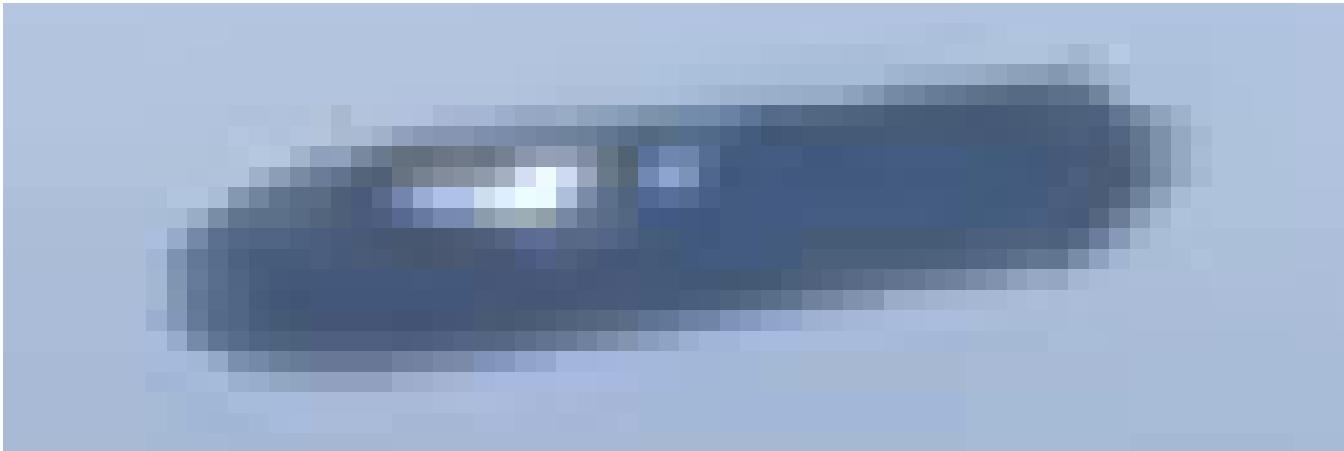


July 9th, 2024



UFO over NYC: FINAL Analysis Results

By Dr. Doug Buettner

**Adjunct Assistant Professor, Dept of Mechanical Engineering's
Systems Engineering Program at the University of Utah
and the**

Deputy Chief Scientist for the Stevens Institute of Technology's SERC/Acquisition Innovation Research Center



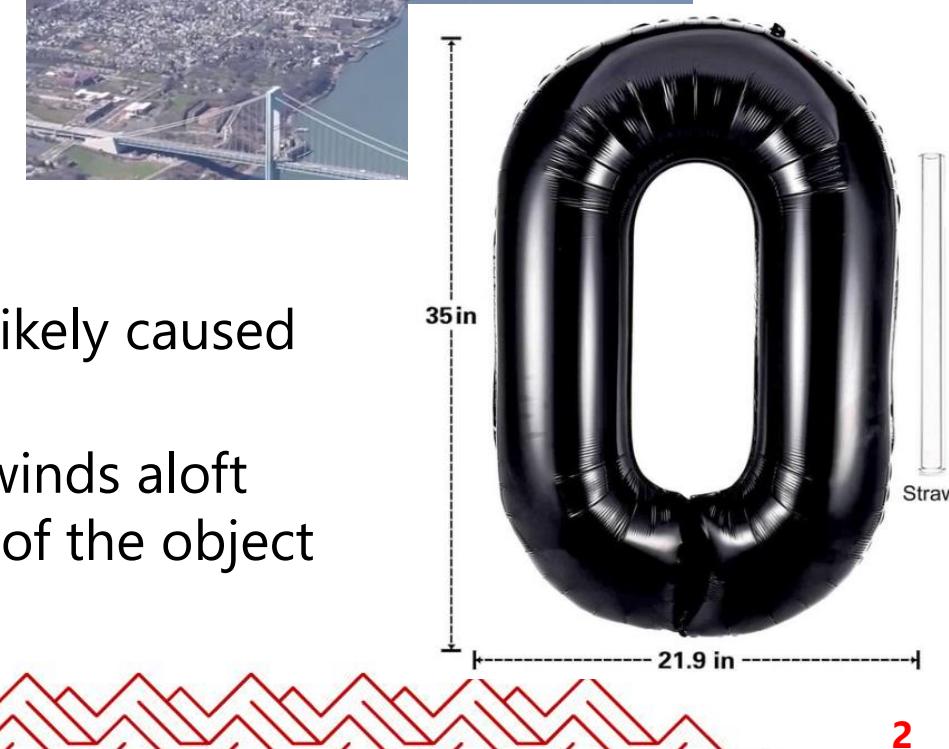
UFO over NYC: Bottom Line Up Front

- **Objective:**

- Investigate the "UFO over NYC" video posted to reddit
 - > https://www.reddit.com/r/UFOs/comments/1bp9v14/possible_ufo_over_nyc/?rdt=39722

- **Findings:**

- Reddit video posted by somebody not known by the individual who recorded the video (Ms. Michelle Reyes)
- Object is most likely a "0" party balloon
- Significant wind event that morning along Long Island likely caused someone to lose the balloon.
- Relative speed difference between the aircraft and the winds aloft leading to erroneous assumptions regarding the speed of the object



Reddit Posted Video

Bridge tower shadow used
to find the approximate time



$t=0.0000 \text{ s}$

Reddit Posted Video

wing tip edge!

Bridge to find

Search
ge

t=0.0000 s

Search location, city, address

3:00 pm UTC -4:00 03/30/2024 NOW

6:43am

44.6°

224.4 Winter Solstice

© Stadia Maps, OpenMapTiles, Nextzen, OSM contrib

SHADOW MAP

<https://app.shadowmap.org>



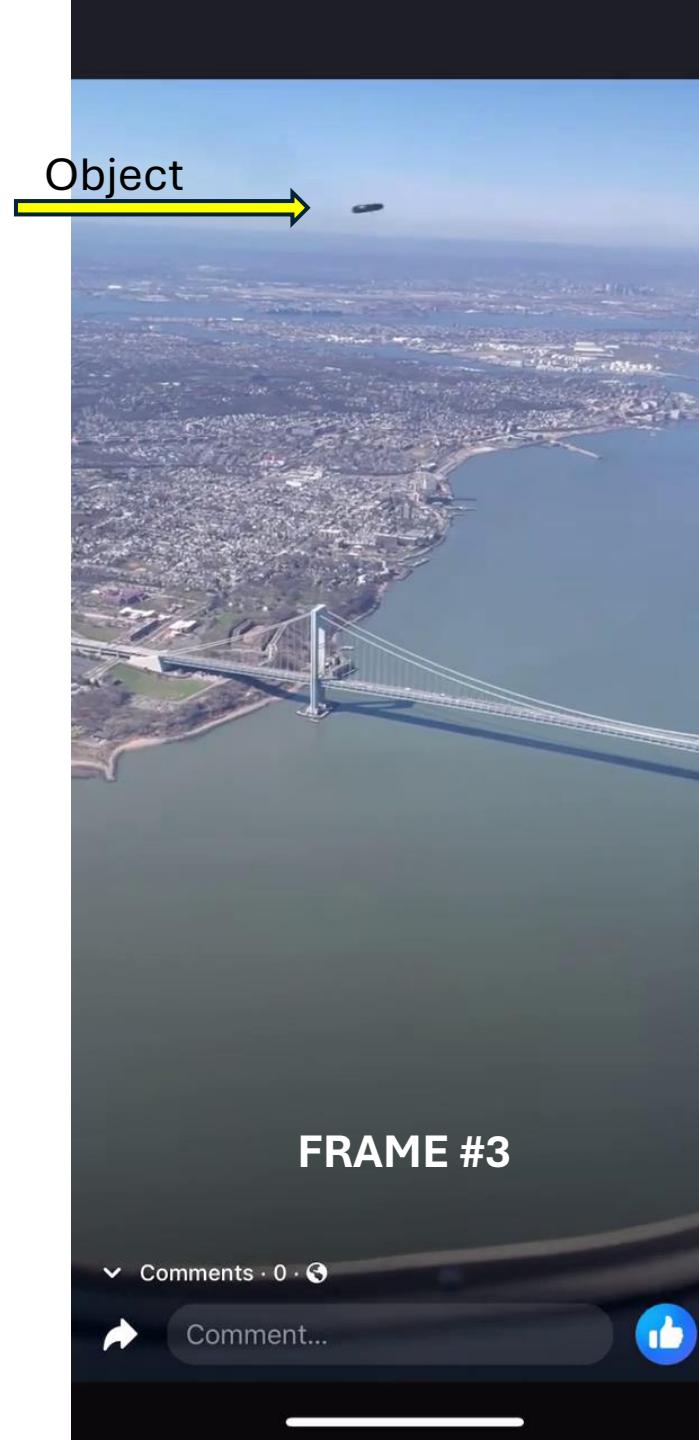
Reddit Posted Video



Unknown frame rate!

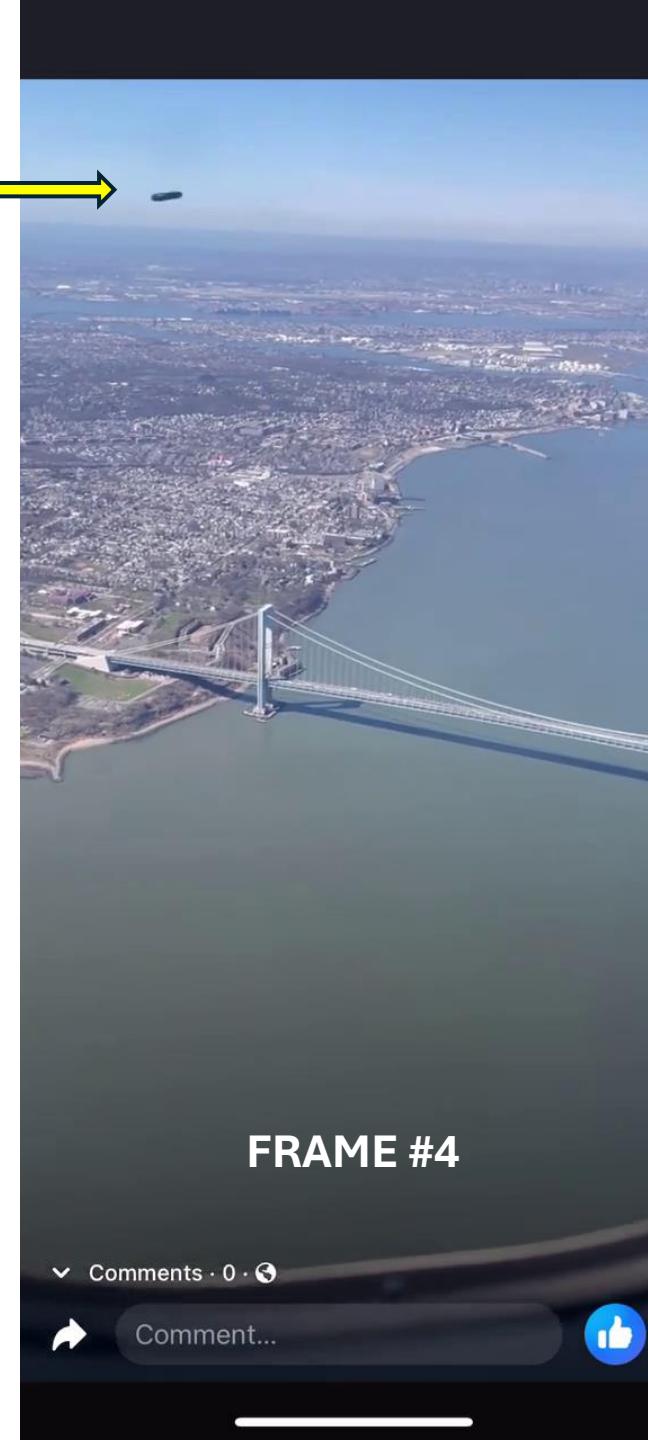


Reddit Posted Video



Reddit Posted Video

Object



Reddit Posted Video

Clipped Object



Witness Interview Critical Information



- Flight: Spirit Airlines NK3380
- Location: Ms. Reyes sat in (35A)
- Original video: iPhone 12
- Metadata: now available (frame rate, time, etc.)



And Critical iPhone 12 Metadata

Encoded Pixels Dimensions	: 1920x1080
Graphics Mode	: ditherCopy
Op Color	: 32768 32768 32768
Compressor ID	: avc1
Source Image Width	: 1920
Source Image Height	: 1080
X Resolution	: 72
Y Resolution	: 72
Compressor Name	: H.264
Bit Depth	: 24
Video Frame Rate	: 29.979
Camera Lens Model (und-US)	: iPhone 12 back camera 4.2mm f/1.6
Camera Focal Length 35mm Equivalent (und-US)	: 27
Warning	: [minor] The ExtractEmbedded option may find more tags in this file.
Matrix Structure	: 1 0 0 1 0 0 0 1
Content Describes	: Track 2
Media Header Version	: 0
Media Create Date	: 2024:04:19 23:53:28
Media Modify Date	: 2024:04:19 23:53:31
Media Time Scale	: 600
Media Duration	: 14.48 s
Media Language Code	: und
Gen Media Version	: 0
Gen Flags	: 0 0 0
Gen Graphics Mode	: ditherCopy
Gen Op Color	: 32768 32768 32768
Gen Balance	: 0
Handler Class	: Data Handler
Handler Vendor ID	: Apple
Handler Description	: Core Media Data Handler
Meta Format	: mebx
Handler Type	: Metadata Tags
Location Accuracy Horizontal	: 5.202405
GPS Coordinates	: 40 deg 35' 13.92" N, 74 deg 2' 20.40" W, 903.895 m Ab
Make	: Apple
Model	: iPhone 12
Software	: 17.2.1
Creation Date	: 2024:03:25 14:25:28-04:00
Apple Photos Originating Signature	: AYu03b+T8aI0z3O1EzomwKNfNcJE
Media Data Size	: 25690988
Media Data Offset	: 14535
Camera Lens Model	: iPhone 12 back camera 4.2mm f/1.6
Camera Focal Length 35mm Equivalent	: 27
Image Size	: 1920x1080
Megapixels	: 2.1
Avg Bitrate	: 14.2 Mbps
GPS Altitude	: 903.895 m
GPS Altitude Ref	: Above Sea Level
GPS Latitude	: 40 deg 35' 13.92" N
GPS Longitude	: 74 deg 2' 20.40" W
Rotation	: 90
GPS Position	: 40 deg 35' 13.92" N, 74 deg 2' 20.40" W
FL	= 4.2mm

Original Video

Object



We now have the wing tip edge!

