IPACO expert report

Expert name	*Report date*	*Last update*
Antoine COUSYN	October 02, 2012	May 05, 2018

Type	*Class*	*Explanation*	*Complement*
IFO	**A**	Towed advertising banner	

Document	*Imaging location*	*Imaging date*
Photos	Manhattan, New York, USA	September 17, 2011 between 04:19:22.11 and 04:19:26.07pm local time

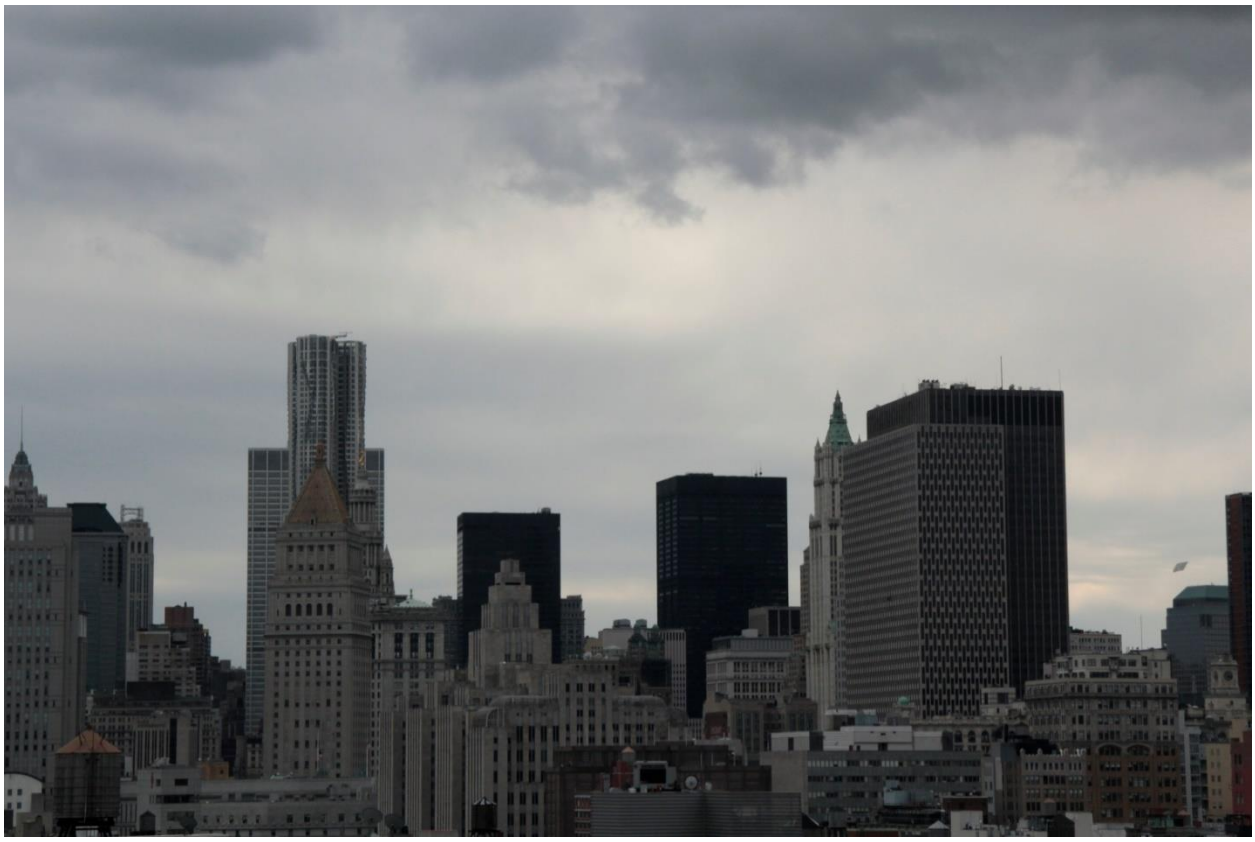


