Pointivo Enables NB+C To Make Mount Mapping Towers Safer, Faster, and More Accurate

OBJECTIVES

Engineers from NB+C wanted to test new ways to improve their mount mapping data collection and analysis that would automate and reduce manual steps, making the process safer, faster, and more accurate.

SOLUTIONS

To investigate ways to improve their mount mapping work, NB+C compared traditional methods for mount mapping against a cutting edge approach that involved using drones to autonomously collect the data and Pointivo's AI-driven software to process it.

BENEFITS OF POINTIVO'S APPROACH

Faster. Using drone-captured data and Pointivo's analytics, a single pilot completed data collection in only 30 minutes on site, and an engineer reviewed and imported the AI-derived mount mapping data in just 30 minutes.

Safer. Using a drone to collect data and Pointivo's platform to process it meant that climbers did not need to do any climbing for data collection, significantly improving safety for the mount mapping work.

More Accurate. Numerous errors were identified in the climbed mapping - in azimuths, offsets, and in transcribing the data to the report. Pointivo's AI driven analytics, correctly determined all measurements and accurately populated the report.

AT A GLANCE

Challenges

- Demand for more inspections per day without increasing labor force.
- Manual data can contain errors, is slow to input, verify, and process.
- Manual approach is hampered by crew shortages, takes far longer to perform, has inherent risk, and is more costly.
- Missed data from a tower climb can result in having to re-deploy a crew to the tower to re-collect data.

Benefits

- Pointivo utilizes a nationwide pilot force to map more mounts per day using one pilot vs two climbers.
- Pointivo provides digital data collected by drone, eliminates human error and remains a ready reference for visual verification.
- Pointivo provides mount mappings in a fraction of the time, at a lower cost and delivers at scale.

TOTALLY COMMITTED.

INTRODUCTION

Mount mapping is the task of identifying and measuring all of the equipment and mount members currently in place on a particular antenna mount system to make structural determinations on whether new or replacement equipment can be added to the mount without exceeding its structural capacity. Mount mapping is crucial for tower owners and carrier operators. Without mount mapping prior to adding new equipment, the mount's structural capacity could be exceeded and the mount could fail.

The traditional method for conducting mount mapping is slow, has inherent risk, and is prone to human error—but, up until recently, it's been the only option.

Until now, drones had only been used to capture imagery on towers and provide 3D models that could be used to apply basic manual measurements on a tower. With Pointivo's patented scale marker system and automated, AI-powered analytics, carriers, tower owners, and their service providers are now radically changing their mount mapping approach with complete confidence in the accuracy and consistency of the data and reports.

Keep reading to learn the results of NB+C's tests comparing traditional mount mapping to the Pointivo approach.

Faster. Period.
1 hr vs. 14 hrs

Safer. Period.

More Accurate. Period.
0 errors vs. 41 errors

NB+C TESTS POINTIVO vs. TRADITIONAL MOUNT MAPPING

To compare traditional mount mapping methods to using drones and Pointivo's software, experts at NB+C performed a mount mapping on a monopole, a self-supported tower, and a guyed tower using both approaches, then compared the results. Before we share the results of NB+C's tests, it's important to first highlight the differences between the two approaches.

Traditional Mount Mapping Test

Step 1: Data collection (4 hours avg.). Requiring a two-man crew, a climber ascends the tower taking photos, taking measurements, and drawing sketches of mount configurations in order to prepare a mount mapping report.

Step 2: Data conversion (2 hours avg.). After the climber collects the raw data it is assembled into a report containing tabular data, mount component sketches, and representative photos taken from the tower. This is then provided to an engineer so they can use it to conduct a mount structural analysis.

Step 3: Data verification (2 hours avg.). After receiving the PDF report, the engineer will verify that they have all the measurements they need to do their analysis. If data is missing, the engineer will either have to make assumptions or send the climber back out to collect it.