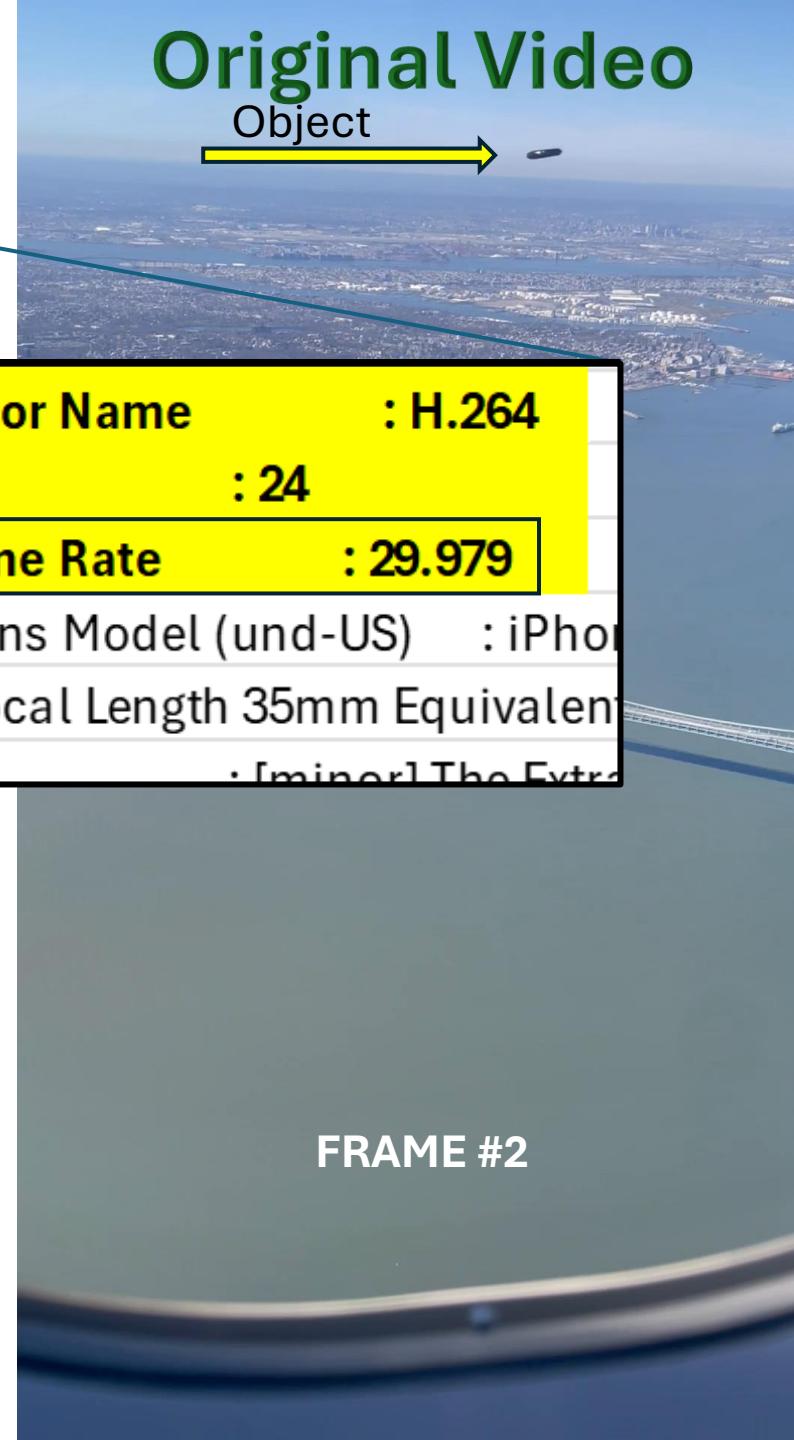
t=0.0000 s

And Critical iPhone 12 Metadata

Encoded Pixels Dimensions	: 1920x1080
Graphics Mode	: ditherCopy
Op Color	: 32768 32768 32768
Compressor ID	: avc1
Source Image Width	: 1920
Source Image Height	: 1080
X Resolution	: 72
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Compressor Name	: H.264
Bit Depth	: 24
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Warning	: [minor] The ExtractEmbedded option may fin
Matrix Structure	: 1000 1000 1
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Media Language Code	: und
Gen Media Version	: 0
Gen Flags	: 000
Gen Graphics Mode	: ditherCopy
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Make	: Apple
Model	: iPhone 12
Software	: 17.2.1
Creation Date	: 2024:03:25 14:25:28-04:00
Apple Photos Originating Signature	: AYu03b+T8aI0z3O1EzomwKNfNcJE
Media Data Size	: 25690988
Media Data Offset	: 14535
Camera Lens Model: iPhone 12 back camera 4.2mm f/1.6	
Camera Focal Length 35mm Equivalent: 27	
Image Size	: 1920x1080
Megapixels	: 2.1
Avg Bitrate	: 14.2 Mbps
GPS Altitude	: 903.895 m
GPS Altitude Ref	: Above Sea Level
GPS Latitude	: 40 deg 35' 13.92" N
GPS Longitude	: 74 deg 2' 20.40" W
Rotation	: 90
GPS Position	: 40 deg 35' 13.92" N, 74 deg 2' 20.40" W
FL = 4.2mm	

Original Video

Object



Known frame rate!

$t=0.0334 \text{ s}$

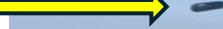
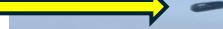