Photo n°5714

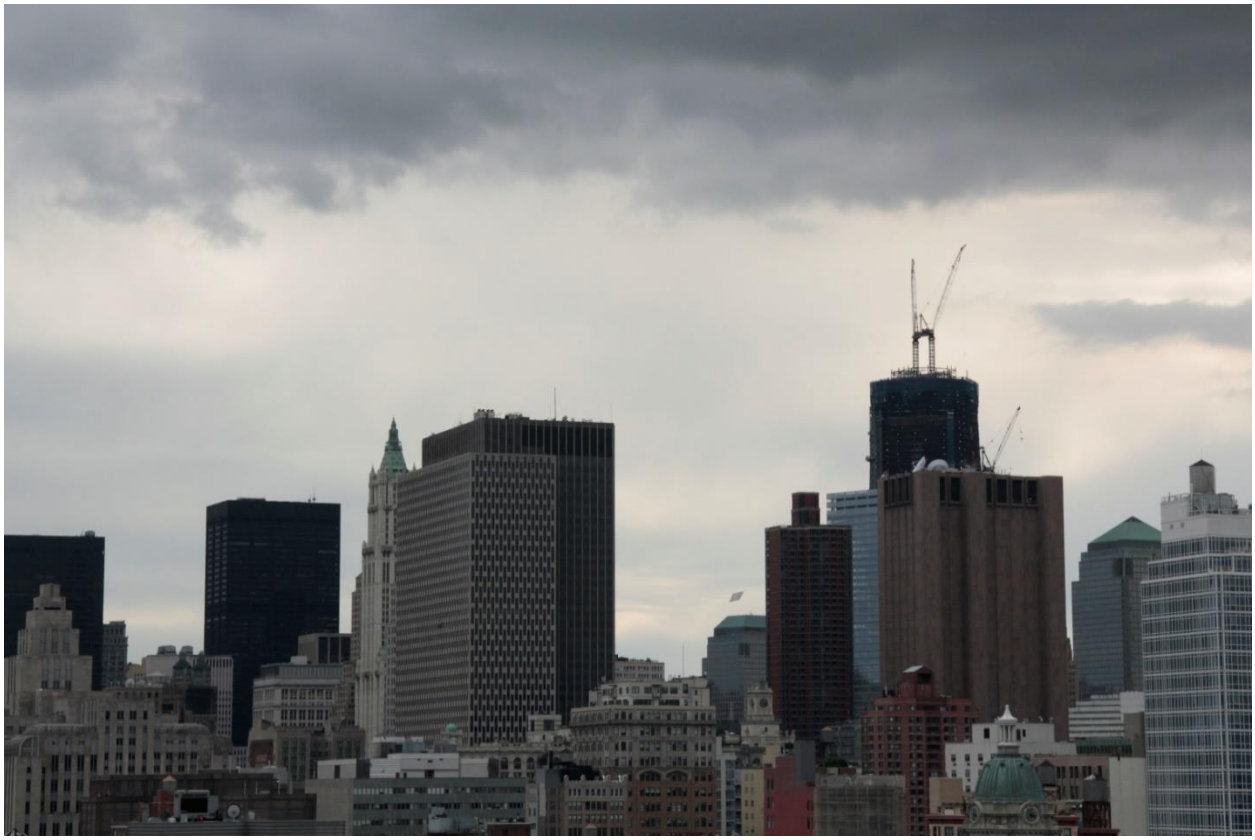


Photo n°5715

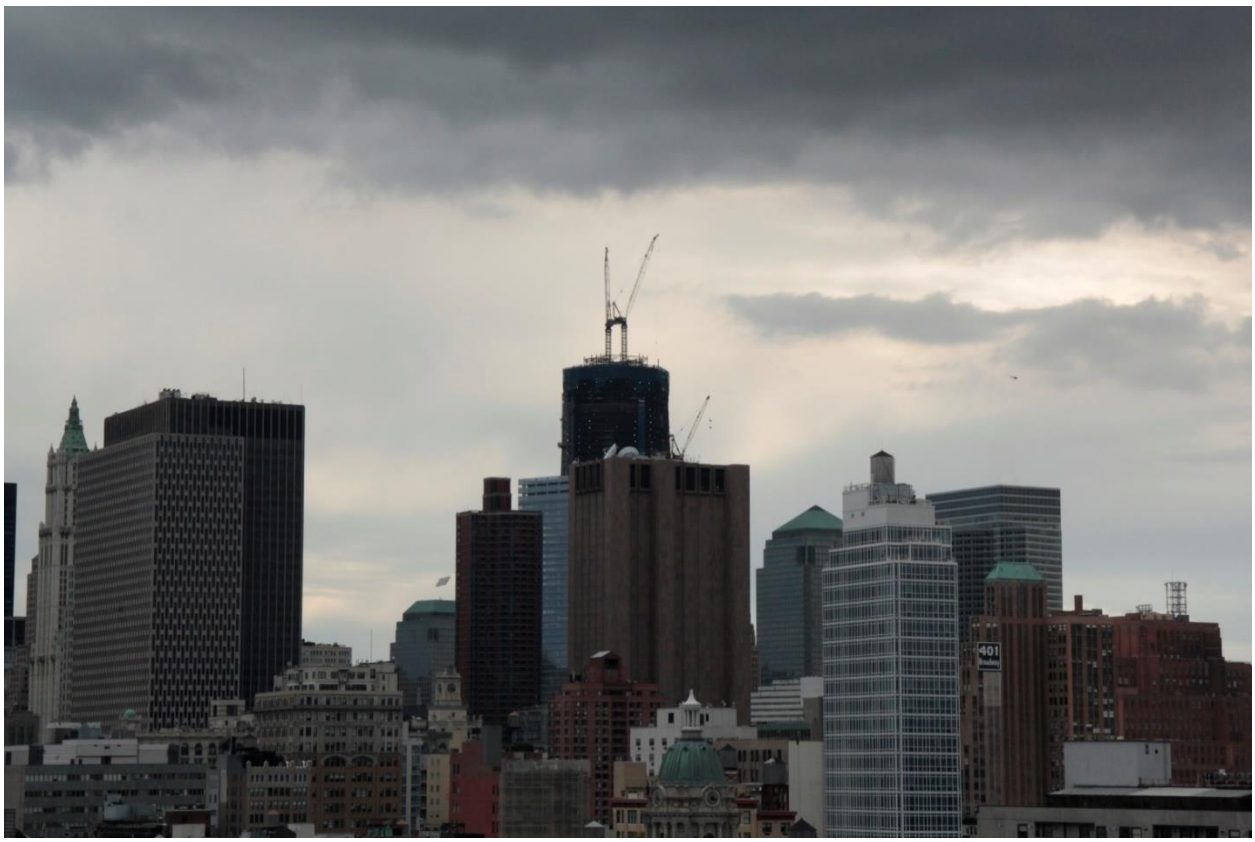


Photo n°5716

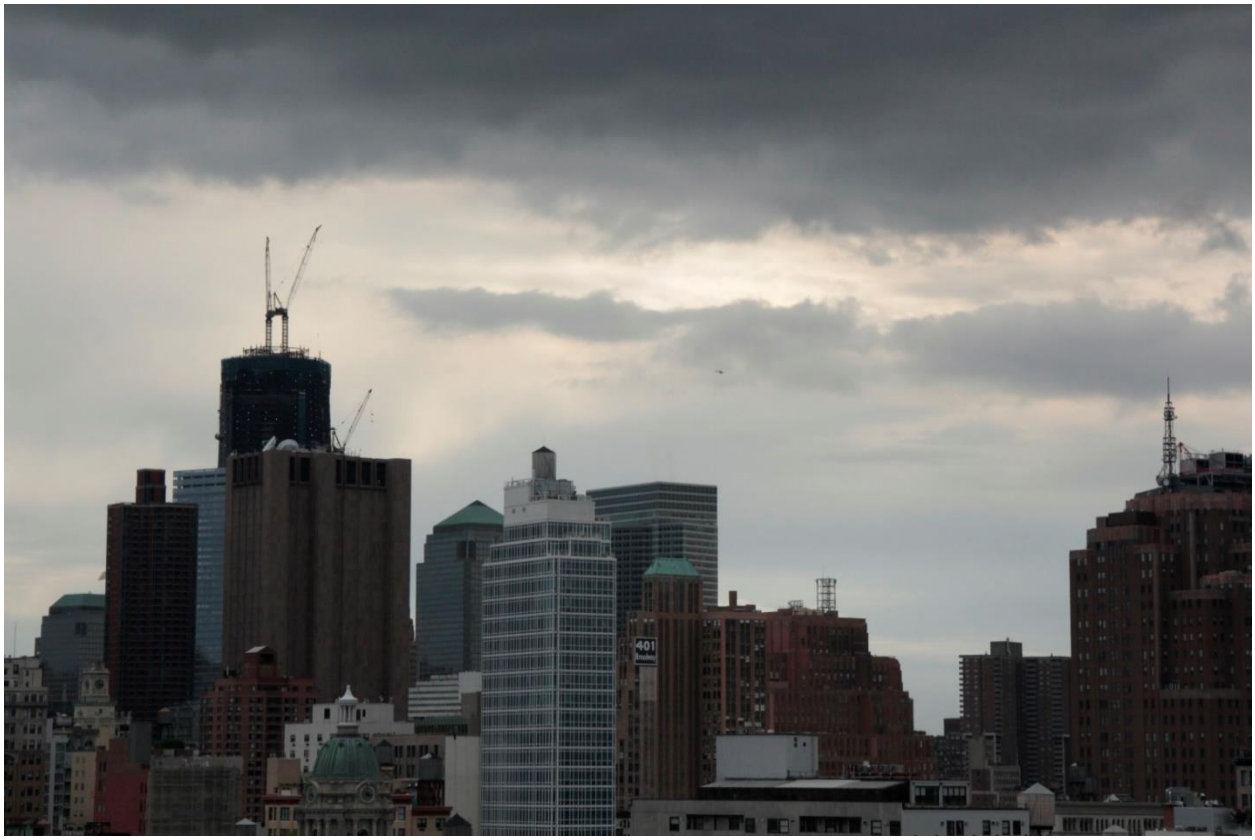


Photo n°5717

1. Imaging circumstances

The photos were taken by an amateur photographer with a high quality camera but at long distance. The statement from the witness is listed below.

