchronizing the two separate recordings to the same clock. In order to compare these elapsed times to the Federal Aviation Administration’s New York Air Traffic Control Clock<sup>5</sup>, add 12:44:45.6 to the times elapsed times printed in the lower left corner of the images from the original tapes.

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NTSB Vehicle Recorder Division

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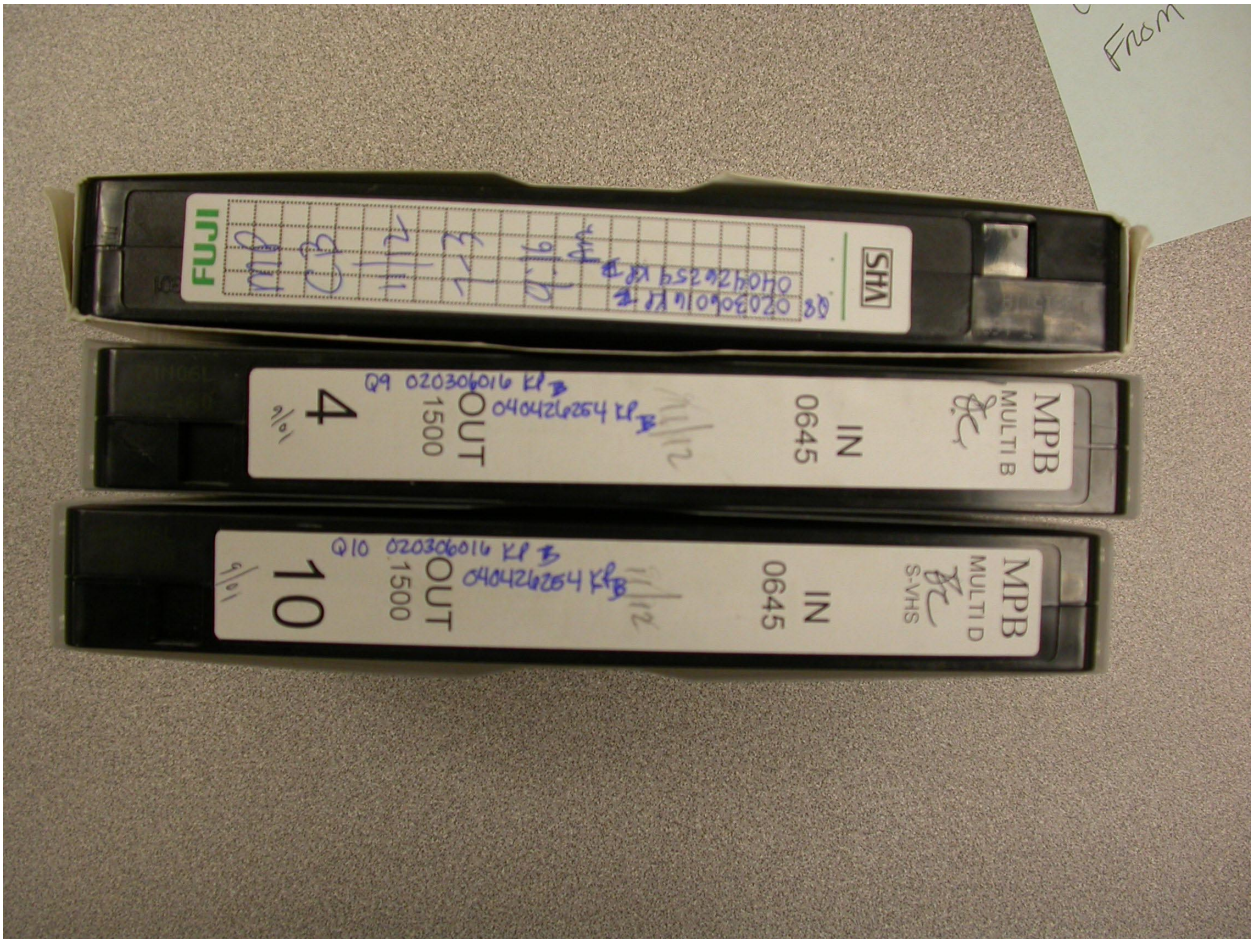
<sup>5</sup> This is the time base used for other data sources for this investigation, including those cited in the [Video Study Report](#).





## **Attachment I**

- Photographs of the two original tapes and the 'first generation' copy tape that were received by the NTSB on May 26<sup>th</sup>, 2004.
- Photograph of the Property Received document.
- Diagram of the toll plaza with lane numbers annotated



VHS Tapes received 5/26/2004

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

Office of the Director

Tom —  
 Here are the  
 AA589 VIDEOS —  
 BOB PEARCE HAND —  
 CARRIED THEM DOWN —  
 FROM NEW YORK.