$t=0.0667$ s

**AT ~193 FEET...
SURELY GROUND OBSERVERS
OR RADAR WOULD HAVE SEEN
IT IN THIS CASE!**

Original Video

Object



FRAME #4

$t=0.1001 \text{ s}$

Object NOT clipped

Original Video



FRAME #5

$t=0.1334 \text{ s}$

Super Resolution 12x



Solar specular reflection

Note apparent rotation

And the apparent seam

$t=0.0000$ s

FRAME #1

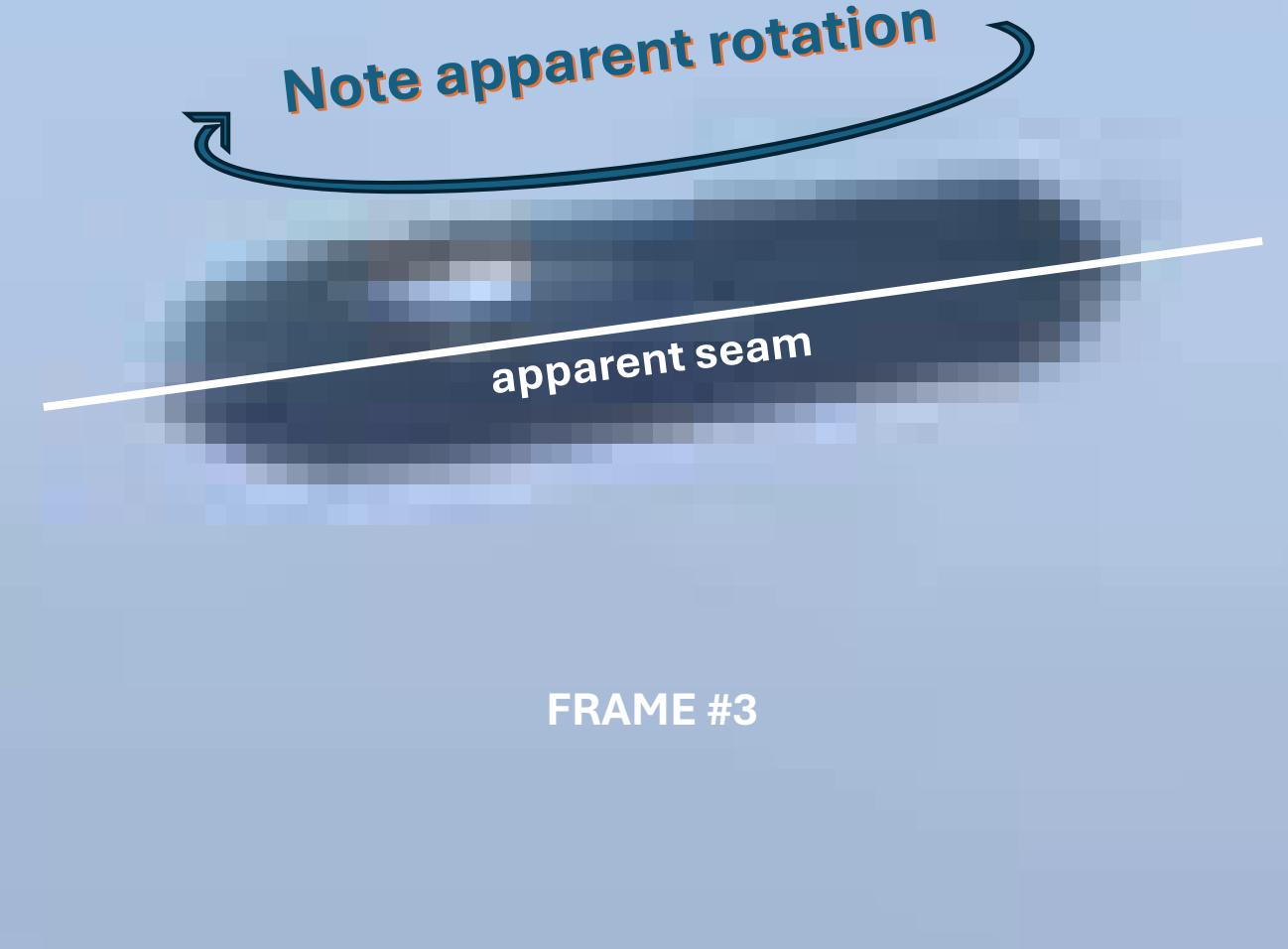
Super Resolution 12x



$t=0.0334 \text{ s}$

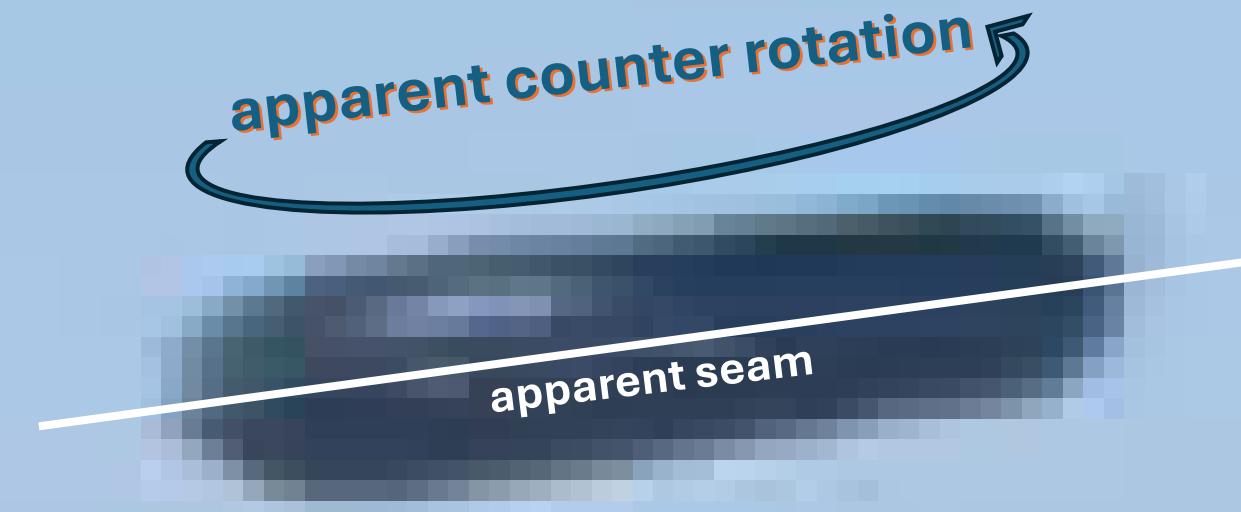
FRAME #2

Super Resolution 12x



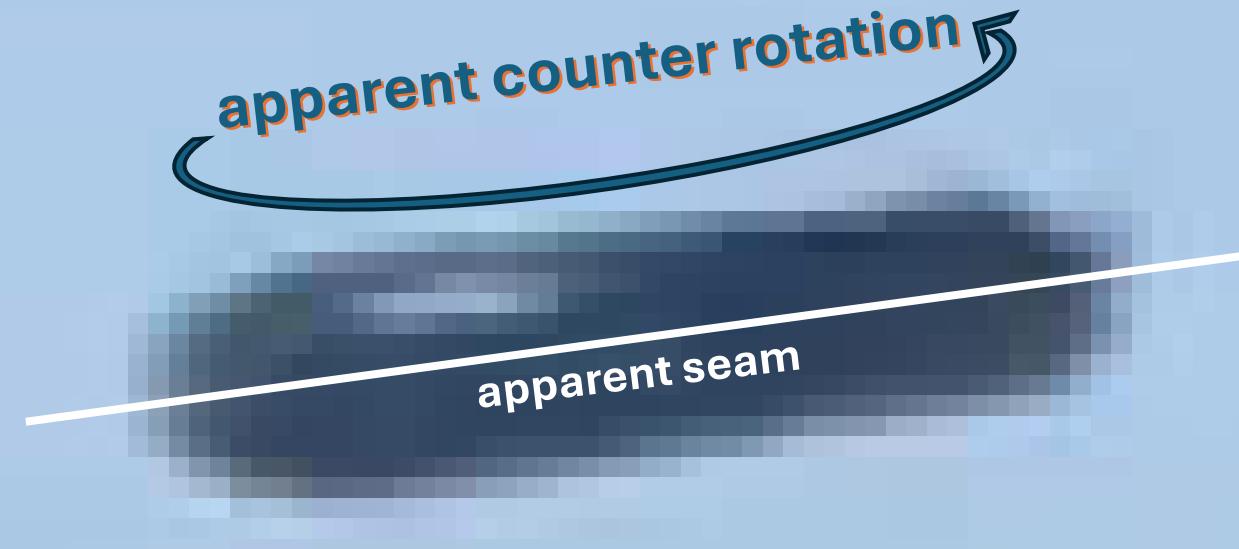
$t=0.0667 \text{ s}$

Super Resolution 12x



$t=0.1001 \text{ s}$

Super Resolution 12x



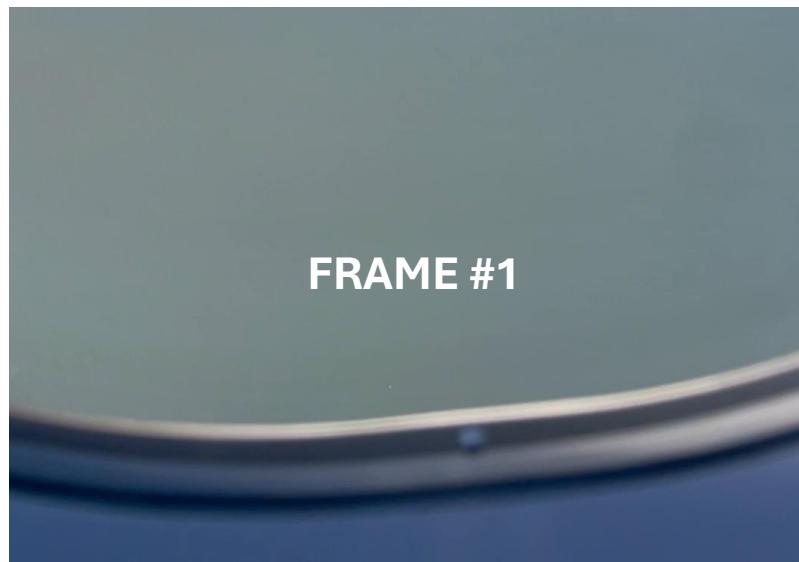
$t=0.1334 \text{ s}$

FRAME #5



**Images Aligned to
Verrazzano-Narrows Bridge
and Staten Island**

$t=0.0000 \text{ s}$





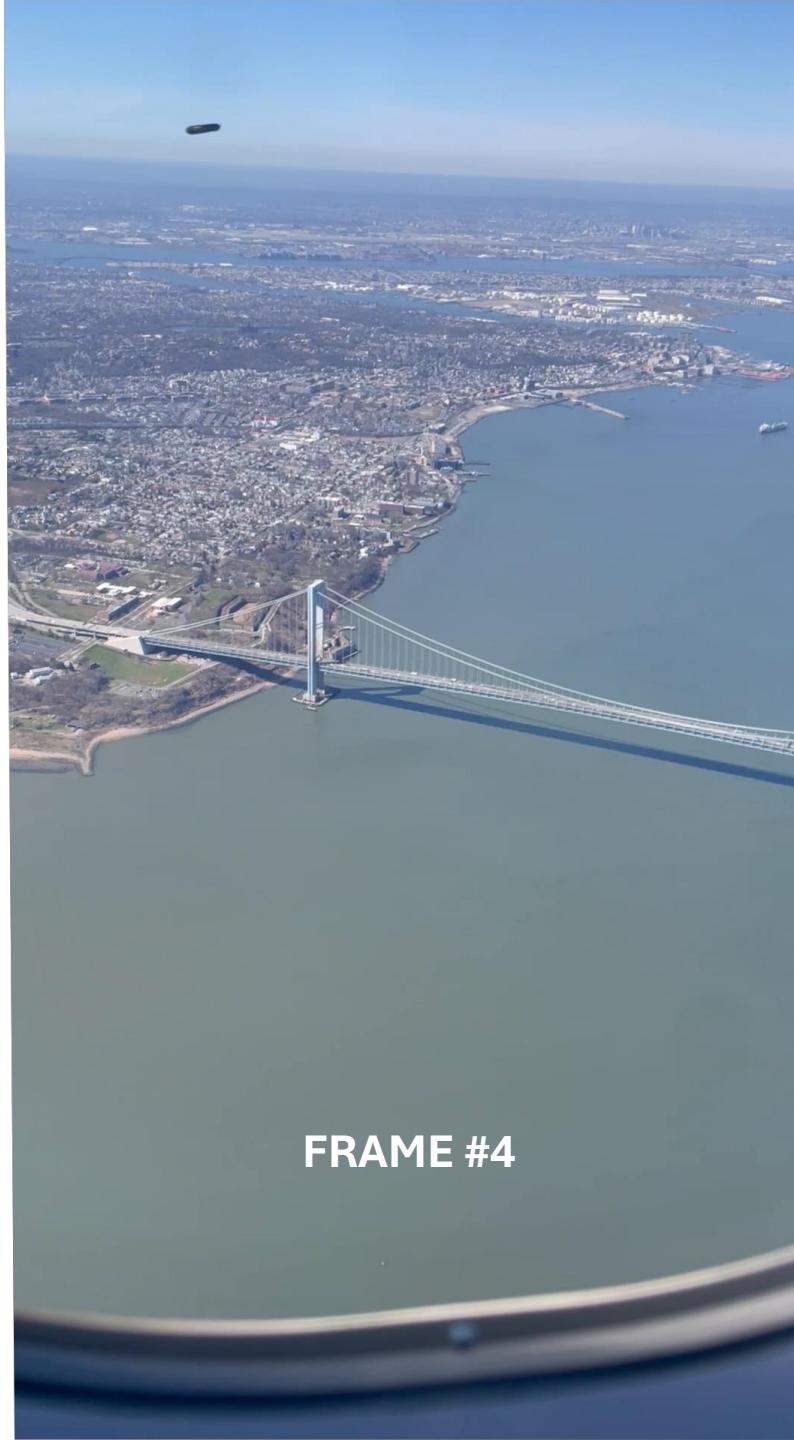
FRAME #2

$t=0.0334 \text{ s}$



FRAME #3

$t=0.0667 \text{ s}$



FRAME #4

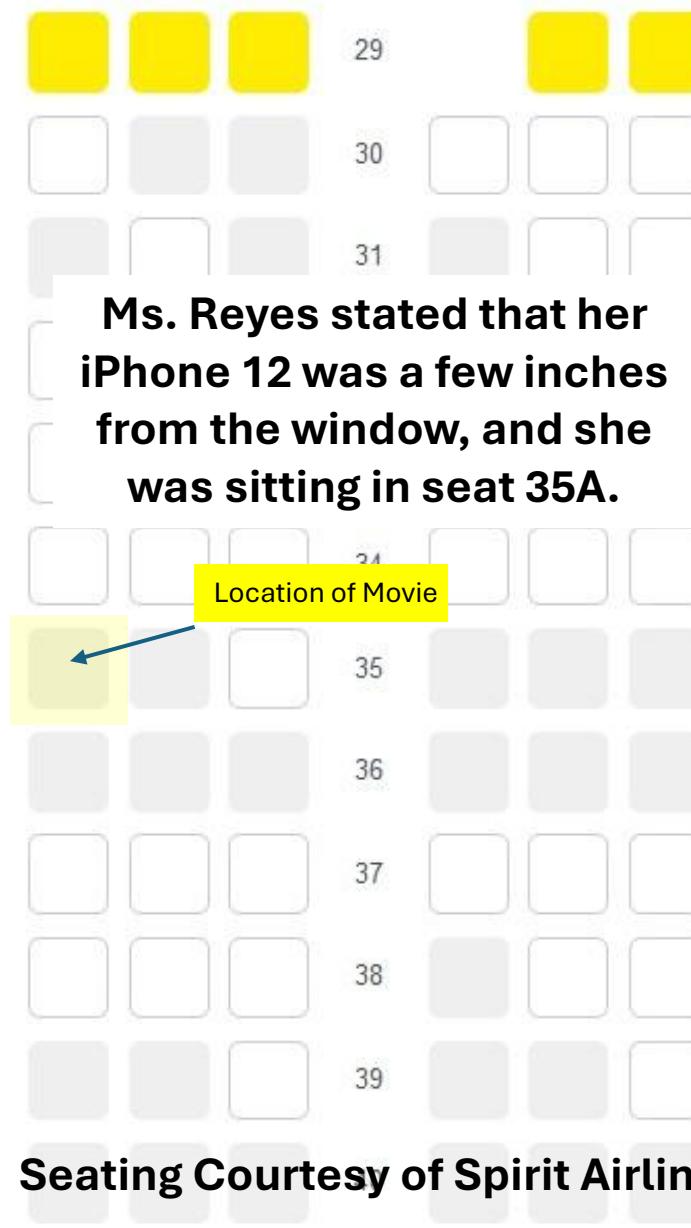
$t=0.1001 \text{ s}$



$t=0.1334 \text{ s}$

EXIT ROW SEATS

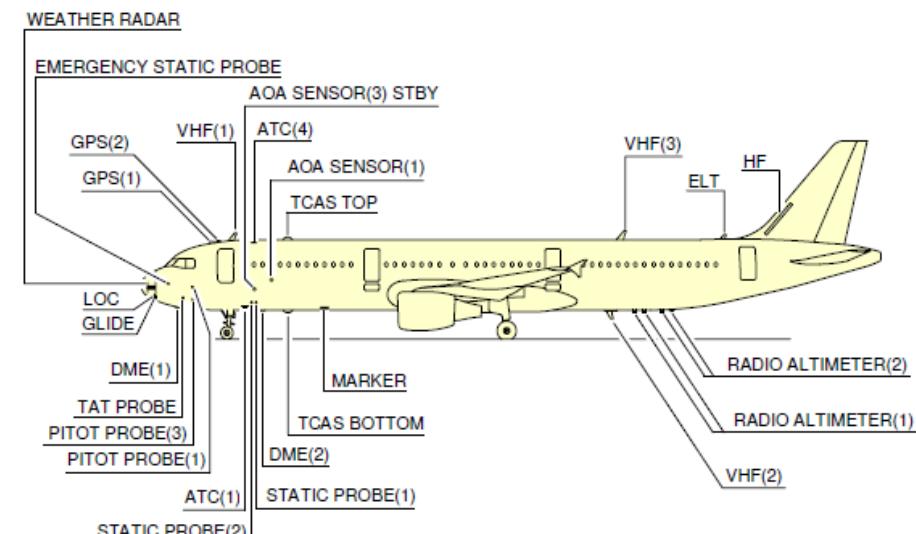
UP TO 10 IN. MORE LEGROOM



Spirit Airlines Flight NK3380

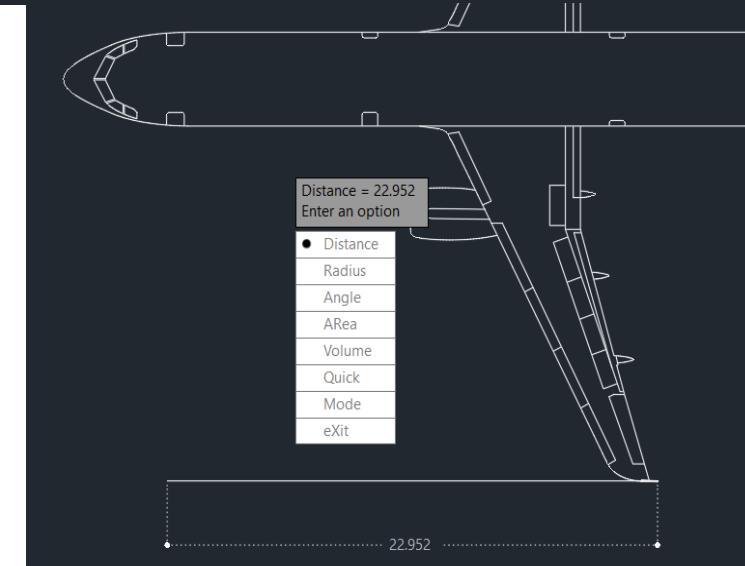
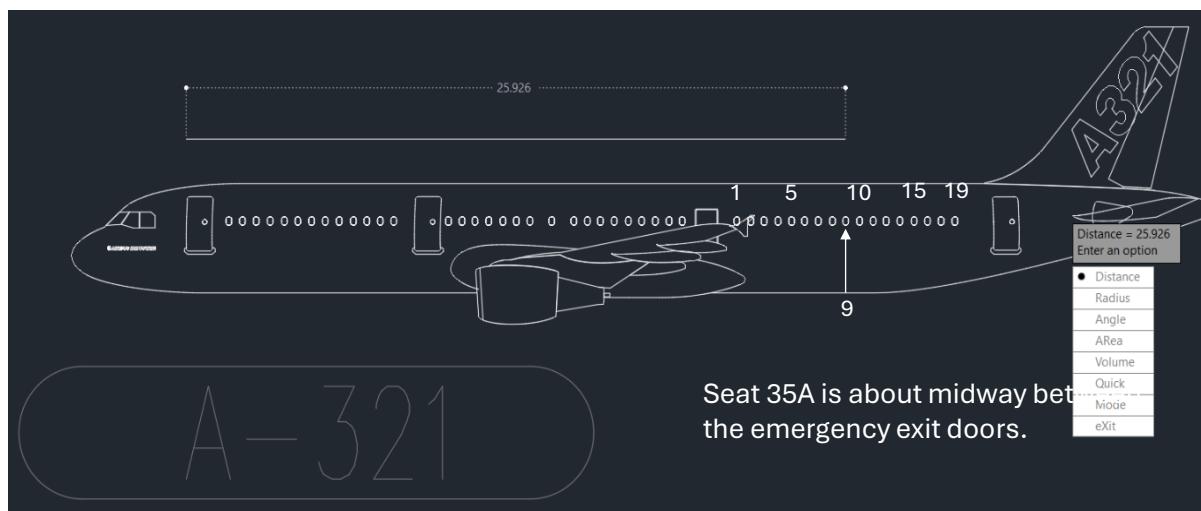
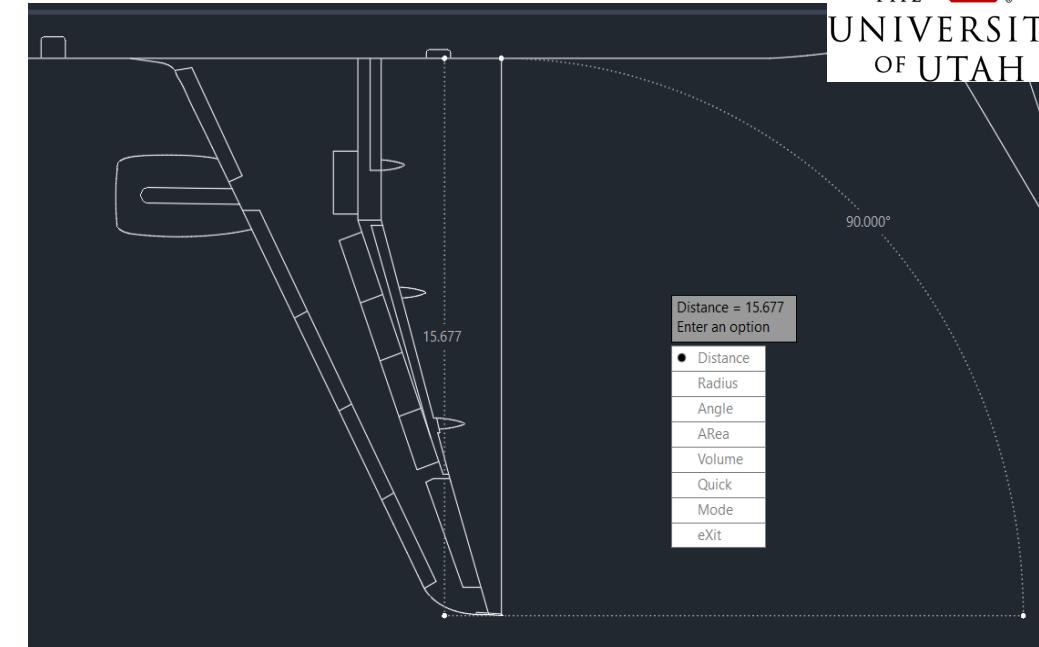
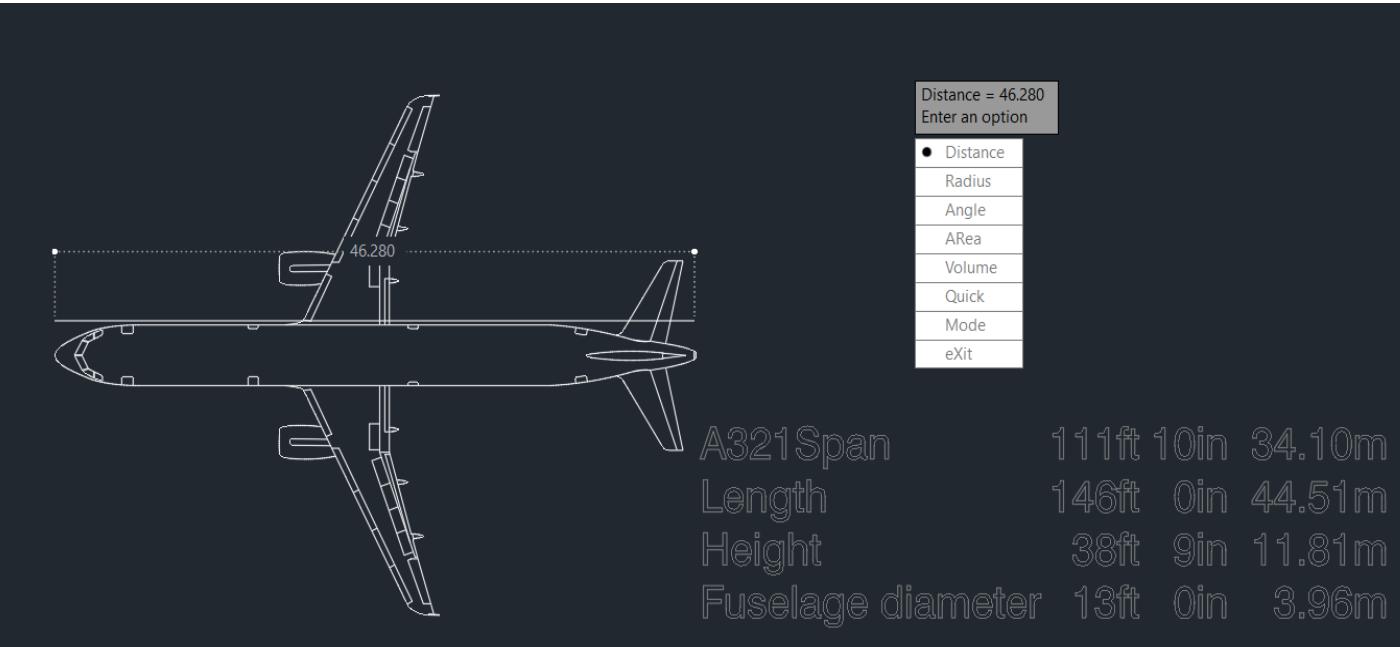


**ON A/C A321-100 A321-200 A321neo



Courtesy of Airbus 25

Spirit Airlines Flight NK3380



Spirit Airlines Flight NK3380



Nonameanymore

Spirit Airbus A321 (taxi livery)

Transportation > Aircraft

Spirit Airlines Airbus A321 in new "taxi" livery. Credit to Mr.G the Sheep, airplanenerd777, AirbusA330, and dre737 for the template. Spirit Airlines has 18 Airbus A321 plus 12 more on ...

[Read more](#)

[View In AR](#)

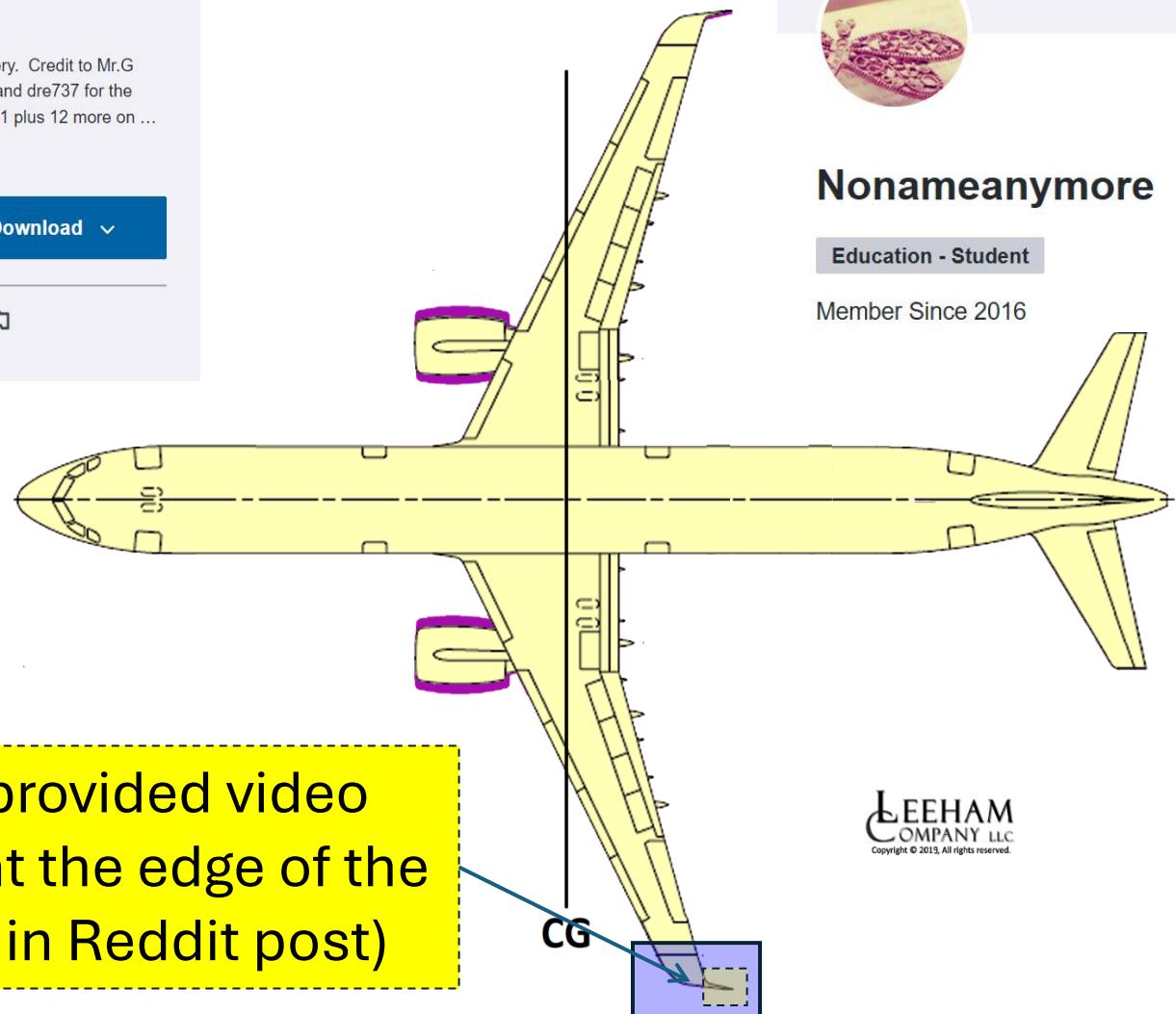
[Download](#) ▾



3D Warehouse

Get SketchUp

Ms. Reyes' provided video camera caught the edge of the wing tip (not in Reddit post)



LEEHAM
COMPANY LLC
Copyright © 2019. All rights reserved.