The four photos that the photographer took are each 6meg in size and were taken with a Canon Rebel in the raw mode; he converted them to jpeg.

The photographer was scanning the Manhattan skyline to take photos related to the building of the Twin Tower monuments that were destroyed on 9-11-2001 and was creating a panoramic view of the skyline. It was when he put his photos together that he noticed this unusual object.

He was located at the top of 238 Bowery Street in Manhattan.

*"*The *event occurred last Saturday 9-17-2011 in the early afternoon. I was taking digital photographs from the roof terrace of the new Museum located on Bowery in Manhattan's Lower East Side. I was shooting a series of images of the downtown Manhattan skyline to get some pictures of the Freedom tower construction.*

Because I had no tripod I was shooting at a very fast exposure rate 1/500th of a second. In addition I was shooting in continuous mode at a frame rate of about 4 Frames per second. I took my pictures and left the location.

Last night upon looking at the images, I noticed a diamond shaped object moving very close to the horizon in four frames of my images. On closer inspection I noticed what appeared to be regular markings and windows on the craft. I had to be moving at an incredible rate of speed for it to have moved as far as it did give the frame rate it was captured at. It seems to be faintly emitting both blue and red light from the openings on its back area. A helicopter was also present in the nearby vicinity.

At first I thought it was a flag or something, but soon realized there was no flag pole and from frame to frame its shape stays regular.

I'm hoping an expert in this type of thing can help me to rule out any other possible explanations for what they think this might be. Please contact me A.S.A.P. as I am curious to get another opinion, especially an expert one. The three images I have supplied are lower resolution details of the actual four images that were taken as described above. »

2. Camera settings

The camera model that was used is a Canon EOS 550D, also called « Rebel T2i »:

This model came out in February 2008 and is an 18.0 megapixels compact SLR, with a max resolution of 5184 x 3456.

Technical specifications can be read here.

The four original photos were made using the following common technical settings:

- Shutter speed 1/512
- ISO 800
- Flash off
- Resolution of 5184 x 3456
- No zoom
- Firmware version 1.0.6

The two format versions, JPEG and RAW (.CR2 for Canon) were provided for the complete analysis.

3. Data examination

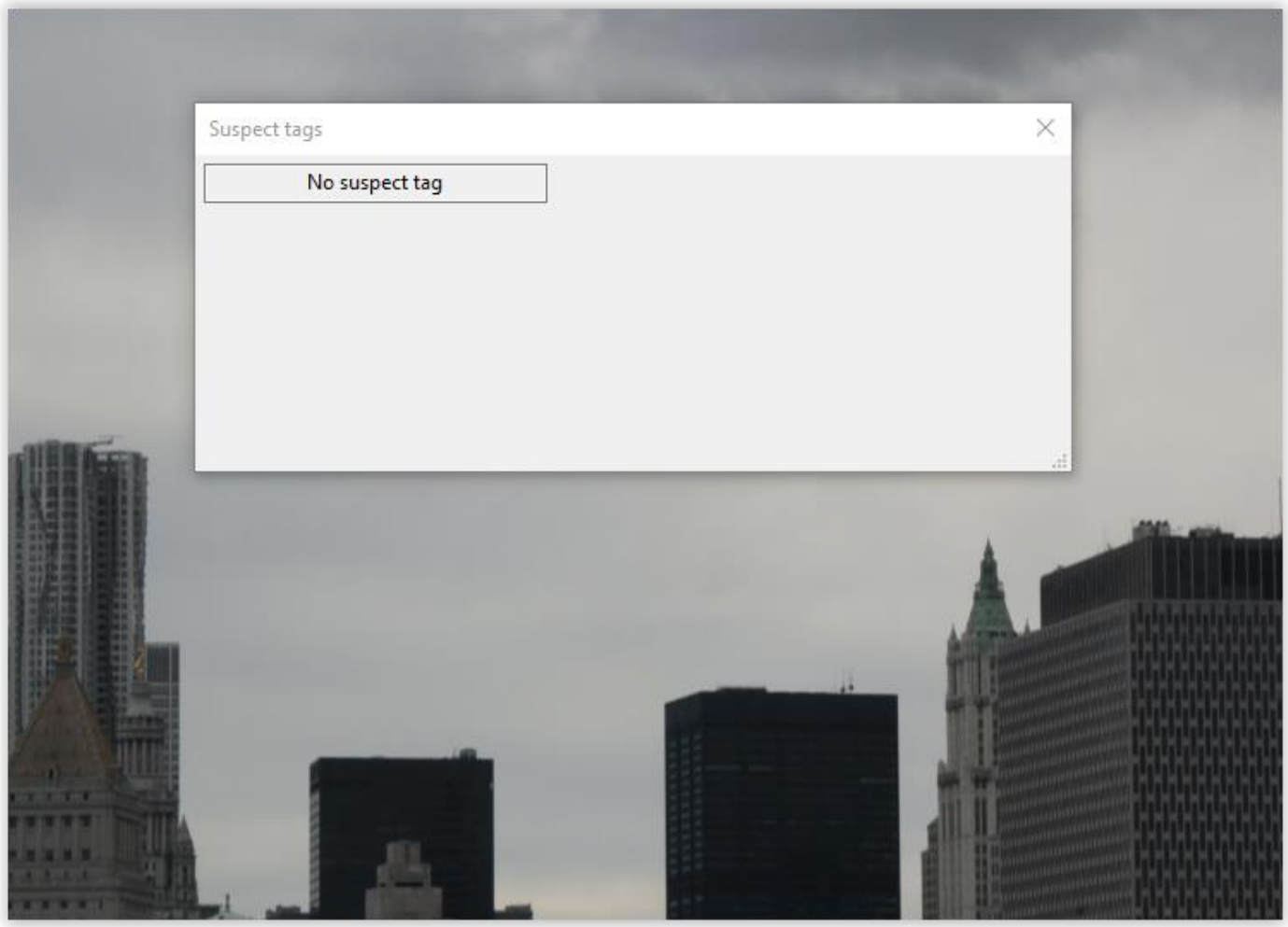
➢ Photos authentication

The photographer provided the original photos, without changing the file names *("_MG_571x.jpg*"), in both .jpeg and .CR2 formats.