— Jeff

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UNITED STATES DEPARTMENT OF JUSTICE  
 FEDERAL BUREAU OF INVESTIGATION  
 Receipt for Property Received/Returned/Released/Seized

File # 149A-NY-280669

On (date) 5/24/2004 @ 11:35 A.M.

Item(s) listed below were  
 Received From  
 Returned To  
 Released To  
 Seized

(Name) Augusto Cruse - Mgr. of Technical Services - Bt 5  
 (Street Address) Randall's Island  
 (City) New York, New York 10035

Description of Item(s): (2) original multiplexed video tapes and (2ND) first generation copy of certain select trac provided by the TSTA with footage from Secur cameras on 11/12/2001. Mann Park Multi B + ~~Man~~ Marine Park Multi D, 11/12/2001 - 0645-152 according to TSTA per la ce

Received by: Luke Schiada, NTSB 5/26/04  
 Luke Schiada

Received By: Augusto Cruse (Signature) Received From: John F. Marx (Signature)

Photo of Property Received document (copy)

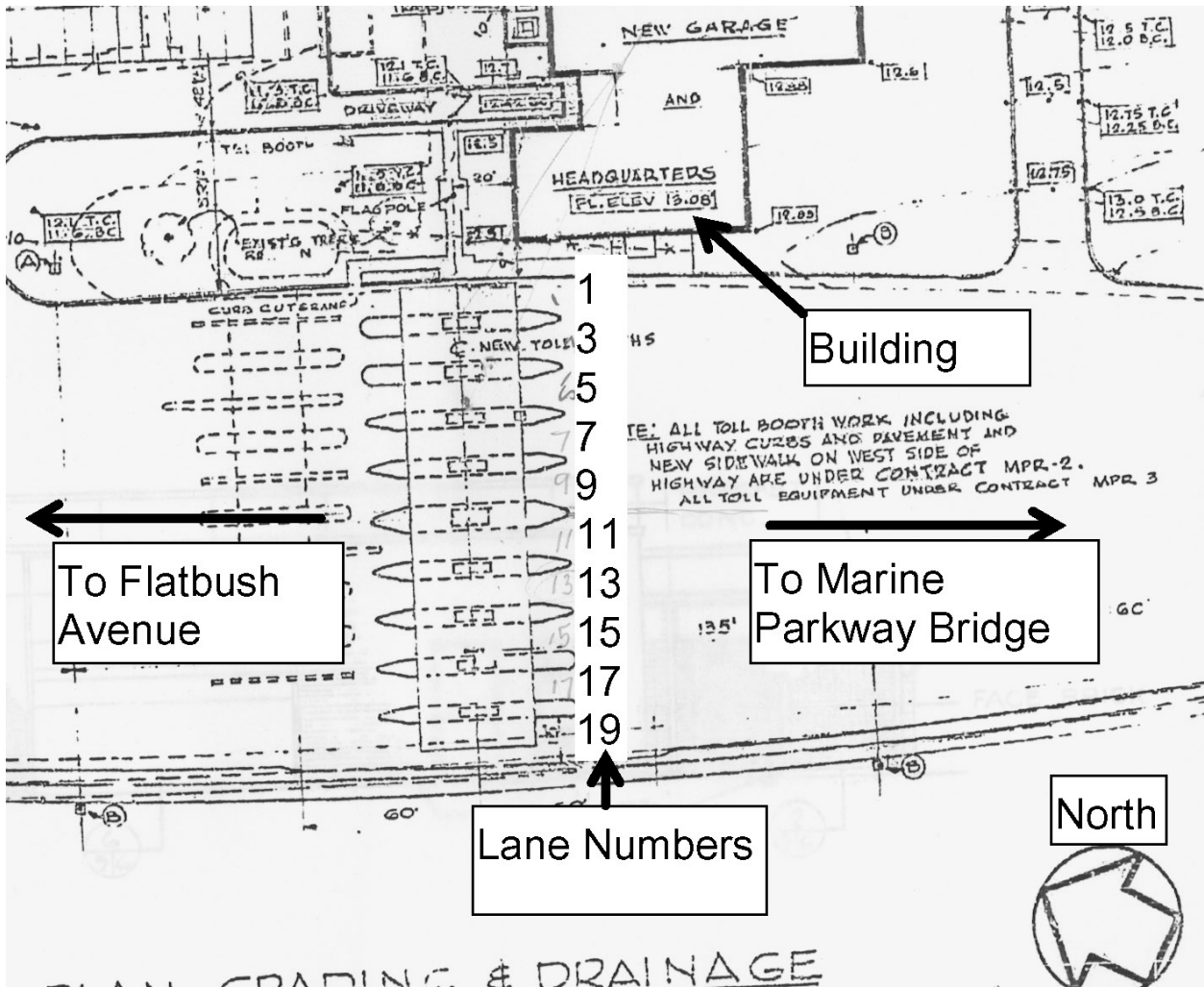


Diagram of toll plaza with lane number annotations