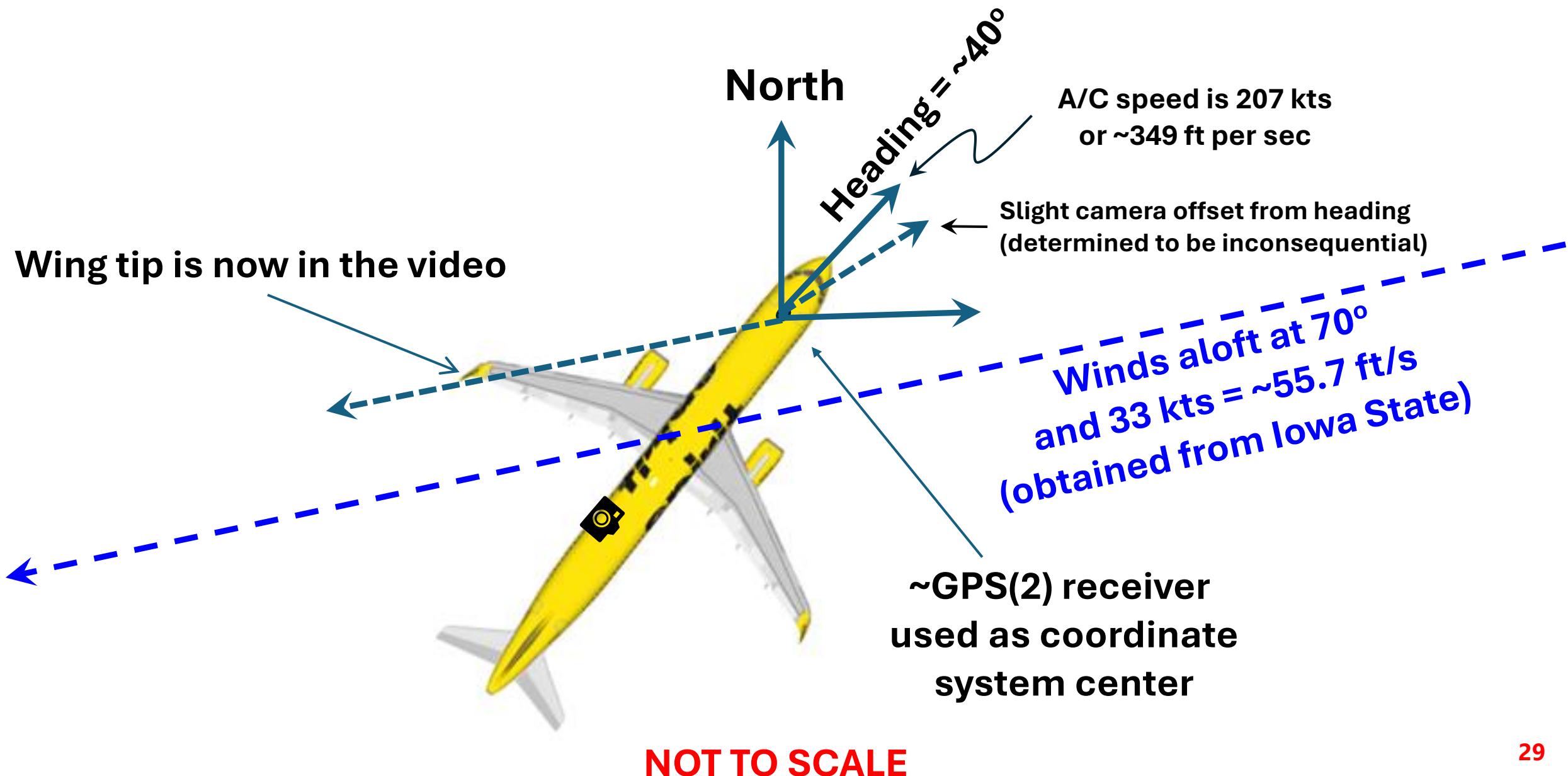
3/25/2024 2:21 pm

Flight NK3380 ADS-B in Google Earth

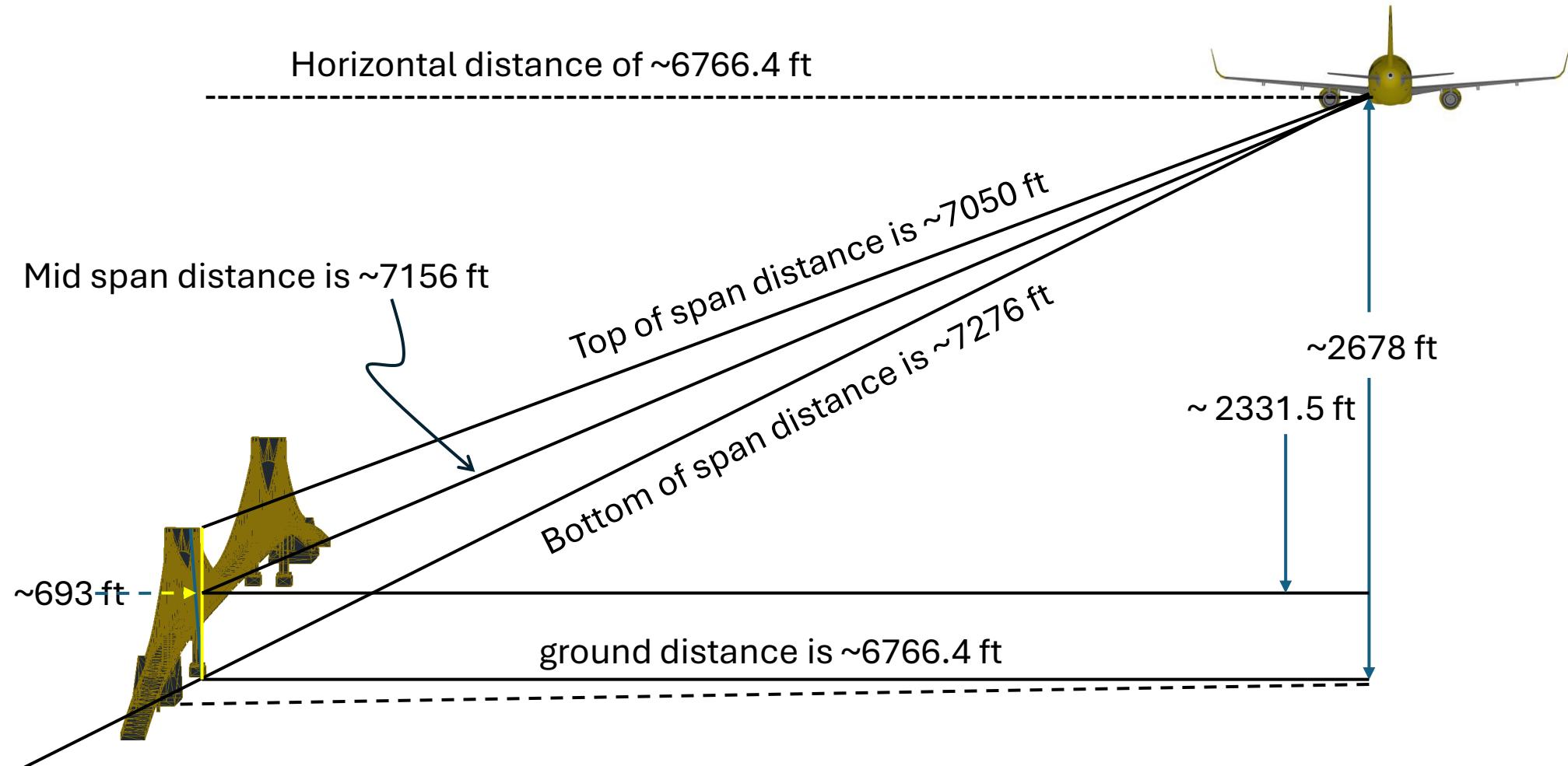


~FIELD OF VIEW

Flight NK3380 Coordinates



Flight NK3380 Coordinates – From the Trigonometry



NOT TO SCALE

Scale comparison to bridge
IF at the same distance, for the
[Verrazzona-Narrows Bridge](#)

Height is ~693 ft

Let's use this to estimate the
camera's AOV!

So, at the same distance as the
Bridge's West Tower

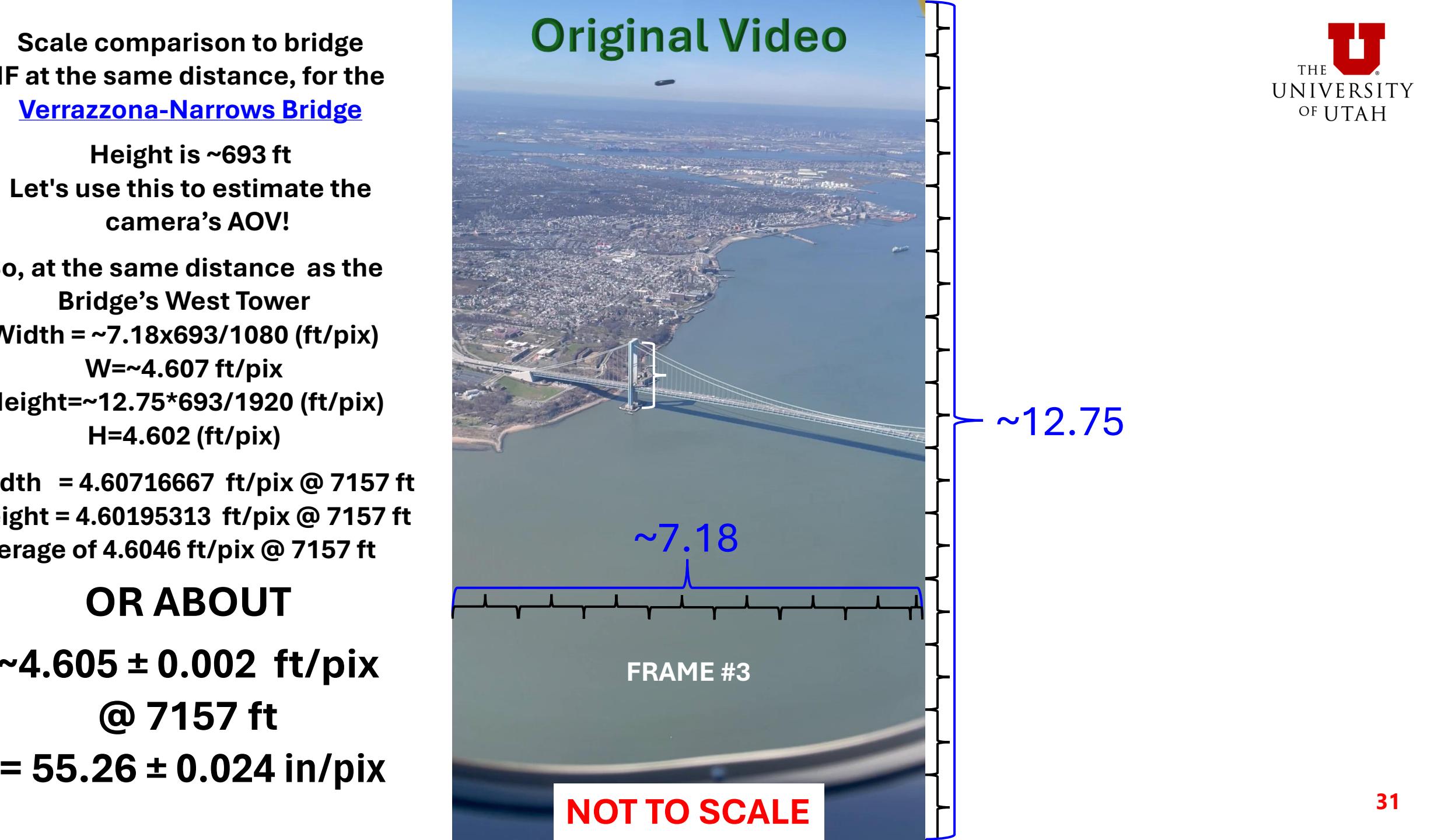
Width = $\sim 7.18 \times 693 / 1080$ (ft/pix)
W = ~ 4.607 ft/pix

Height = $\sim 12.75 \times 693 / 1920$ (ft/pix)
H = 4.602 (ft/pix)

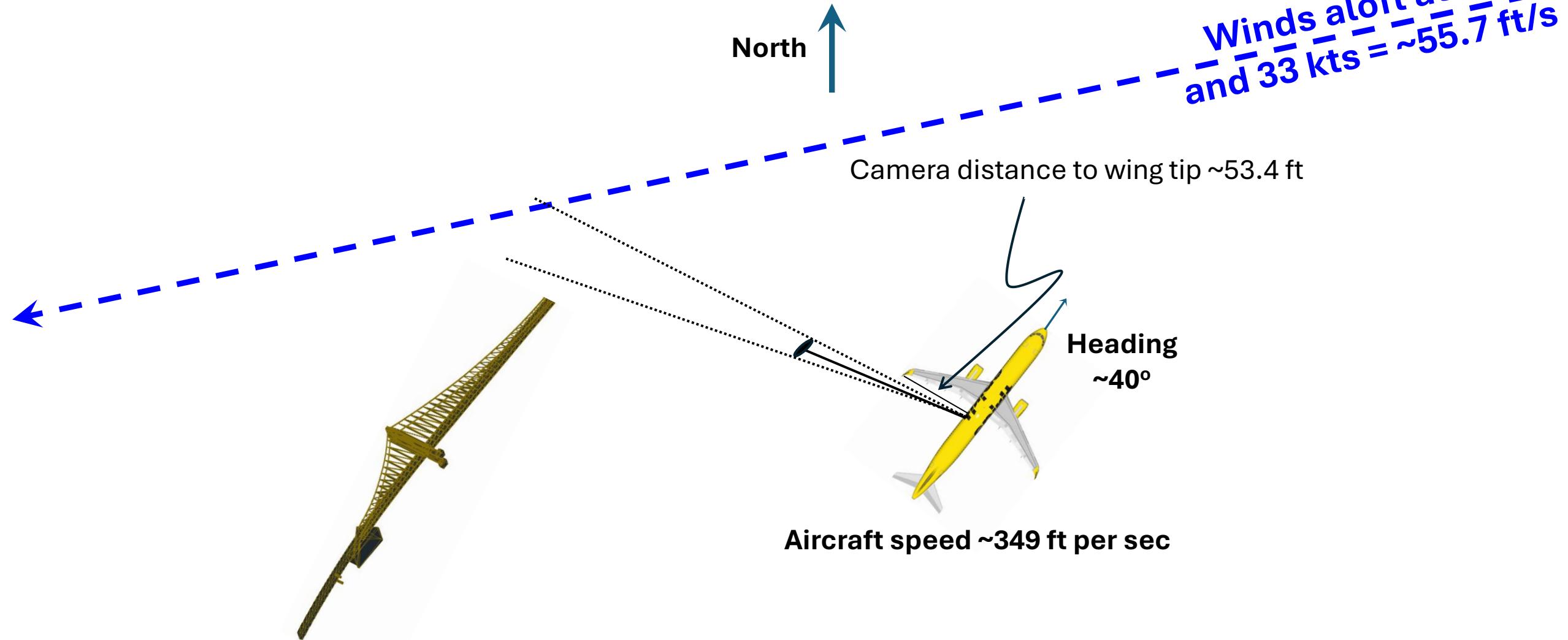
Width = 4.60716667 ft/pix @ 7157 ft
Height = 4.60195313 ft/pix @ 7157 ft
Average of 4.6046 ft/pix @ 7157 ft