A document is deemed authentic, in the sense of "*IPACO' analysis methodology*", if it results from a direct copy of the original file created in the camera.

Any modification, made either the file still in the memory of the camera, or later, can be detected by IPACO with the "*Authentication*" module in three different possible ways.

The "*Suspect tags*" tool, in particular, can be used to determine, for example, the possible use of post-process software, or a modification of the dimensions of the file (cropped image):



The photographs were taken at resolution 5184 x 3456, ratio 1.5, with a "*RAW*" quality for the .CR2 format and "*Fine*" for the .jpeg format, which is consistent with the capabilities and specifications of the Canon EOS 550D.

In conclusion, the photographs are certainly original and unretouched.

- Determination of the actual presence of a material object in the photographed scene or of a photographic artifact

Obviously, the photographed phenomenon is not of a luminous nature, and exhibits neither motion nor focus blur.

The operator did not move or moved very little during the duration of the exposure, as the photographed scene is sharp elsewhere.

We are most likely dealing with an external stimulus to the camera and therefore the presence of a material object in the scene.

➢ Attempts to identify the phenomenon

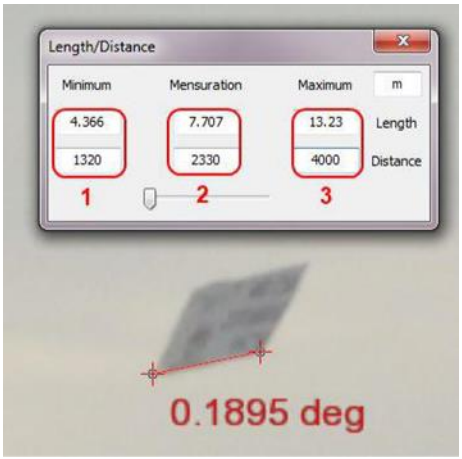
The most likely hypothesis at this point is the passage, into the camera's field where the pictures were taken, of an advertising banner towed by a helicopter or an airplane moving to the right and being masked by the high towers from the beginning of the shoots.

Let's examine the admissibility of this hypothesis.

• Geometric measurements

➢ Size and distance estimates

Using the "*Length/Distance*" tool, we can do various estimates of possible object's sizes according to its distance to the camera, after having measure its angular size:

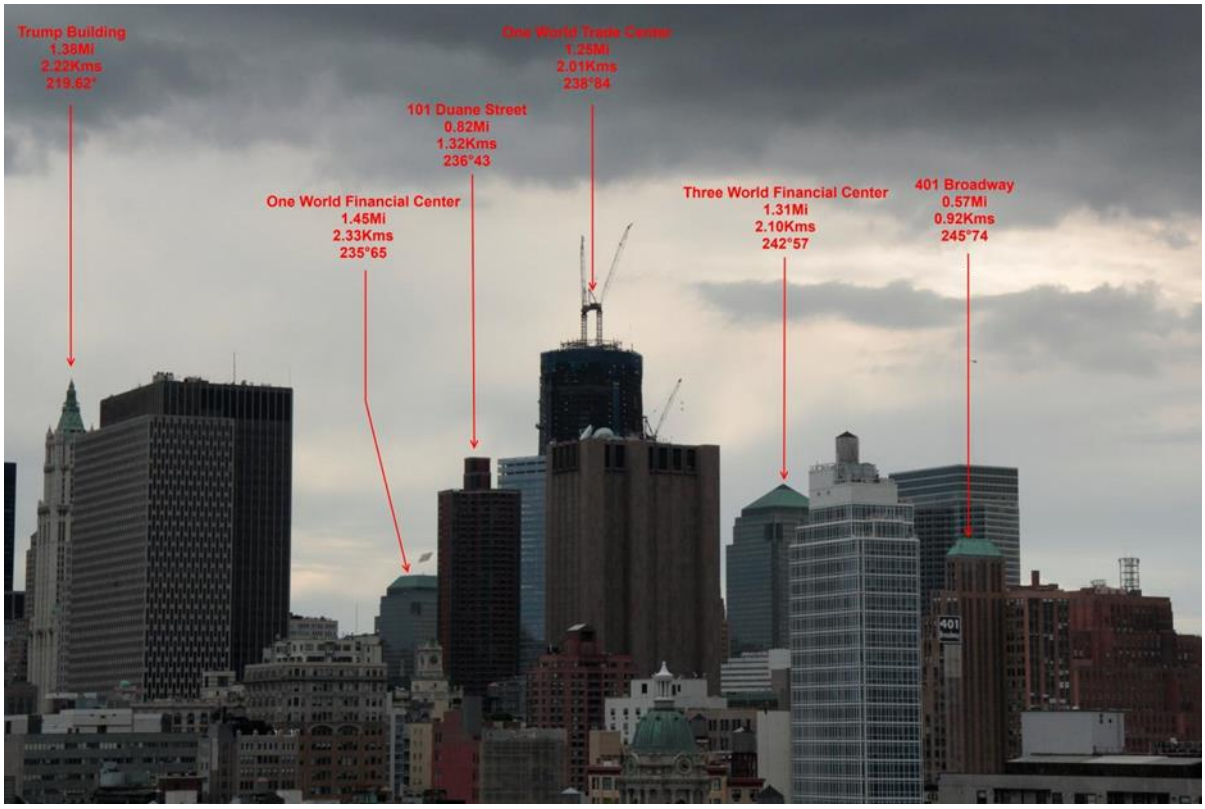


These measurements give an angular size of 0.1895°; then, if the object is located at:

- 1320 m (0.82 miles) away from the camera, its length is then 4.36 m (14.3 feet),
- 2330 m, (1.45 miles), its length is then 7.70 m (25.26 feet)
- 4000 m, (2.49 miles), its length is then 13.23 m (43.41 feet)

It is worth noting that for a big 200 feet (61 m) long banner, the corresponding distance from the camera would be about… 18.4 km! (11.43 miles)

These values were not arbitrarily chosen, but according to the measured distances between the photographer and the buildings:



Then, if the object is located between the two buildings « *101 Duane Street* » and « *One World Financial Center* », its length is somewhere between 4.36 m (14.3 feet) and 7.70 m (25.26 feet), and obviously more if it is farther away.

