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Technical document

Preliminary video recording analysis

accident on **January 15th 2009**
at **New York City**
to the **Airbus A320**
registered **N106US**
operated by **US Airways**

BEA

Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

Foreword

This document contains technical information that is the property of the manufacturer of the equipment. Information and photographs in this document are intended only to explain the various phases of the examination and should not be used in any way other than for the purposes of this investigation.

The conclusions of this document are based upon work performed by the Bureau d'Enquêtes et d'Analyses (BEA) pour la sécurité de l'aviation civile. They cannot be used in any way to presume the conclusions of the investigation.

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SUMMARY

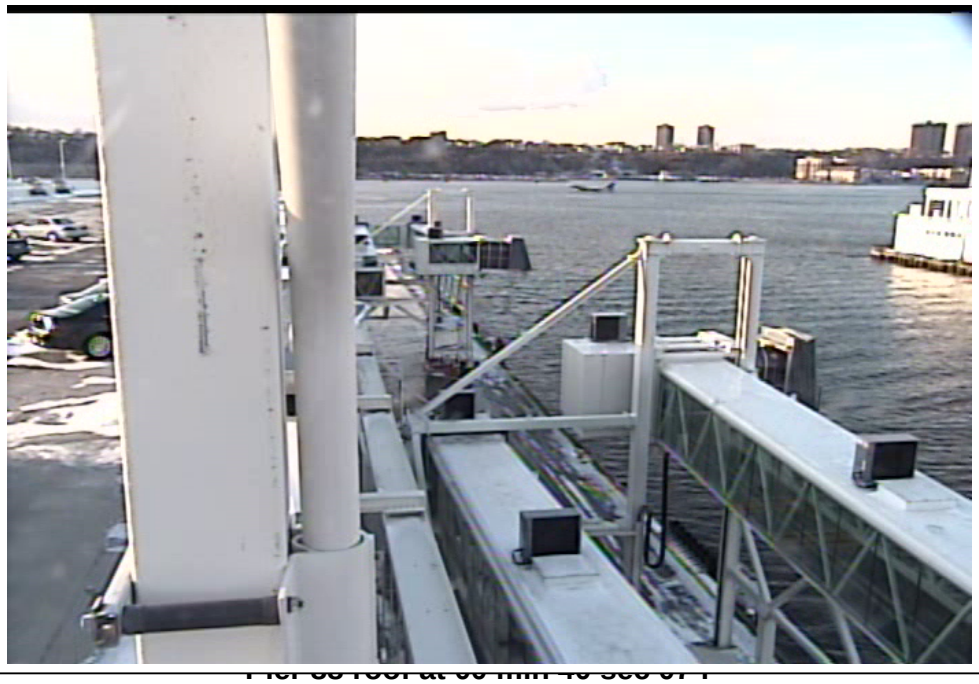
On January 15th 2009, an Airbus A320, registered N106US, operated by US Airways, suffered both engine failures, due to bird strikes, shortly after take off from La Guardia airport. The pilot managed to glide and land successfully on the Hudson River in New York
All passengers and crew were rescued.

Various surveying videos cameras recorded the event.
Some video samples were sent to the BEA for analysis in order to calculate speed, trajectory and deceleration of the aircraft in the river.

The BEA having not got enough time to collect some valuable information about the exact location of each video camera and their optical characteristics, this analysis must be considered as very approximate.

1 – CHOOSING THE VIDEO CLIP

Among all the video clips sent to the BEA the clip named “Pier 88Roof” seems to be the most appropriate because it offers a nearly complete view of the landing of the Airbus in the Hudson.



2 – VIDEO CHARACTERISTICS

This film is a NTSC, 704 x 480, 29.97 fps, video clip with duration of 01 min-00 s-16 frames (or images).