OR ABOUT

$\sim 4.605 \pm 0.002$ ft/pix
@ 7157 ft
 $= 55.26 \pm 0.024$ in/pix

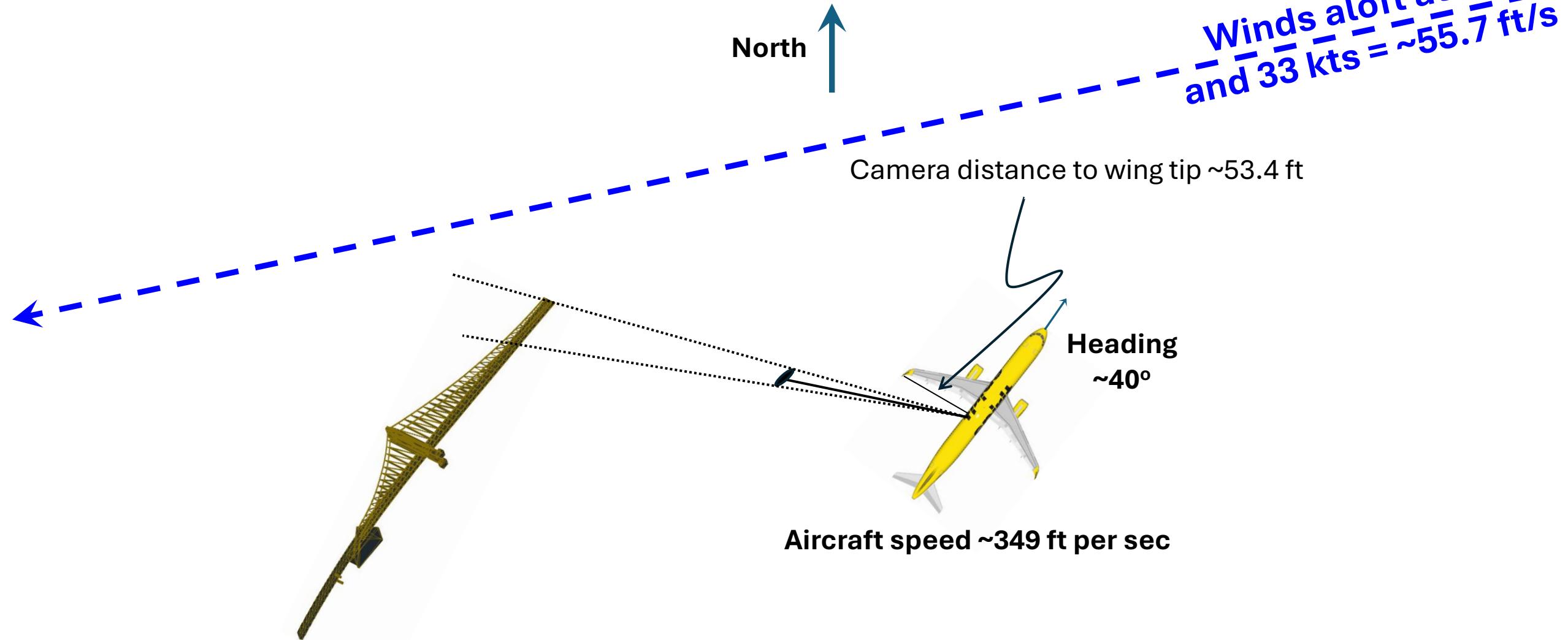


Geometry: View from Above



NOT TO SCALE

Geometry: View from Above



NOT TO SCALE

Geometry: View from Above

Keeping the bridge tower at same spherical distance and rotate for perspective distance. Object is ~3.5x shorter than the span. Hence if 1:1 length to distance ratio, it would mean it is $693/3.6 = \sim 193$ ft in length at that distance. Surely it would have been seen from the ground and shown up on radar!

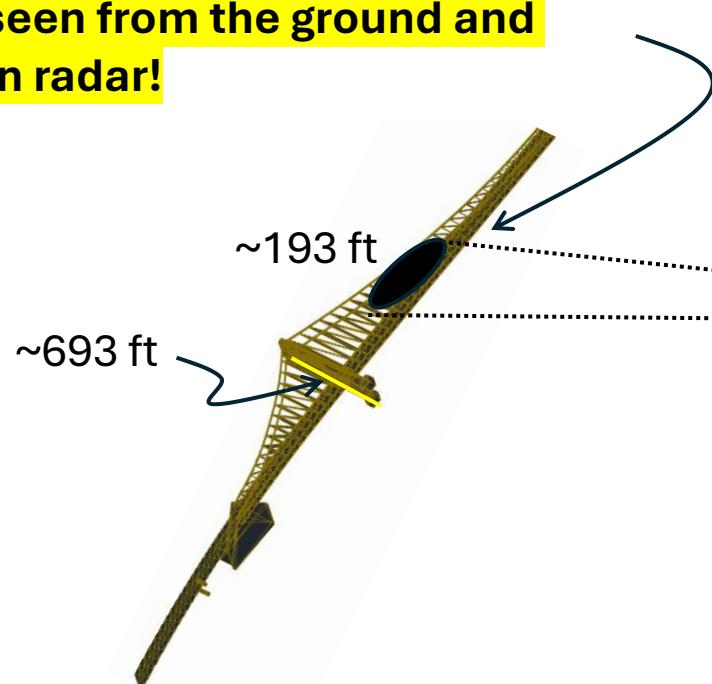
North

Camera distance to wing tip ~53.4 ft

Heading
~40°

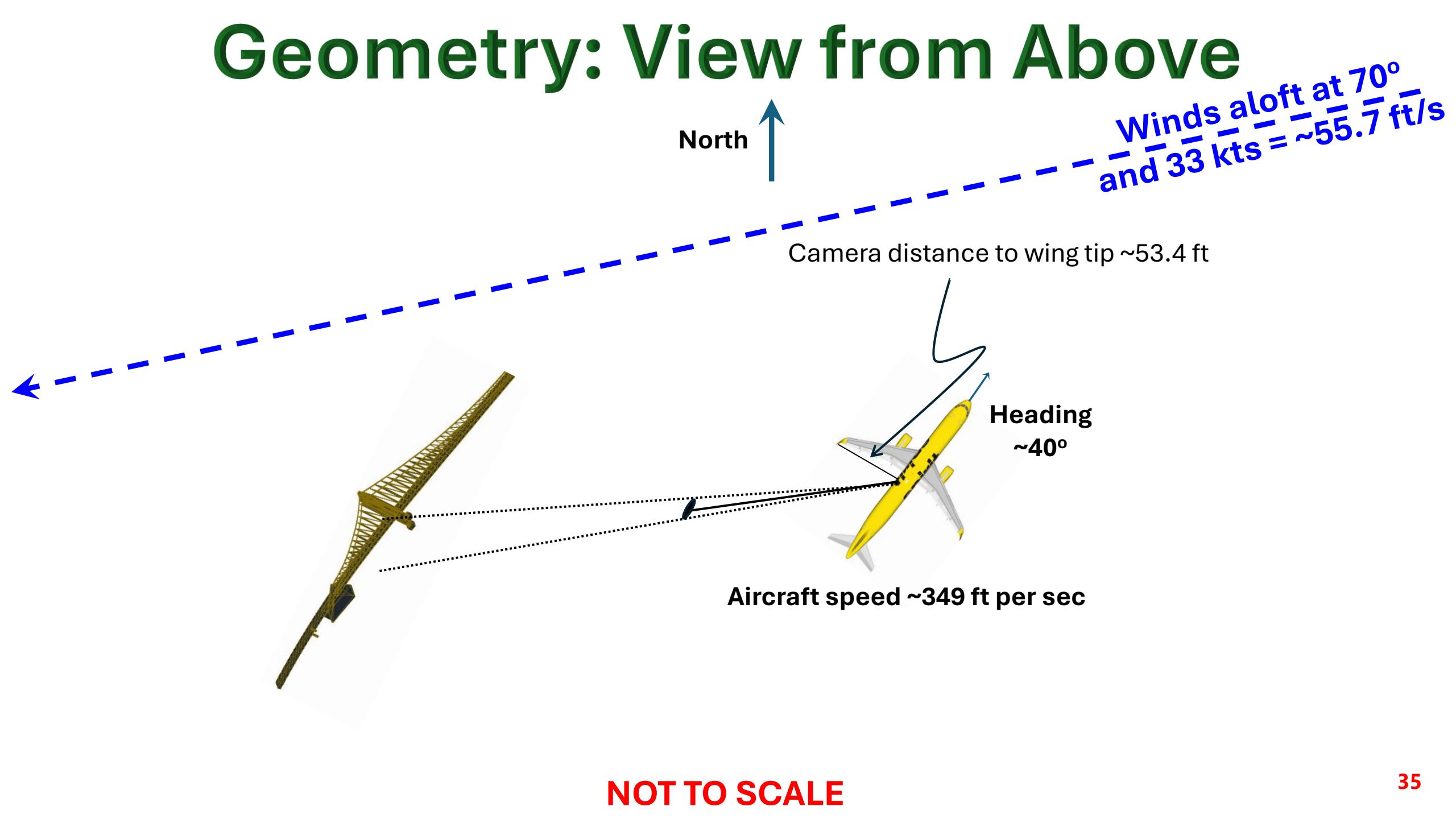
Aircraft speed ~349 ft per sec

Winds aloft at 70°
and 33 kts = ~55.7 ft/s

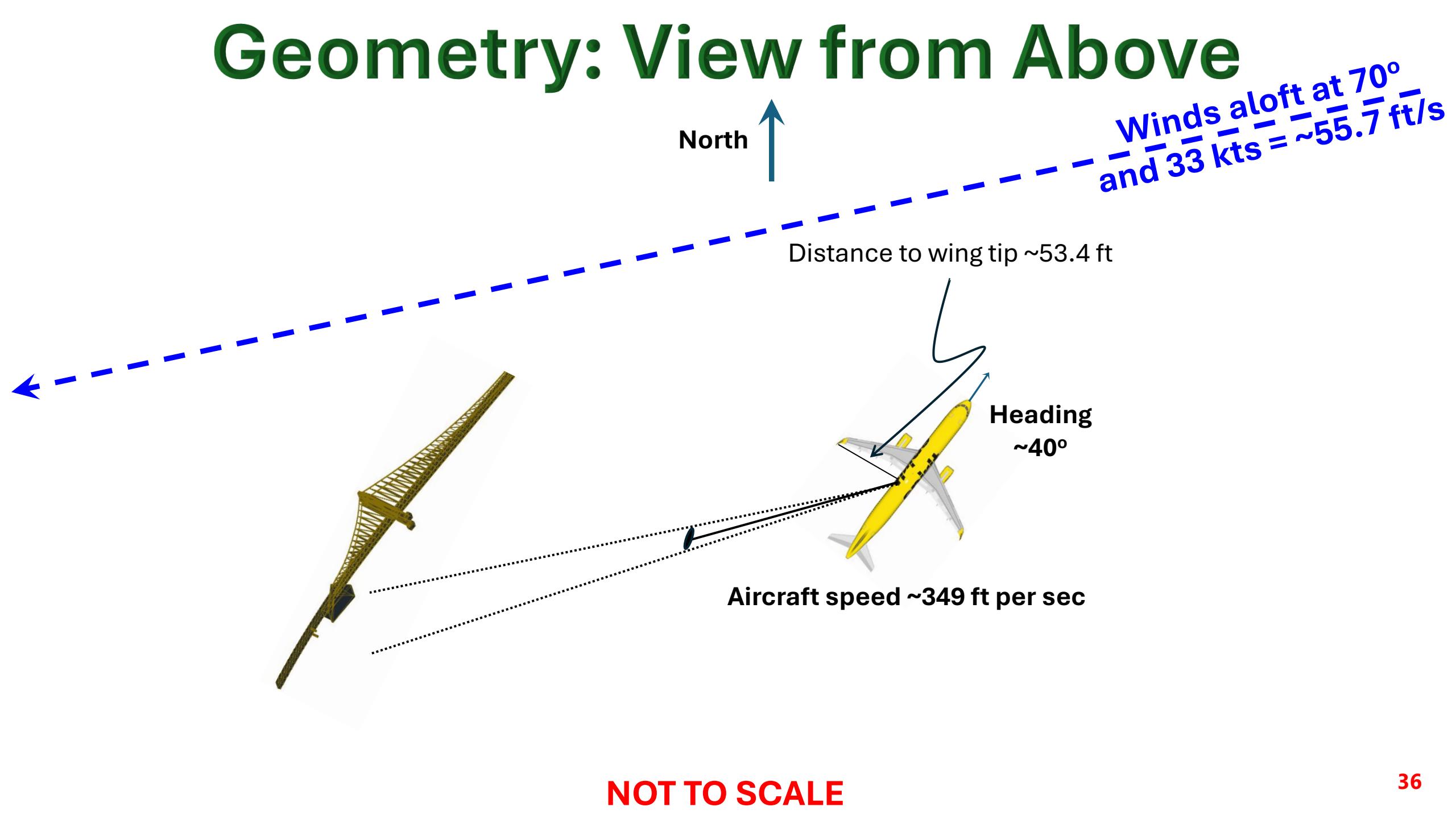


NOT TO SCALE

Geometry: View from Above



Geometry: View from Above



Using Ratios

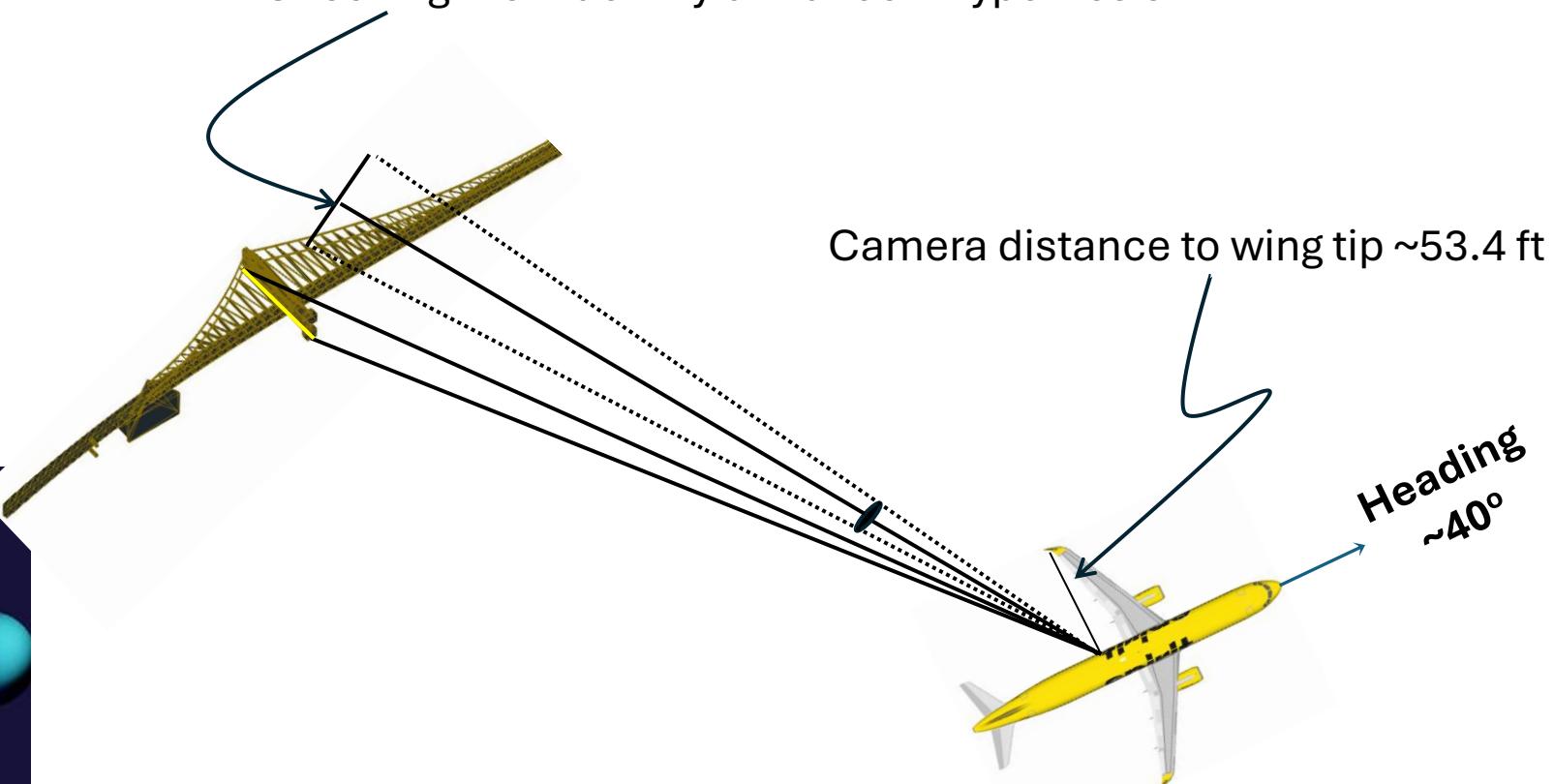
North ↑

Use the lengths at this distance to estimate the distance to a Lovoir® black “40”-inch jumbo mylar balloon (which is 35” when inflated)



My original hypothesis was a toroid balloon or a custom-built drone. One proposed toroid is the Number “0” balloon like the one on the left, which certainly fits this description.