- <u>Speed estimations</u>

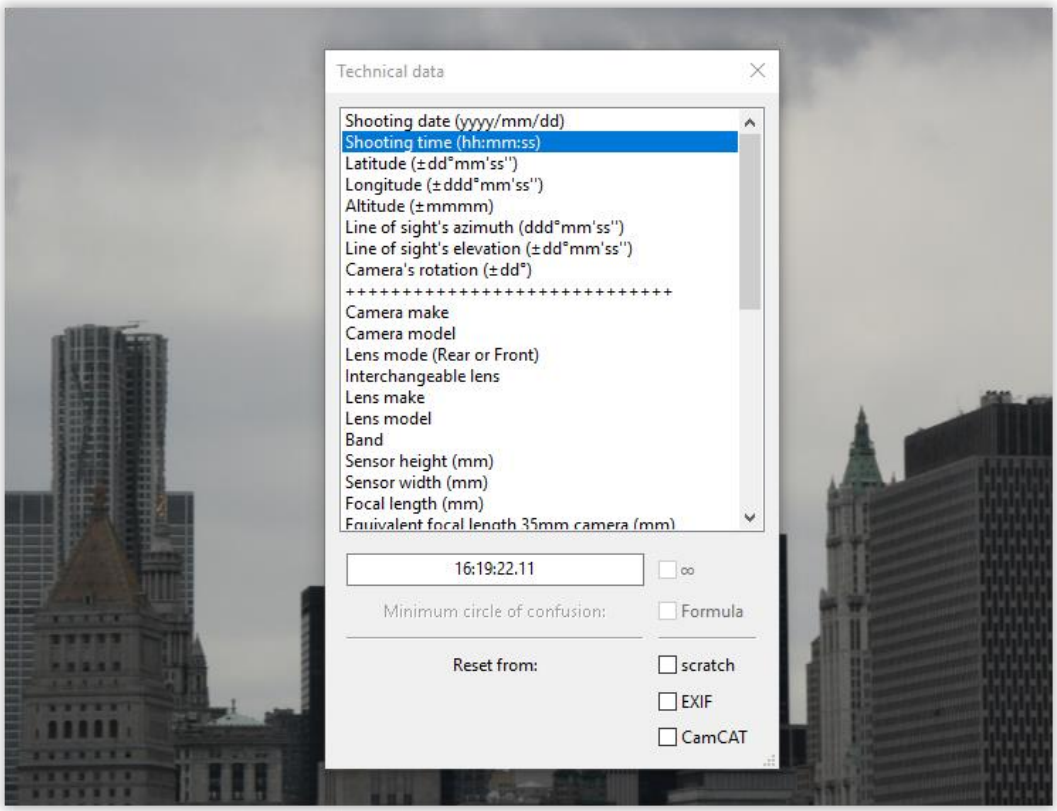
The "UFO" being « frozen » in its displacement, captured at a 1/512^{e} speed, we can logically think that it moves at a relatively slow speed, if not located hundreds of miles away of course.

Let's see if this apparent movement between the pictures could be compatible with the average speed of a plane towing a banner.

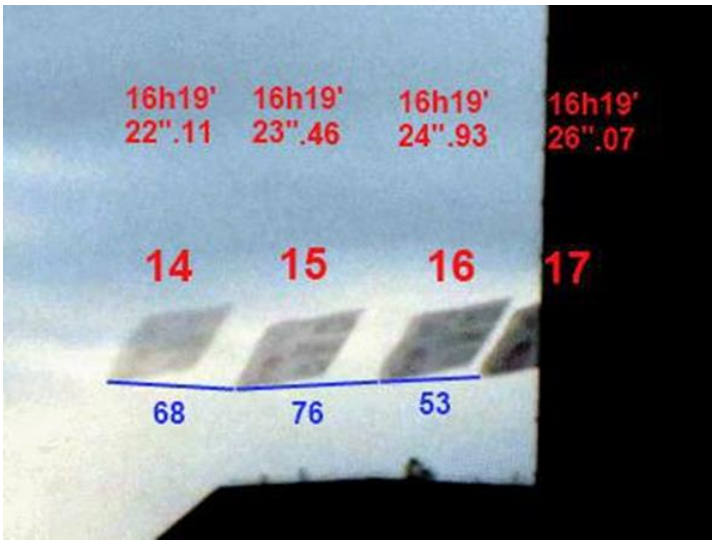
Fortunately, the camera that was used registered the timing of the shot in *hundredth of seconds*. So for the four photos, here are the exact times for each one:

- n°5714: **16h19'22".11**
- n°5715: **16h19'23".46**
- n°5716: **16h19'24".93**
- n°5717: **16h19'26".07**

… Visible in the "*Technical data*" of IPACO as below:



First step is to do a composite of the four photos using the closest building as a reference and note on it these timings (in red) plus the distance in pixels between each object (in blue):



Next, it's possible to check the regularity of the movement of the object:

- Interval 1: between shot n°5714 and 5715: **68 pixels in 1".35**
- Interval 2: between shot n°5715 and 5716: **76 pixels in 1".47**
- Interval 3: between shot n°5716 and 5717: **53 pixels in 1".14**

The calculations of the average speed per pixel for each interval:

- Interval 1: **0.19" per pixel**
- Interval 2: **0.19" per pixel**
- Interval 3: **0.21" per pixel**

A variation of a few pixels due to a possible margin of error does not fundamentally change the results. We can therefore say that **<u>the speed of the object has remained relatively constant</u> throughout its movement.**

Second step is to directly measure on the photo one of these intervals in degrees (we take the first one, for example):

Here, 68 pixels correspond to **0.3491°.**

Third step is to compute all the possible banner size/distance possibilities according to the already known distances, and also according to some random calculations from further away:

The red lines illustrate the distance and the line of sight between the photographer and the various visible buildings.

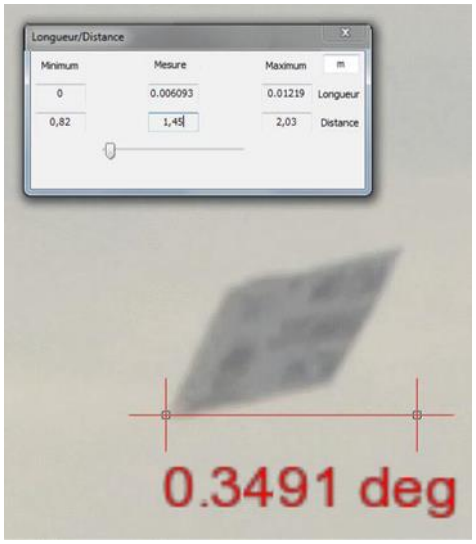
The green line shows the line of sight in the direction of the object, whose distance to the photographer cannot be less than 1.3 km, since it passes behind the building located at "*101 Duane Street*", being at this distance from the photographer.