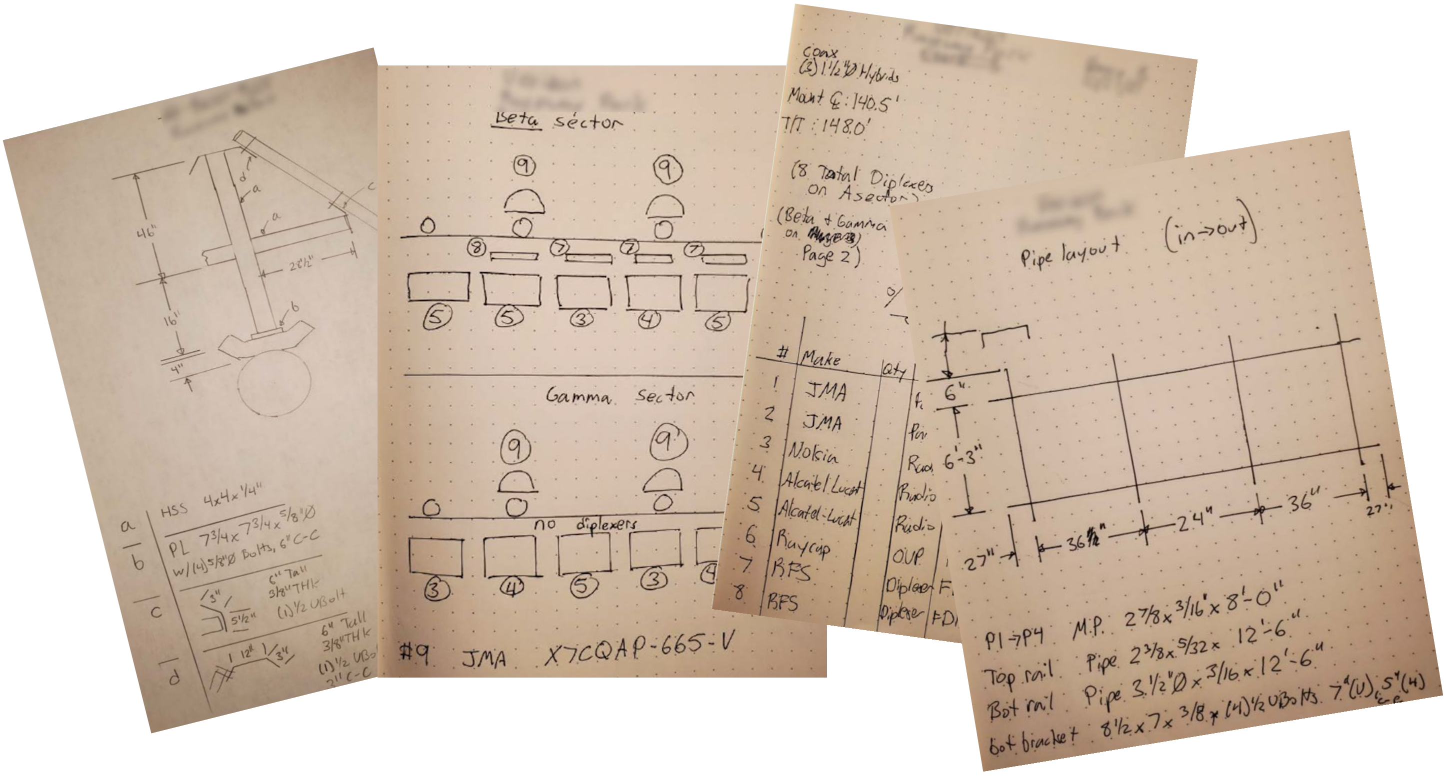
Step 4: Data transfer (2 hours avg.). Once the engineer verifies the data is complete, they have to manually enter all of the measurements into a standard mount analysis software (e.g., RISA-3D) and potentially, a carrier specific report, an effort that is time consuming and labor intensive. The software will then process the data and make a determination regarding whether the tower can sustain the new equipment or not.

This entire 14 man-hour process includes several manual steps. Climbers may have to take as many as 130-150 individual mount system measurements, for components like antennas, remote radio units, and structural members using a tape measure, a caliper, and a compass. For each part, measurements must be taken for the thickness, length, width, and centerpoint location of each point of attachment. After measurements are taken, the climber either records them while on the tower or calls them down to a colleague on the ground to be recorded.