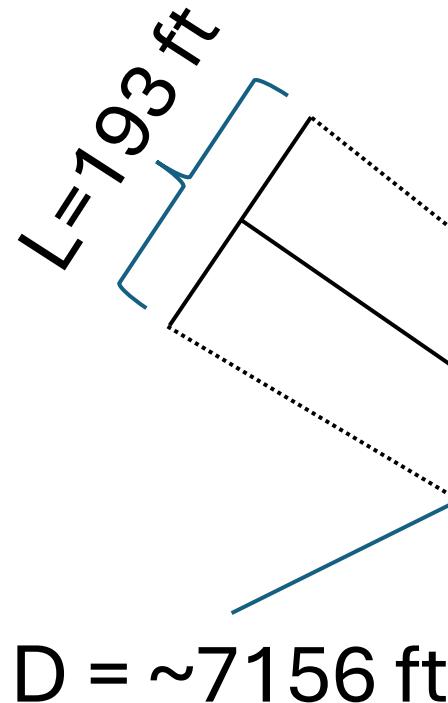
Checking the Black Mylar Balloon Hypothesis...



NOT TO SCALE

Aircraft speed ~349 ft per sec ³⁷

Use the lengths at this distance to estimate the distance to a Lovoir® [black “40”-inch jumbo mylar balloon](#) (which is 35” when inflated)

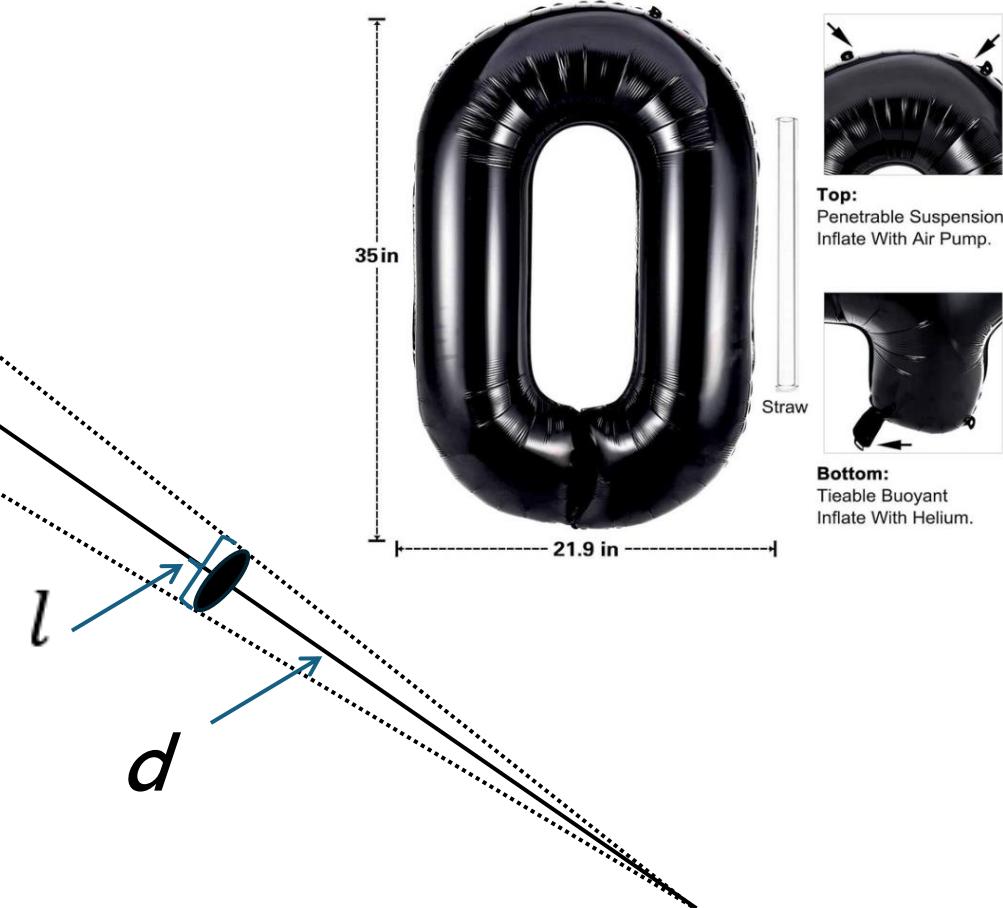


IF it's an edge on jumbo mylar balloon then...

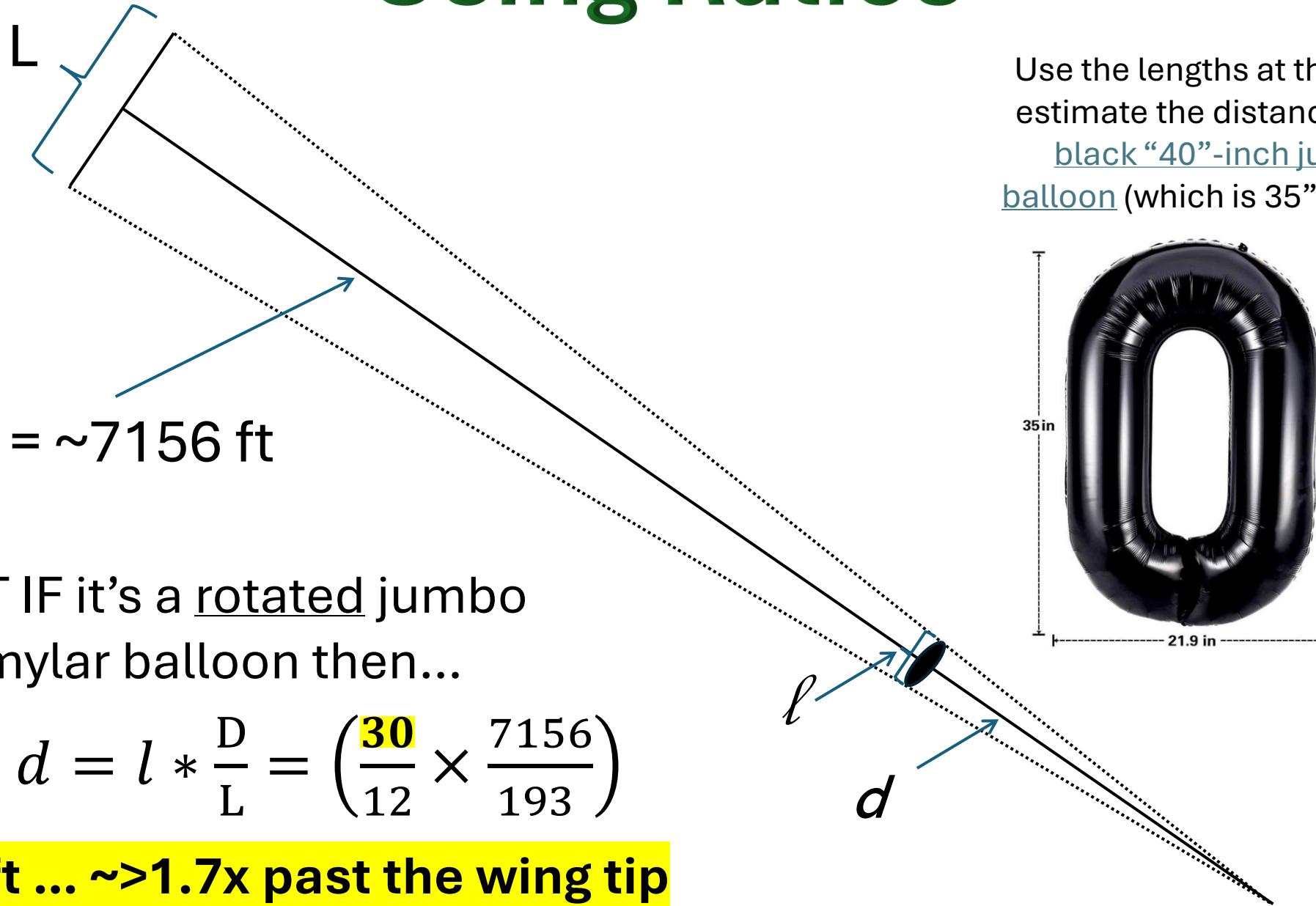
$$\frac{L}{D} = \frac{l}{d} = d = l * \frac{D}{L} = \left(\frac{35}{12} \times \frac{7156}{193} \right)$$

= ~108 ft ... ~>2x past the wing tip

NOT TO SCALE



Using Ratios



Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



AOV/FOV Cross Check

$$\theta = \tan \frac{L/2}{D} \Rightarrow 2 \times \theta = AOV_{(w \text{ or } h)}$$

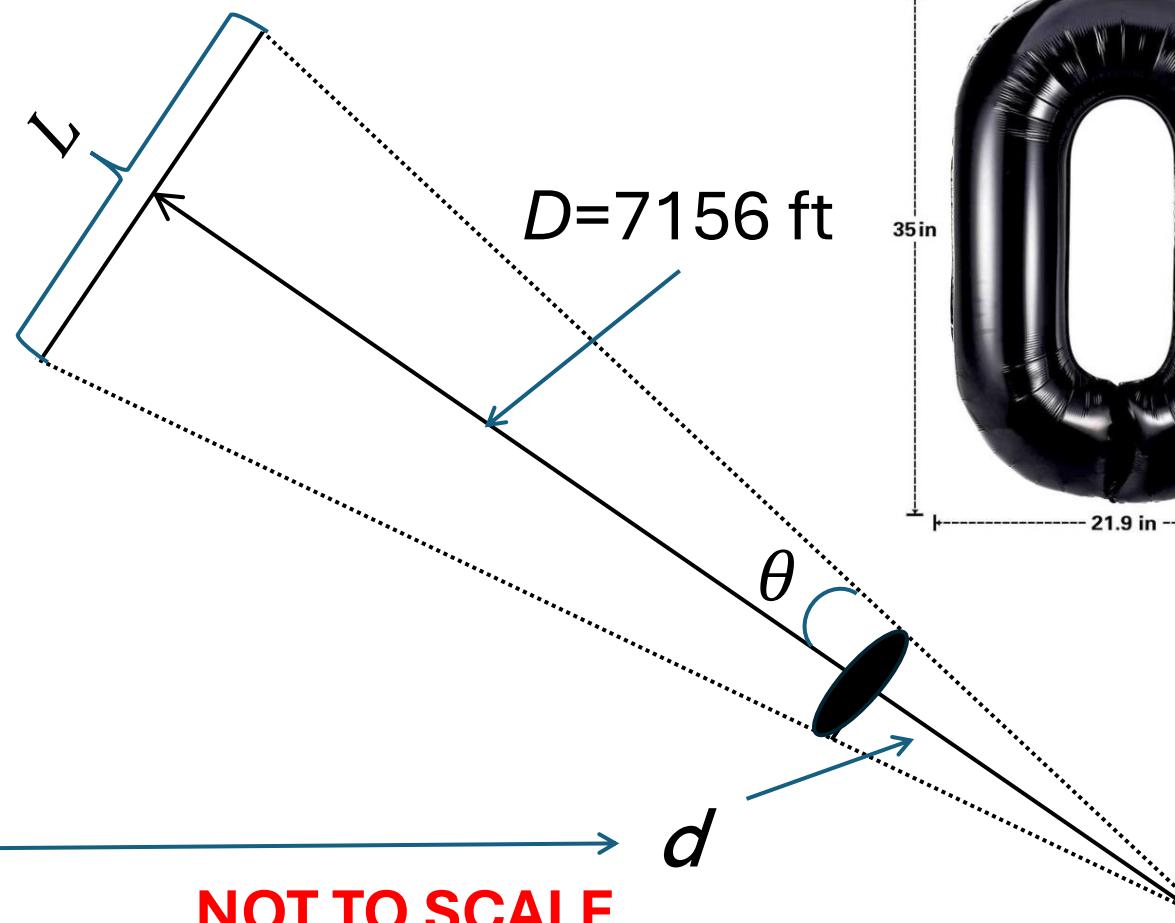
$$L_w = 4975.70 \text{ ft}$$

$$L_h = 8835.75 \text{ ft}$$

AOV_w	41.53	deg
AOV_w	0.038	deg/pix
AOV_w	0.000663	rad/pix

Frame #	Length (pixels)	distance (ft)
1	48.7	89.2
2	46.5	93.43
3	46.4	93.63
4	46.4	93.63
5	46.5	93.43
AVE	46	93

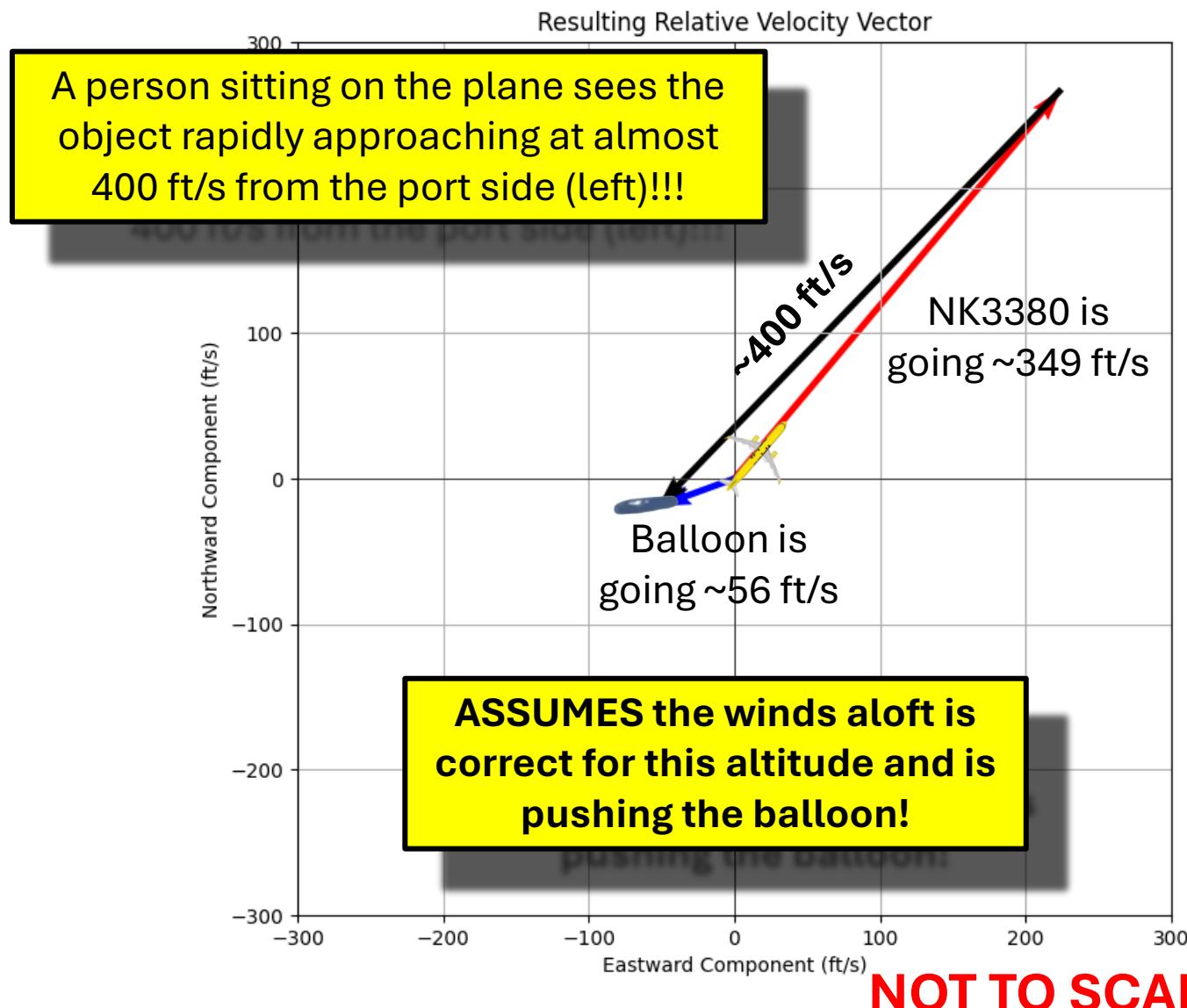
Dimension	pixels
Height	1920
Width	1080
Diagonal	2203



Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



Velocity across the AOV Cross Check

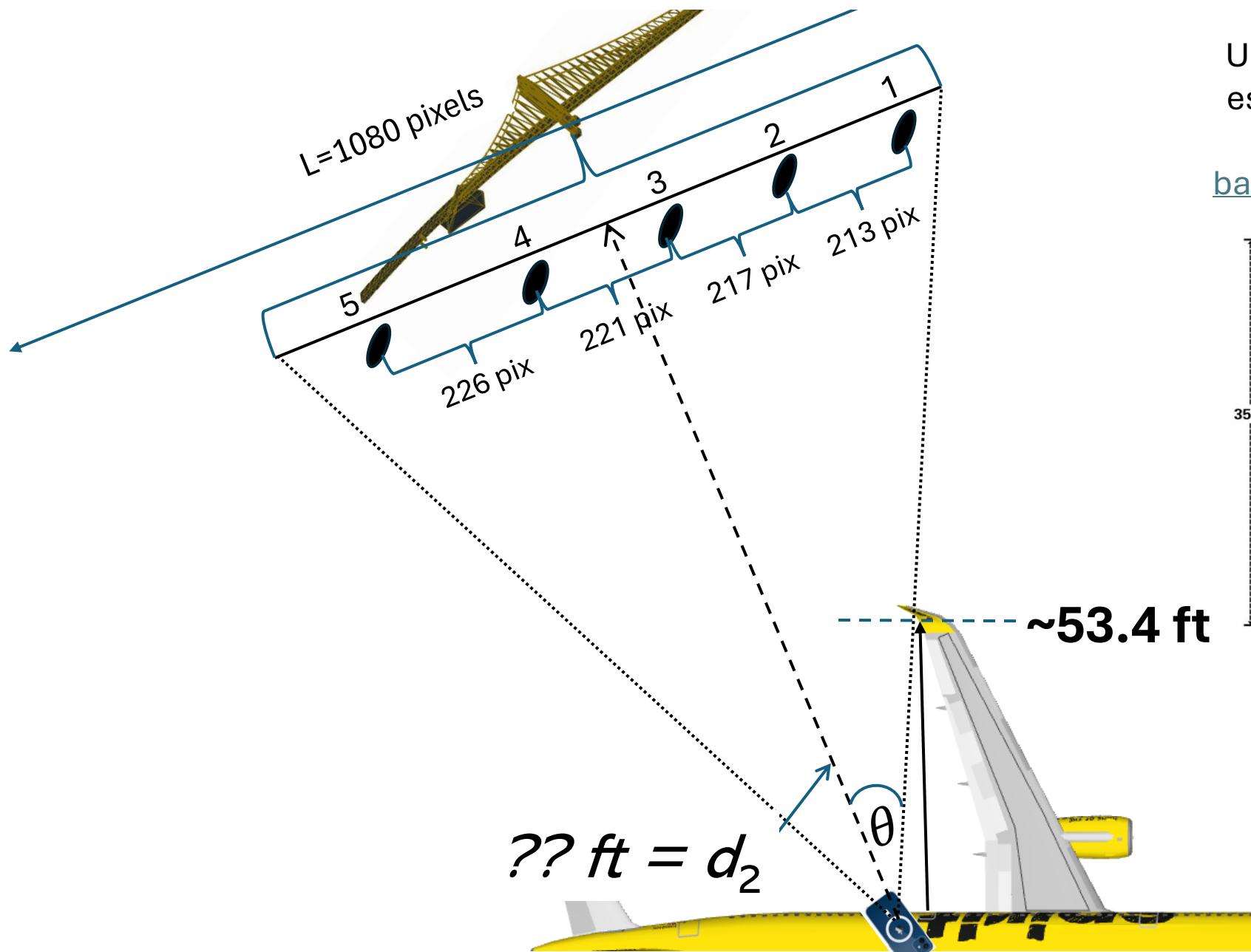


Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



NK3380 & Winds Aloft Speed & Directions
Relative Speed: ~399 ft/s
A/C Relative Vel. X: ~ 386 ft/s

Velocity across the AOV Cross Check

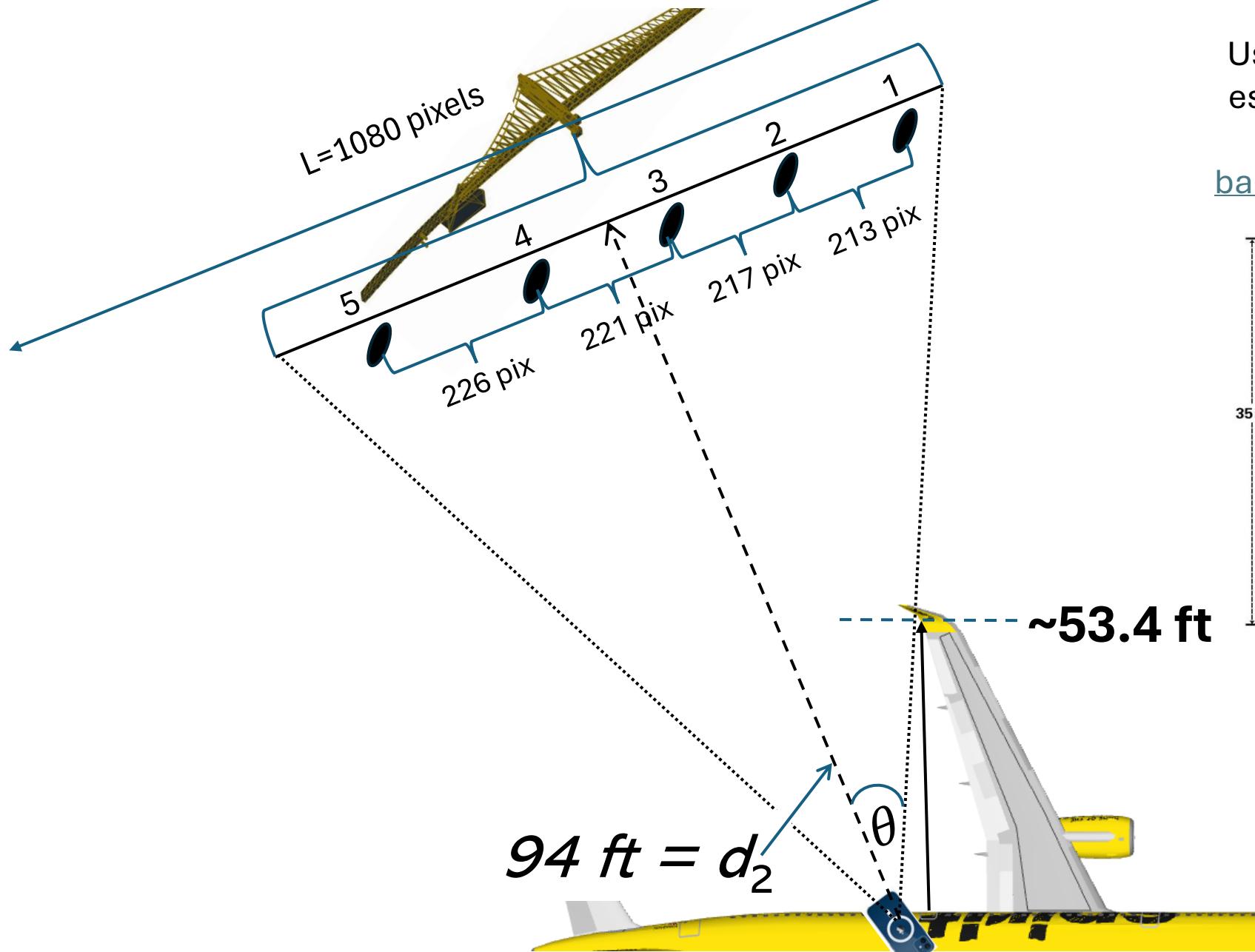


Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



NOT TO SCALE

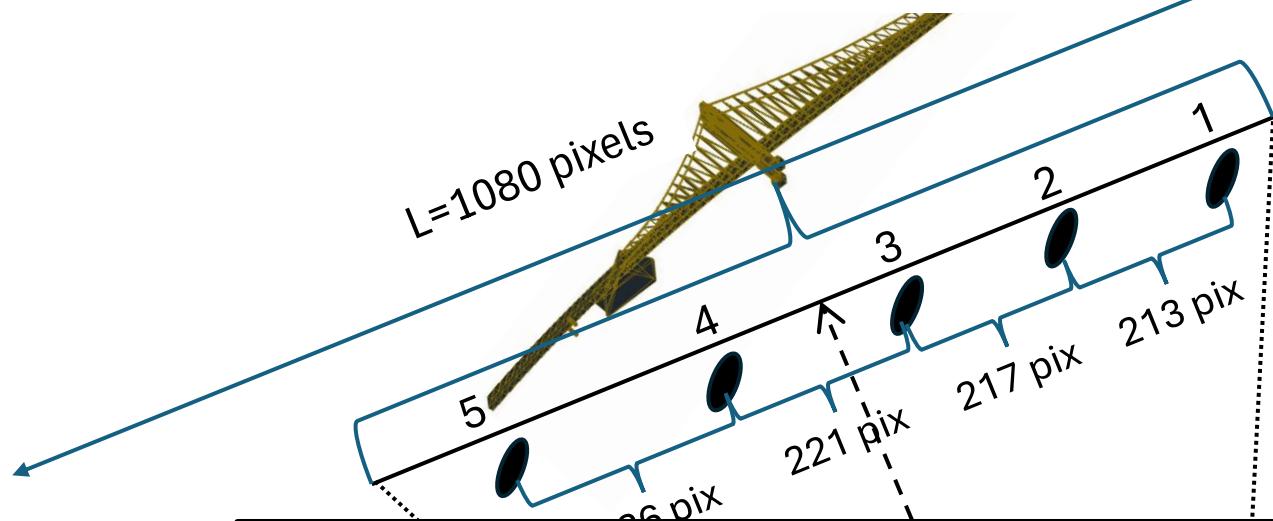
Velocity across the AOV Cross Check



Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



Velocity across the AOV Cross Check



Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



Top:
Penetrable Suspension
 Inflate With Air Pump.



Bottom:
Tieable Buoyant
 Inflate With Helium.

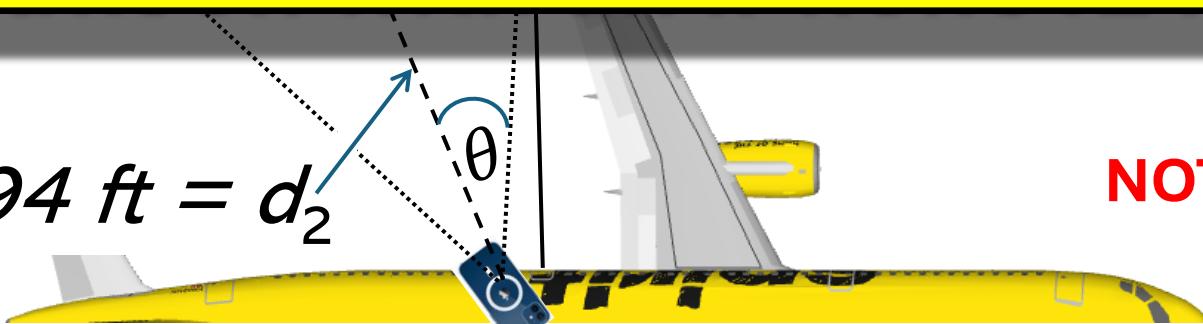
~94 ft from camera

FOV match based on taking a movie of this balloon with an iPhone12 PRO.

$$94 \text{ ft} = d_2$$

θ

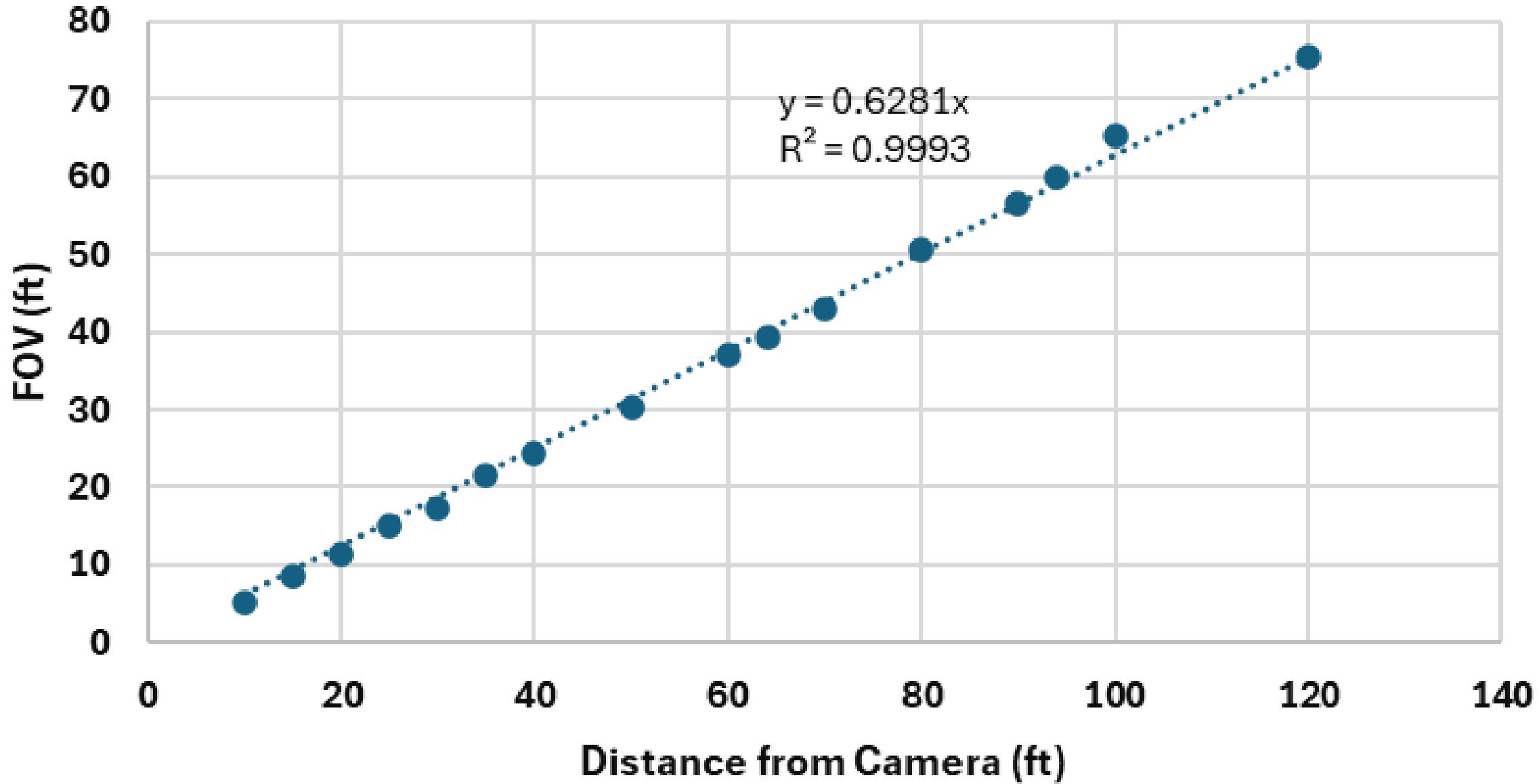
NOT TO SCALE



iPhone 12 PRO FOV Measurement



iPhone 12 PRO FOV Measurement



Balloon Speed Estimate

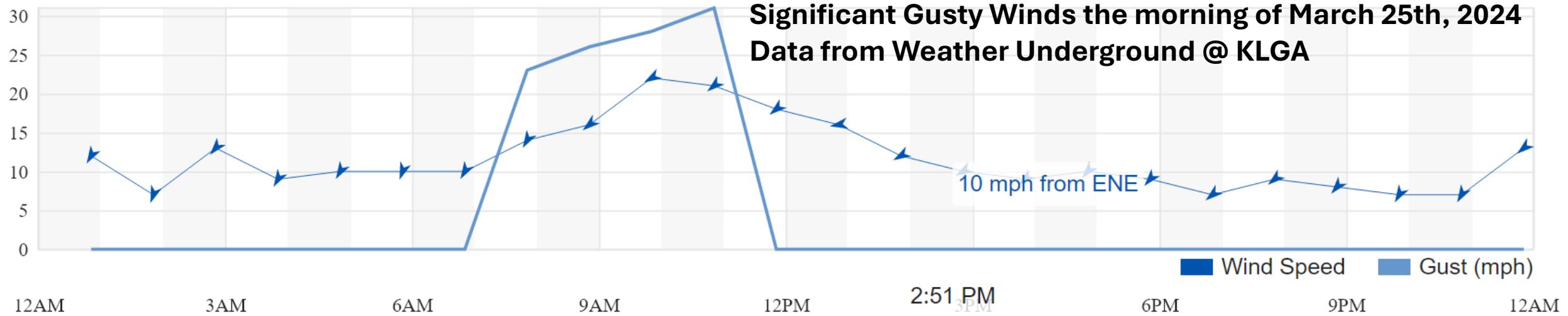


	Frame 1->2	Frame 2->3	Frame 3->4	Frame 4->5		
Distance Traveled (pix per frame)	212.5658721	216.6292916	221.65288	225.67953	Average	Std. Dev.
Distance Traveled (ft per frame)	11.81055159	12.03632267	12.315443	12.539171	12.175372	0.318537
FOV Speed (ft per sec)	354.0685261	360.8369172	369.20465	375.91179	365	9.5