We will therefore take the values of these distances as references:

1- 0.82 miles: 101 Duane Street building
2- 1.45 miles: One World Financial Center
3- 2.03 miles: Over the Hudson River (approx. in the middle)
4- 2.93 miles: Over Elis Island
5- 5.00 miles: Over Bayonne 1
6- 7.00 miles: Over Bayonne 2

Fourth step is to compute the apparent movement of the object according to the estimated distances above:

1- If the object was located 0.82 miles away, then it moved **0.004996 miles - 23 ft - 7.23 m**
2- If the object was located 1.45 miles away, then it moved **0.006093 miles - 32 ft - 9.80 m**
3- If the object was located 2.03 miles away, then it moved **0.01219 miles - 64 ft - 19.61 m**
4- If the object was located 2.93 miles away, then it moved 0**.01785 miles - 94 ft - 28.72 m**
5- If the object was located 5.00 miles away, then it moved **0.03046 miles - 160 ft - 49.02 m**
6- If the object was located 7.00 miles away, then it moved **0.04265 miles - 225 ft - 68.63 m**



Fifth step is to compute the average speed for each possibility, knowing that there was 1.35" during interval 1:

1- 0.004996 miles during 1.35" makes an average speed of **13.32 mph**
2- 0.006093 miles during 1.35" makes an average speed of **16.24 mph**
3- 0.01219 miles during 1.35" makes an average speed of **32.50 mph**
4- 0.01785 miles during 1.35" makes an average speed of **47.59 mph**
5- 0.03046 miles during 1.35" makes an average speed of **81.22 mph**
6- 0.04265 miles during 1.35" makes an average speed of **113.73 mph**

Now that we have our estimated speed according to estimated distances, we may consider what the average speed of a plane towing a banner is.

We tried to find this info on-line and there are various data:

- This document gives this information: ***"Typically, depending on the type of aircraft, it will cruise at speeds between 45 and 75 mph"***

- Other estimations are given on Internet, particularly an average speed ***between 60 and 65 mph***.

We choose, among from these sources, the larger range of speed, i-e **45 to 75 mph**.

That means that the distance should be, for a typical plane towing a banner at these average speeds, comprised between the number 4 and 5 of our estimations above, i-e **between 2.93 and 5.00 miles** away from the camera.

The distance of 2.93 miles place the object over Elis Island and the distance of 5.00 miles place it over Bayonne.

Conclusion 1:

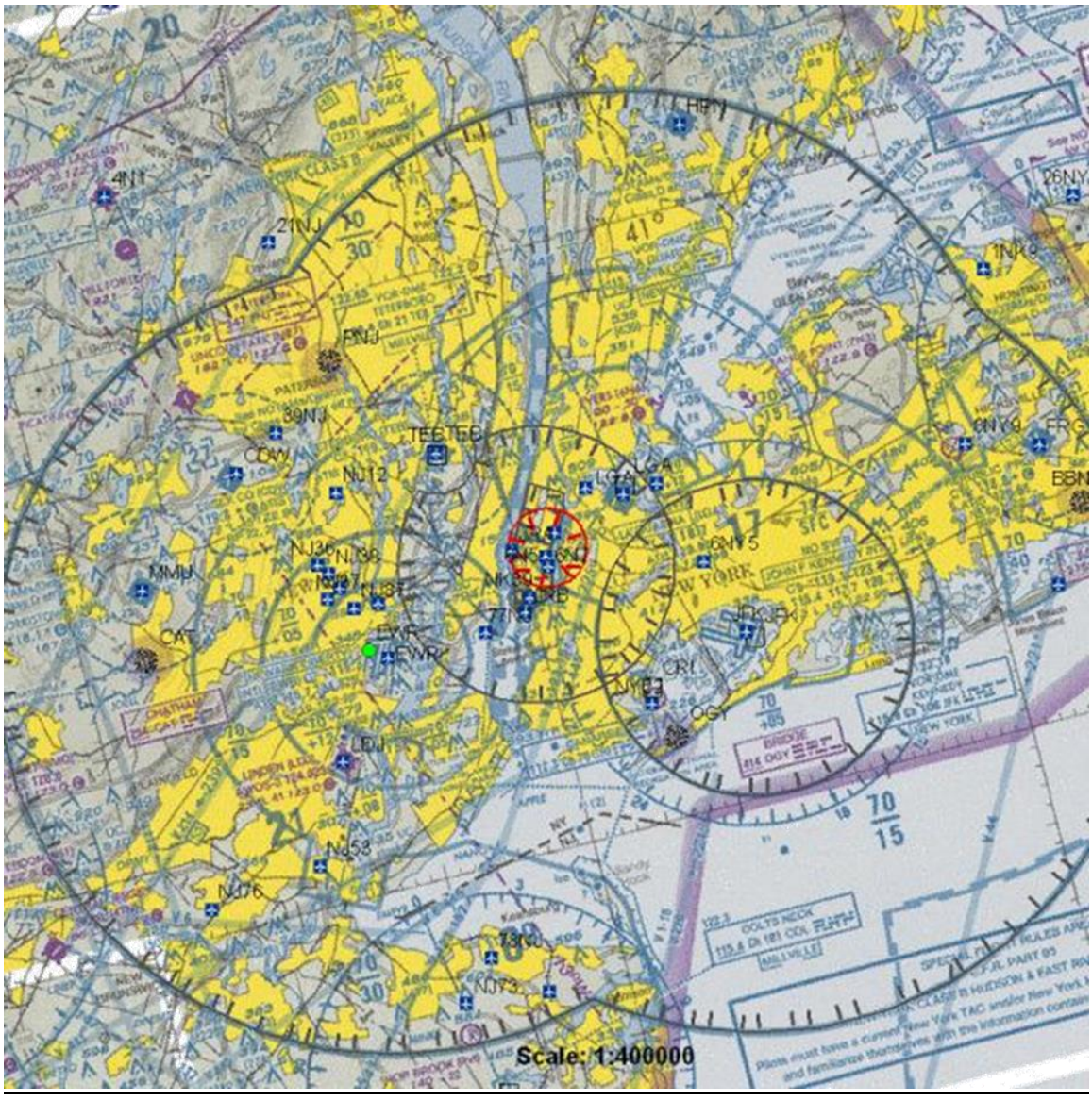
Calculations show that the distance and speed of the object is consistent with those of a plane trailing a banner.

For an average estimated speed comprised between 45 and 75 mph, the object is located at an estimated distance comprised between 2.93 and 5.00 miles away from the camera, then between Elis Island and Bayonne.

- Altitude estimations

In order to conform to the general FAA regulation rules and to the Temporary Flight Restrictions as well, the supposed plane has to fly:

For the Temporary Flight Restriction in place through September 30th, 2011: *"outside a 2 nautical miles radius that include airspace from the surface up to but not including 7000 feet MSL, centered on the LA GUARDIA VOR/DME (LGA) 258° radial at 5 nautical miles (Latitude: 40°44'59"N, Longitude 73°58'08"W)",* which is the UN headquarters position (centered in the middle of the red circle in the TFR map below).



For the general FAA rules concerning the trailing banners: "*over 1000 feet above the highest obstacle*", for any craft at any time.