3 – LOCATION OF THE CAMERA

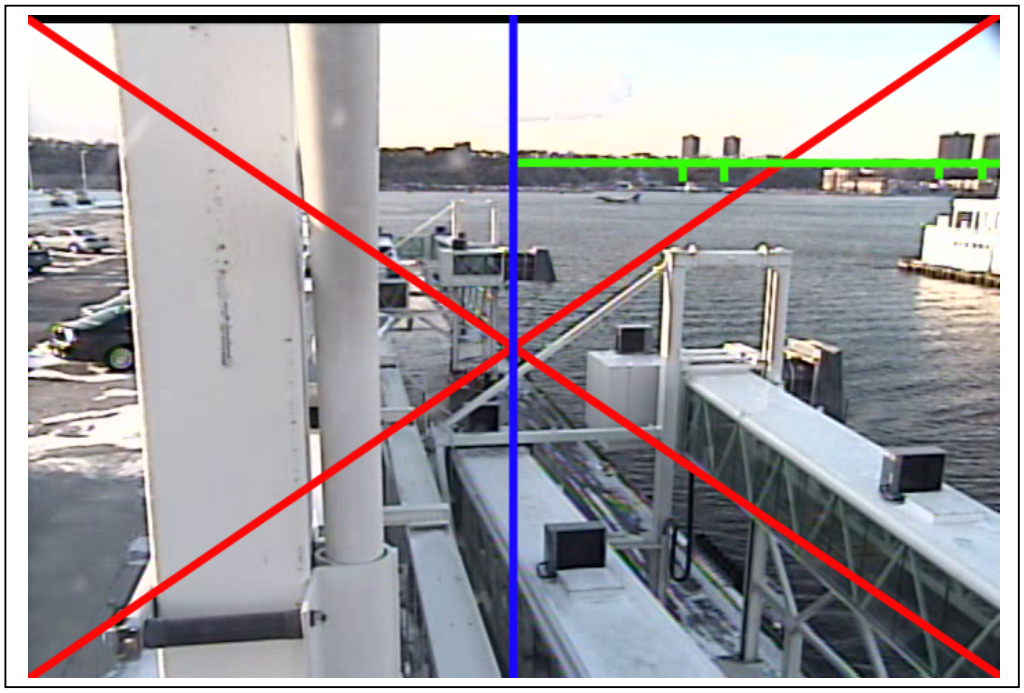
An approximate positioning of the camera on pier 88 can be done considering the alignment of a building located on the other bank of the river with the end of Pier 90.

The reference green line is not vertical because of the camera positioning on his pod and the optical deformation induced by the wide angle lens

era «Pier 88 roof»
oximative position

4 – ORIENTATION OF THE CAMERA

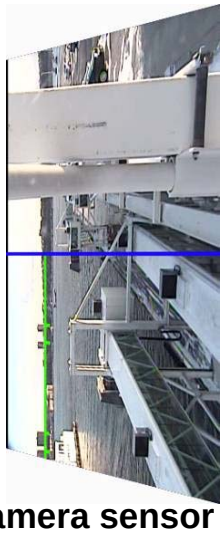
This method is very approximate with wide angle lens because of the peripheral deformations. This deformations could be corrected but with the need of testing the camera himself.



4

3

Same proportions



Camera sensor

2

1

90°

Lens horizontal axis

<u>The references are the four building's south angles</u>

The horizontal axis of the camera is roughly positioned to the 309°.

Positioning the diagonal of the picture (red line), extracted from the clip, parallel to the building's reference (green comb), and keeping the same proportions as from the picture, allows to measure the angle of view of the lens.

In this case this camera has an angle of view of roughly 64°.

Comparatively, lens with 1:1 enlargement ratio have an angle of view around 50°.

5 – AIRCRAFT SPEED AND DISTANCE MEASUREMENT

5-1 - Horizontal speed at the impact

Because of the low definition of the pictures extracted from the video clip it is difficult to determine the exact moment of the impact.

The foam visible on the film at the beginning of the touch down is generated by the tail skidding on the surface of the river. It can be taken as a time reference.

Pier 88 roof at 00 min 40 s 07 f

The video time of 40 s 07 frames could be chosen as the start of touch down.

To determine an average speed at the impact, a fixed reference (green dart) is chosen on the picture and the length of the A320 fuselage (37.57 meters) is used as a distance unit.

This picture is a mix of pictures extracted at video times 39s20f and 40s07f.

The plane covers around 37.5 meters in: 40s07f minus 39s20f = 17 images or frames.

The frame rate of the clip is 29.97 fps

The average horizontal speed at the impact could be calculated roughly:

37.5/17*29.97=66,1 m/s=132 knots

5-2 – Distance covered during touch down

It is difficult to determine the exact moment when the plane slowed down to the Hudson current's speed because the four video clips recorded by the Pier's 88 and 90 cameras were not synchronized, but one can consider that the plane is nearly stopped when his nose appears in middle of the foamed water during his left hand rotation

Because of the rotation of the plane around his vertical axis during his touch down and the lack of plane's detail due to the foamed water the distance covered by the centre of gravity of the A320 can not be precisely calculated.

One can consider that the Airbus could have covered a distance between 5 to 5.5 times his fuselage length;

Distance covered: 187 to 206 meters approximately

5-3 – Position on the river

An approximation of the distance between the plane and the camera could be calculated comparing the relative size of the airbus in the clip and a reference in the background with a well known distance from the camera lens.

The background reference could be the relative distance between building's 1 and 3 south angles.

The two relative sizes are projected on a line of reference, parallel to the camera sensor.

The tail impact reference is also added.

With no optical deformation, the relative size of the object is inversely proportional to the distance between the object and lens of the camera on the lens axis.

The relative object sizes, projected on the reference line and the lens axis, are copied and pasted on a map (next picture)

If, at a distance of 1680 meters from the camera, the relative fuselage length reference has a length of 83 meters, the distance between the camera and a object of 37.5 meters having the same relative length reference is:

1680/83*37.5= **759 meters**

The aircraft touchdown trajectory could be approximately described as followed