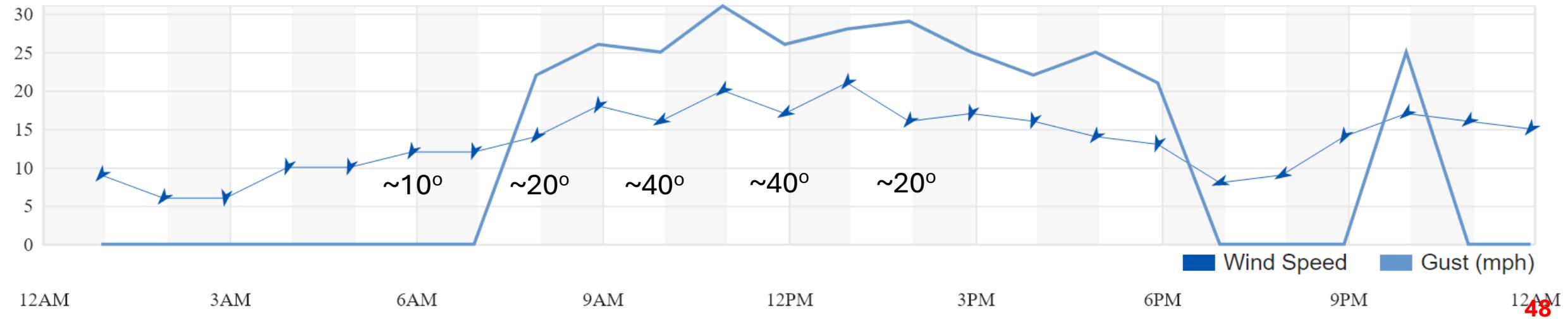
Relative Speed Magnitude (fps)	400
Aircraft X-Component Relative (fps)	386 @ 33 kts, 70°
IF Winds aloft 1 sig error (fps)	381 @ 29 kts, 70°
IF Winds aloft +/- 7kts (fps)	378 @ 26 kts, 70°

Difference can be attributed to winds aloft accuracy, or aerodynamics of the balloon may contribute to it not equaling the winds aloft speed or there is also an error in the winds aloft speed. Estimated errors above.

NYC Weather on March 25th, 2024



Data from Weather Underground @ Long Island MacArthur Airport (Further East along Long Island)



Balloon Origin Estimation

Party balloon blown away from the owner somewhere along Long Island or the North of NYC, and becomes airborne

Knowns:

Altitude: ~2570 ft = ~0.5 miles
Time: 2024-03-25T18:25:32Z
A/C Lat: 40.5916
A/C Lon: -74.0340

Assumptions:

Speed (assumed): 33 kts = 38 mph
Heading (assumed): 250°
Approx Lat: 40.5914
Approx Lon: -74.0338

Critical Unknowns & Errors:

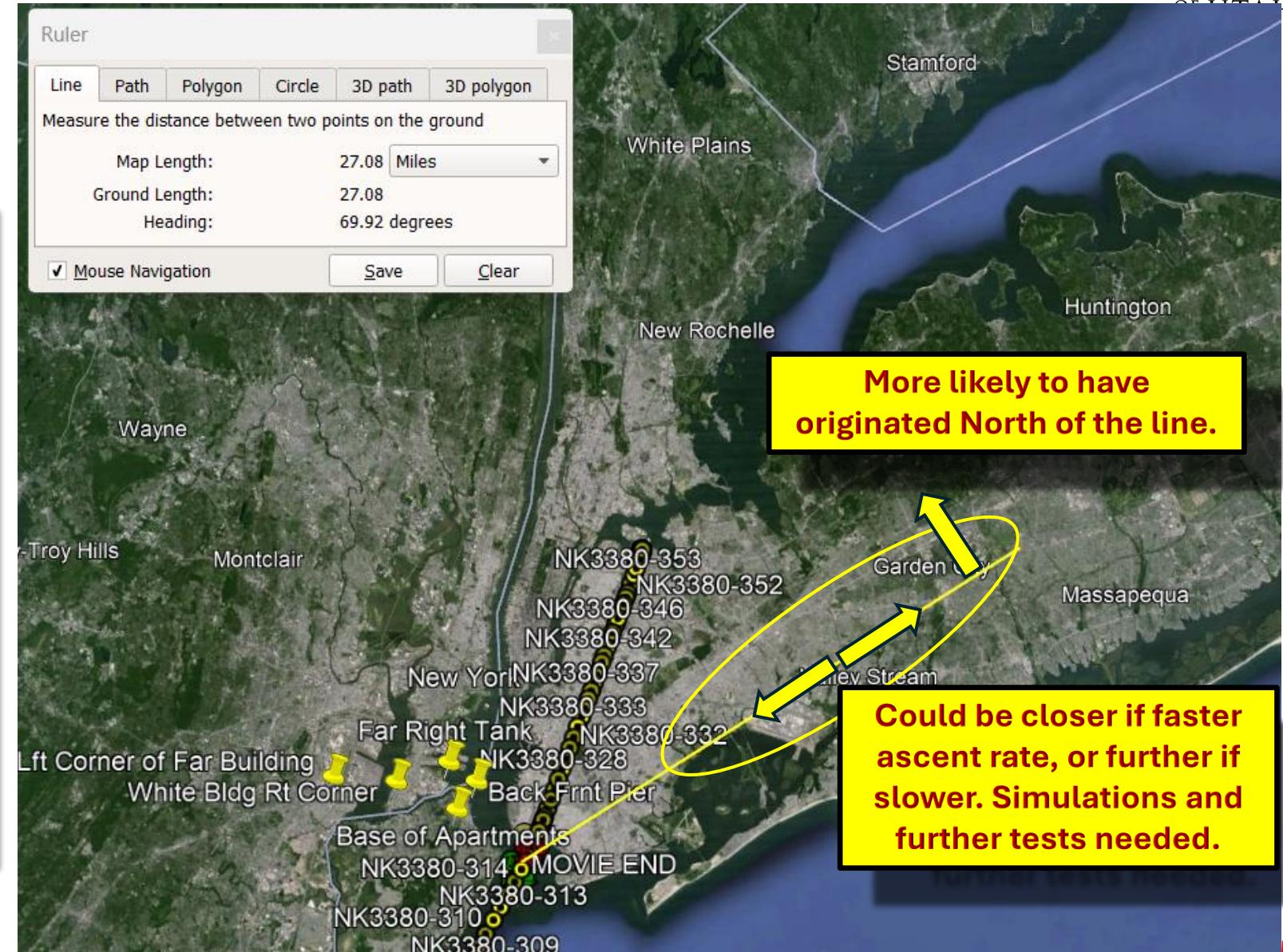
Gas fill: Air or Helium
Ascent: rate of climb (**try ~ 1 fps**)
Time aloft: 2570 s = ~42 min
Speed: up to -10 kts
Heading: up to 10°



Balloon Origin Estimation

If aloft for ~42 minutes
@ 1 fps ascent rate.

Additional ascent rates could be explored using for example in 15 min bands from the start of the wind event. Further, with a more thorough weather pattern analysis and simulations using this balloon in similar high gust wind conditions.



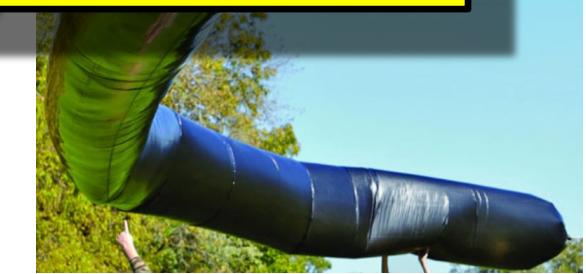
OTHER OBJECTS?

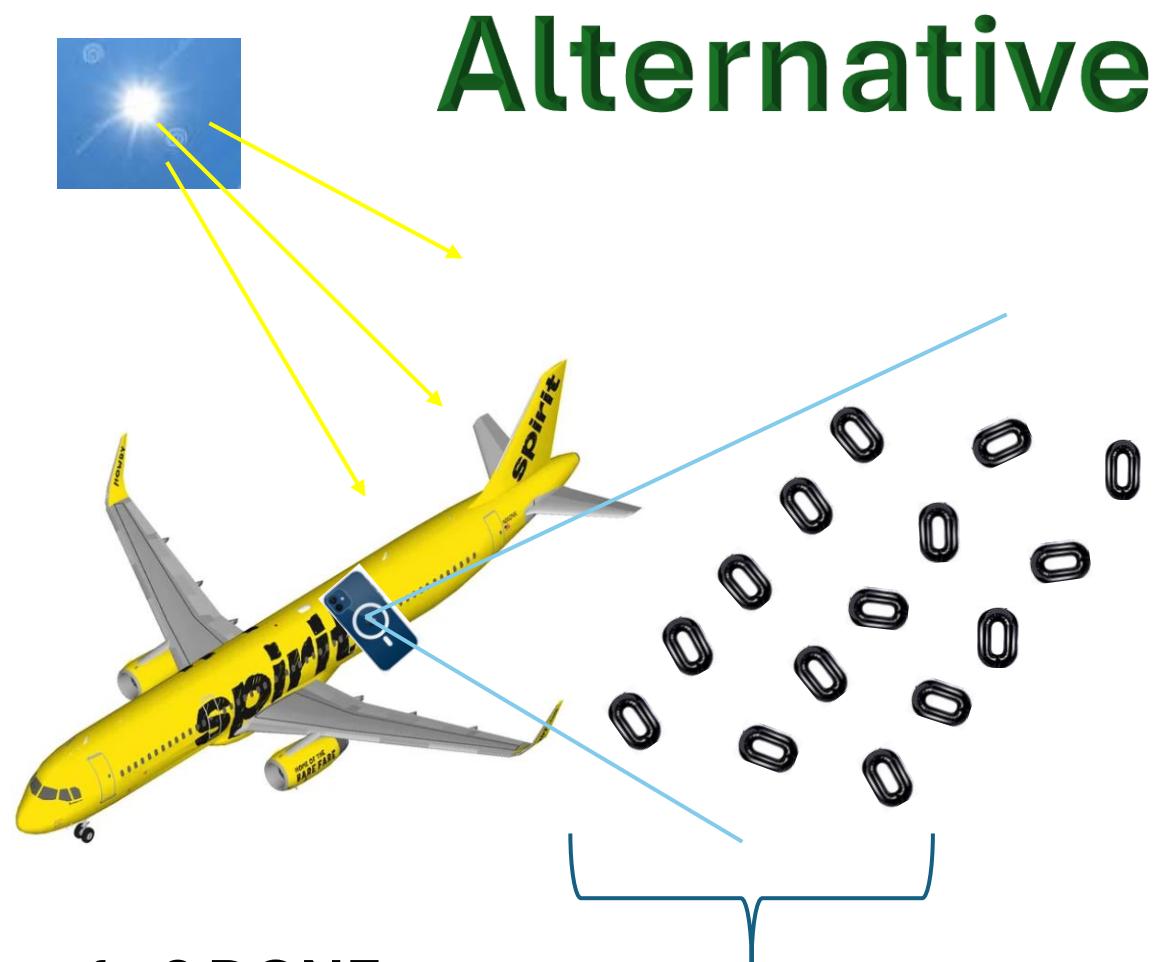


OTHER OBJECTS?



**Nothing else really matches
the visual profile once you view
the zoomed in images.**





Alternative Field Work

Use the lengths at this distance to estimate the distance to a Lovoir® [black "40"-inch jumbo mylar balloon](#) (which is 35" when inflated)



How far? **DONE**

Correct rotation/orientation? **Partial**

Does this object fit the profile? **Yes**

Is the object the right size in the FOV? **Yes**

Does the object give the right reflections? **Yes**



Field Work Result ~94 ft from Camera



CONCLUSION

Black “0” Mylar Balloon

- @ ~94 ft from the camera, closely matches our FOV estimation
- Apparent relative speed between ~365 and 390 fps

Our INITIAL time estimate

- Likely skewed by not paying to analyze the photo on the day taken (5 days difference)

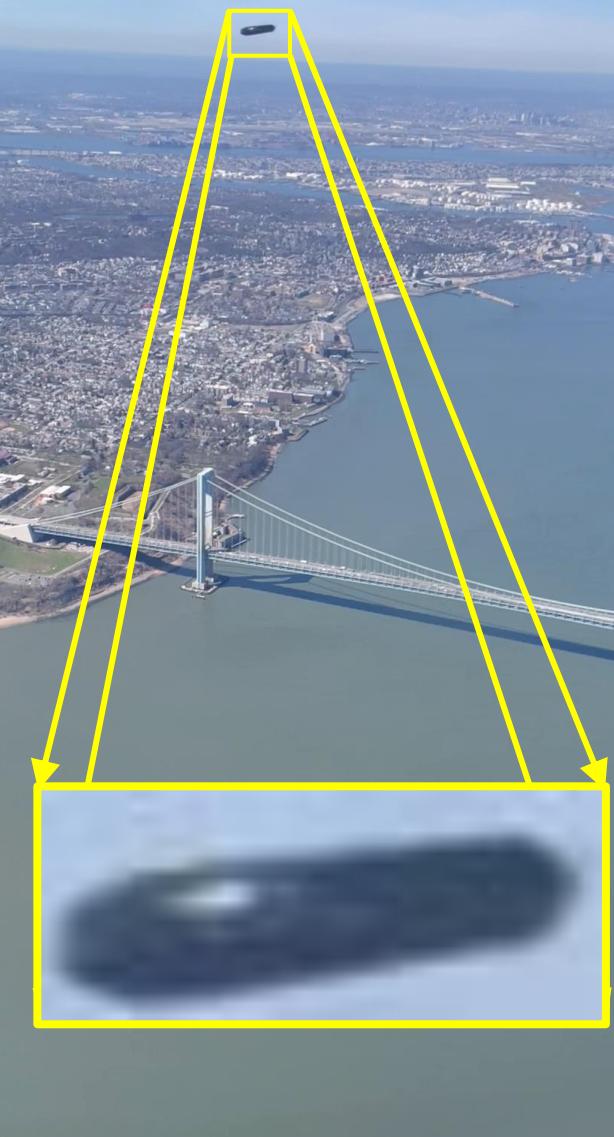
ROOT CAUSE-accidental release:

- Significant wind event that same day likely jarred the balloon loose from a birthday, anniversary or some other celebration

My Confidence Level:

- Is greater than 90%

Original Video



Acknowledgements:

Thanks go to Enigma Labs for working with us for Ben Hansen to interview the witness. I would like to thank Ms. Michelle Reyes and Ben for providing the original video for this detailed analysis. The details from which this analysis was critically dependent and other members of Ben's team for obtaining the ADS-B data and other great support!

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All analysis and opinions are that of the Dr. Doug Buettner.