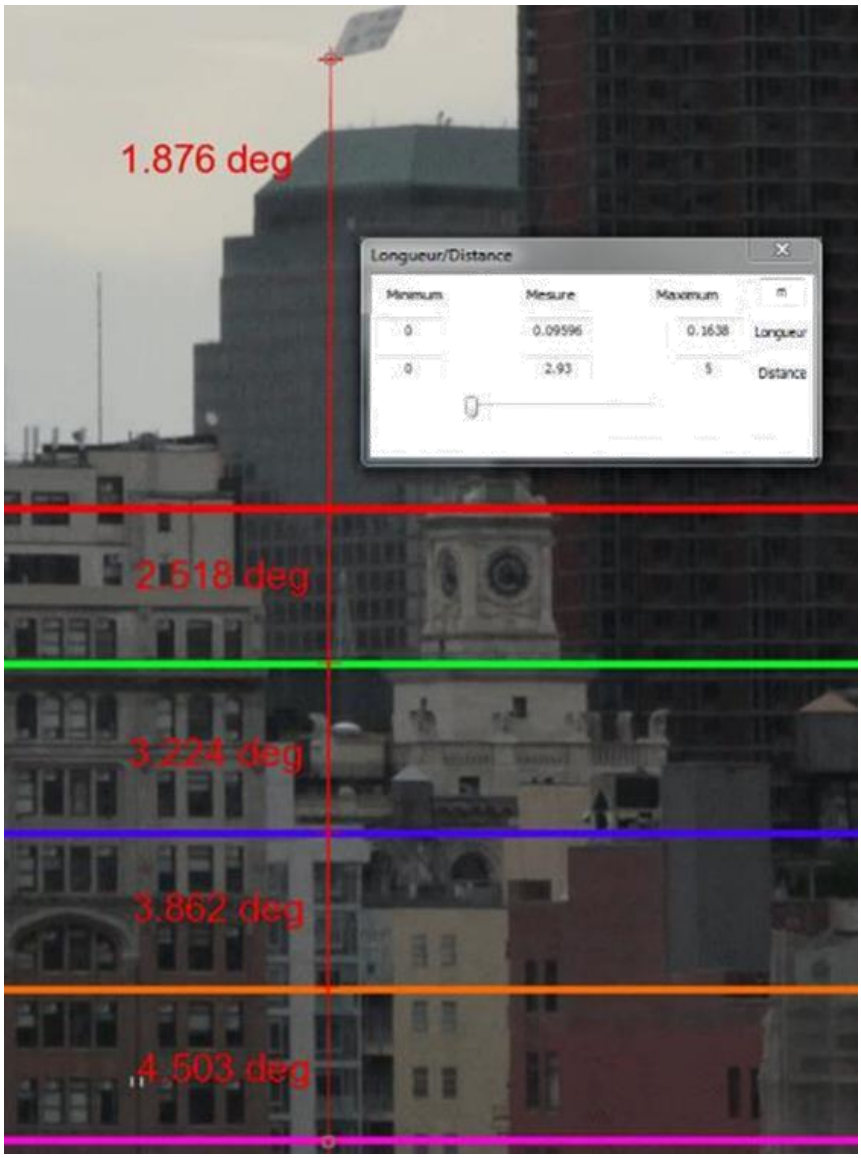
The photographer is located ca. 2.5 miles south of the center of the restricted area, and the object, if we take again our conclusion n°1, is located between 2.93 and 5 miles SW from the photographer. This put the object position outside the TFR area.

Now, to conform to the general FAA rules as explained above, the object, if it's an airplane with a banner, should be no less than 1000 ft above the highest obstacle.

Next step now would be to determine, using the previous speed/distance object estimation, if such an altitude is possible and still consistent with the towed banner theory.

Assuming that the camera was nearly horizontal, we can compute the various possibilities about the horizon line position, since it's not visible in any photography.

In order to do this, we drew five reference lines on one of the photographs and, with IPACO, measured for each one of them the angular size between these and the object, which materialize in fact its altitude, in degrees:



It is then possible to compile a table that gathers the different altitudes (above sea level) which are calculated according to the previous estimates of distance of the object, in km:

	4.7 km	8.0 km
1.876°	154 m	263 m
2.518°	208 m	355 m
3.224°	265 m	453 m
3.862°	318 m	542 m
4.503°	370 m	632 m

Table 1

All the above results in orange are consistent with a distant object that flies over 1000 ft above sea level.

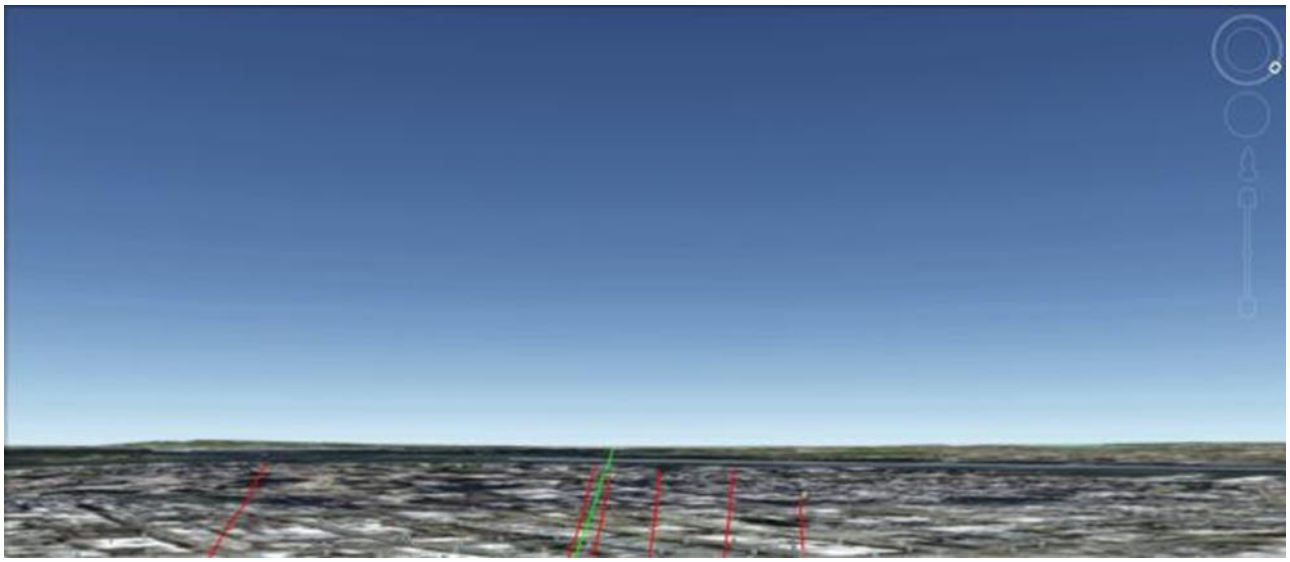
However, **could it be possible to determine the exact position of the horizon line**?

There's an interesting feature in Google Earth that could help us to find it. It's the 3D buildings feature.