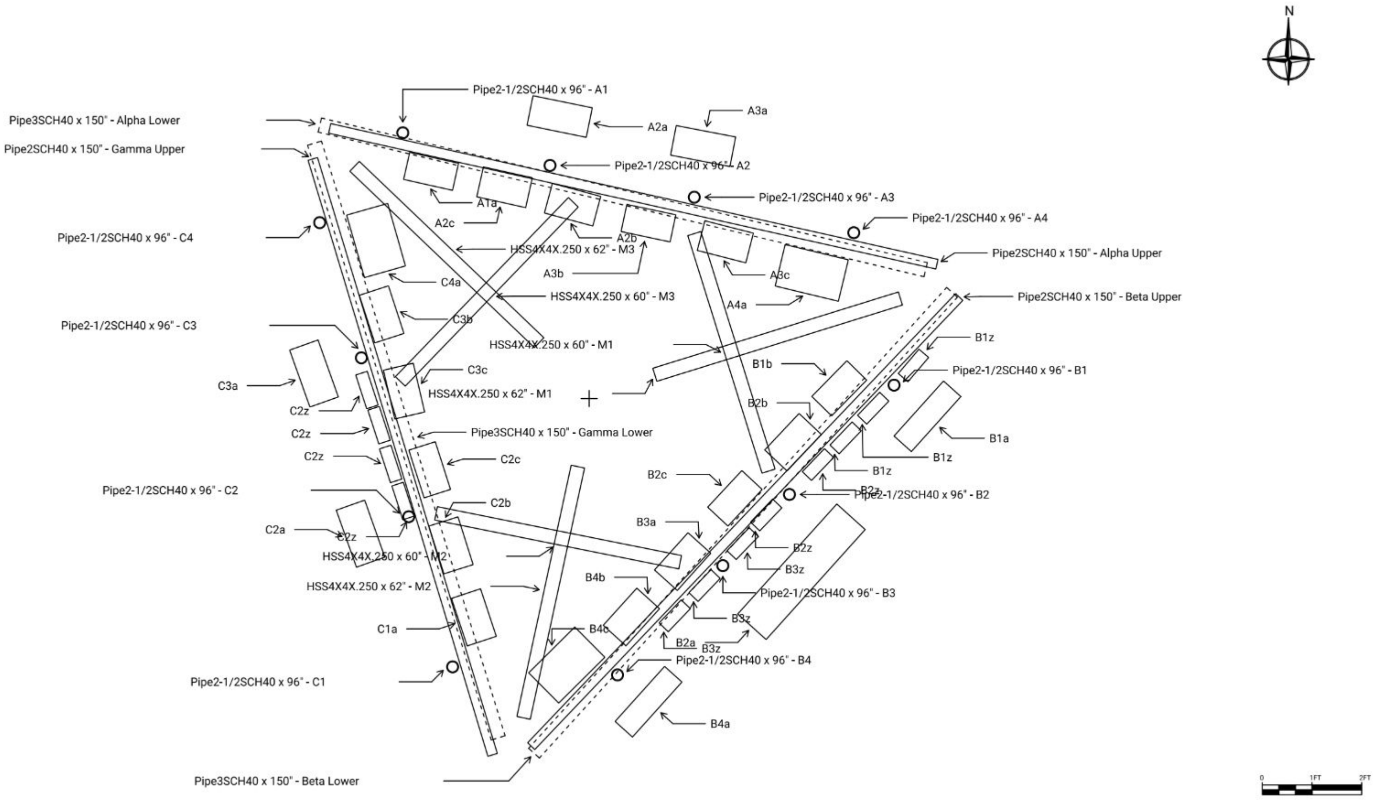
One of the more important data points climbers collect is the offset of the antennas on the tower. Antennas are not mounted directly to the mount face, but rather to brackets, allowing them to be angled to the correct azimuth and downward tilt for optimum coverage.

Tower crews are very professional and skilled at taking measurements, but they often operate under very difficult conditions and from less than ideal positions. Collecting this data manually leaves room for human error, including errors that could arise from adverse weather conditions, misread tape or caliper measurements, or from the climber being unable to take photos or create accurate sketches of the mount face from all the angles needed for an engineer to verify and model the data.

Traditional hand drawn sketches.



Pointivo generates clean plans backed by access to a highly precise model and hundreds of images.



POINTIVO SOFTWARE PLATFORM + DRONE FLIGHT

Using a drone simplifies the process, removing the need for climbers to climb the tower to collect data, and streamlining data processing by having it all performed within the Pointivo software. The accuracy of the drone data captured using Pointivo's proprietary scale marker system has been validated across hundreds of data points through comparisons with LIDAR collected data and manufacture specifications. Further, while manual data must be converted into a digital format, drone data is digital and remains referenceable, making it more accurate and far easier to verify.