Here's how we proceed:

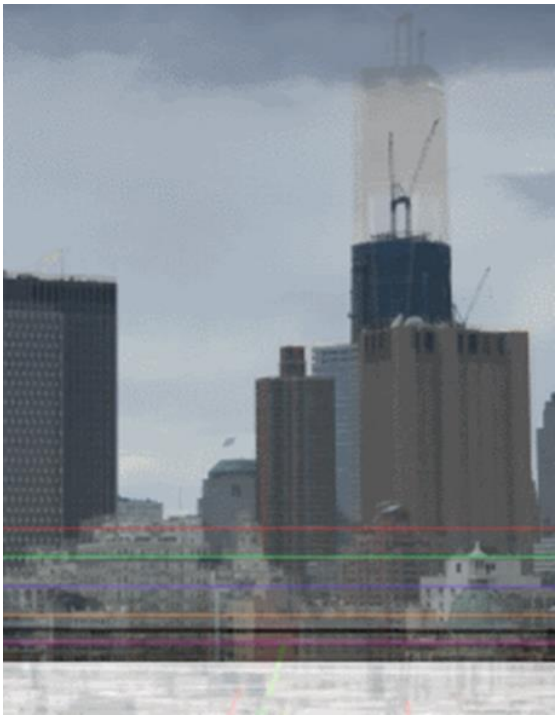
First, we place ourselves as if we were the photographer, at the top of the "*New Museum, 238 Bowery Street*"; trying, in the best possible way, to reproduce the relative visible positions of the distant buildings, then we take a screenshot:

Next step is, without modifying anything else, to remove the 3D feature to let appear the horizon line, as seen from the photographer position, then take another screen-shoot:



Finally, we superimpose the two screenshots using layers, which allow us to determine the exact position of the horizon line, in respect to the position of the buildings:

This, entered on the five previous estimates of the position of the horizon line gives the following result, with the "*true*" horizon line in black:



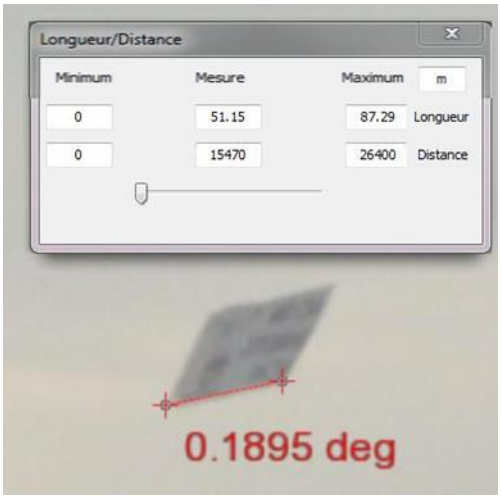
As it can be seen, this line is located between the orange line and the pink line, which gives as angular altitude for the object a range comprised between 3.862 ° and 4.503 °, then an actual altitude comprised between 318 m and 632 m (the two last lines of table 1).

Conclusion 2:

Calculations show that the **object altitude could be comprised between 1043 ft and 2073 ft above sea level, for a distance to the camera between 2.93 and 5 miles**, then that both its position and altitude conform to the FAA regulations.

- New sizes estimations

At the light of the previous results, we can re-evaluate the possible size of the object, using the "Length/Distance" tool of IPACO:



So, for the object located 2.93 miles away from the camera (15470 ft), it will have a visible **length of 51 ft**, and if 5 miles away (26400 ft), it will have a **length of 87 ft**. Even if we take account of the perspective effect (roughly 10-15% here), these data are still compatible with the aerial banner dimensions (mainly between 40 ft and 125 ft long).

➢ Why the cables of the towed banner are not visible?

It depends on several factors that include thickness of the towing cables of course, but also the distance away of the banner and the camera resolving power as well.

- Distance of the banner: between 2.93 (15470 ft) and 5 miles (26400 ft) as estimated above.

- Thickness of the towing cables: for a View Piper PA-25 PAWNEE Installation, for example, the towing cable is 6mm in diameter.

- Camera resolving power: the Circle of Confusion (CoC) with the related hyper-focal distance for a Canon Rebel T2i can be precisely defined using the technical data of the photo:

    - Focal length: 59 mm.
    - Aperture: f/14.3.
    - Subject distance: between 15470 and 26400 feet.

This involves some math, but this DOF calculator can easily and quickly give those values.

As the camera focused on the infinite, they stay the same for both distance estimations, i-e:

- CoC: 0.019 mm.
- Hyperfocal distance: 42.4 feet.

That means that, 42.4 feet away, the far limit resolving power is of 0.019 mm. A quick computation of these values for the estimated distances gives:

- Ca. **7 mm**, if the banner is located 15470 feet (2.93 miles) away.
- Ca. **12 mm**, if the banner is located 26400 feet (5 miles) away.

In other words, if the cables aren't visible in the photos, that means that they can't be resolved by the resolving power of the camera if they are under 7 mm in diameter for the banner to be 2.93 miles away and if they are under 12 mm in diameter for the banner to be 5 miles away.

6 mm in diameter puts the far resolving distance up to 13.389 ft (2.94 miles). So if the cables aren't visible, it's because the banner is more far away than this distance, which is compatible with the previous distance/speed/size estimations, as computed above.

- Radiometric measurements

No useful radiometric measurements can be done here, as the object cannot be considered as a "*black body*".

- Additional research

After some research on the Internet, we finally succeeded in finding the photographed banner, confirming then the initial hypothesis.

Between September 17 and 21, 2011, a summit in New-York City brought together leading experts in the diabetes problems and, on this occasion, an advertising campaign was launched, jointly by the International Diabetes Federation (IDF) and "LIVESTRONG", The Lance Armstrong foundation.

This advertising campaign planned, among other things, to fly over New-York, the first day of the event, four planes equipped with the following banner:

The plane is not visible on the photos, hidden by the buildings, and the cables that trailed this banner weren't visible, due to their thinness, as demonstrated above.

A brief description of this campaign can be read on this PDF report, p18. Furthermore, this banner can be seen on the IDF's Flickr page.

To close this analysis, an animated flash, that can be downloaded here, allows us to better visualize this banner, both in its original version and in its "degraded" version in the photos.

4. Conclusion

Given the objective data collected through the examination of the photos and the subsequent Internet research, we can conclude that this object is a **51/87 ft long** advertising banner trailed by a plane flying at a **constant speed** of **between 45 and 75 mph**, and located **between 2.93 miles and 5 miles away** from the camera, **between 1043 ft and 2073 ft** above sea level, over a position between Elis Island and Bayonne (New Jersey).

5. Sources – Photo credits - Acknowledgments

Original photos were provided by Robert Powell.

Ephotozine.com - Canon EOS 550D tests

TFRs during the UN General Assembly – September 2011

Thanks for their help in the constitution of this file to:

Robert Powell, former SRB MUFON Director.
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The team of the French forum "*UFO Scepticisme*", especially "*Nablator*" and "*Sebastien*".
"FLAM", of the French forum "*Ufologie et paranormal*" for the creation of the animated flash.