Here is how mount mapping is performed using drones and Pointivo:

Step 1: Data collection. The drone collects all of the measurement and visual data needed (25-30 minutes).

Step 2: Data review and engineer upload. The engineer reviews and imports the digital data into their analysis software (30 minutes).

In the end, the Pointivo approach takes only one man hour compared to the 14 man-hours required for the traditional approach. Also, the Pointivo approach results in more accurate data, which is collected without the need to place climbers in potentially dangerous situations to get it.

RESULTS FROM NB+C MOUNT MAPPING TESTS WITH POINTIVO

After performing mount mapping on the three towers using the traditional approach and the Pointivo approach, the NB+C team found the Pointivo approach to be faster, safer, and to produce more accurate data. Here are the highlights:

- 41 errors were found in the traditional climbed mount mappings. The Pointivo report contained zero errors. See Table 1.
- Azimuth measurements taken by climbers were off more than 10 degrees in many cases. Pointivo's azimuth measurements were accurate to within 0.5 degrees.

Climbed mount mapping shows incorrect and imprecise face and leg azimuths.

Climbed

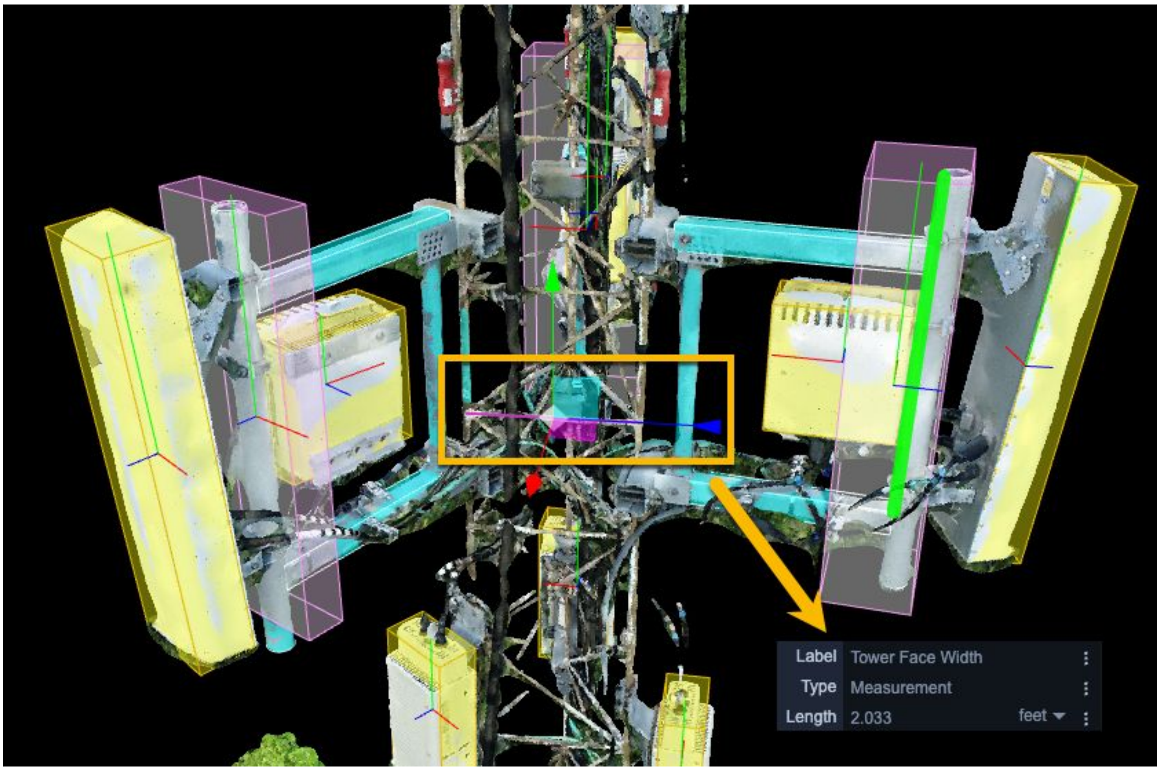
Mount Azimuth (Degree) for Each Sector			Tower Leg Azimuth (Degree) for Each Sector		
Sector A:	0.00	Deg	Leg A:	0.00	Deg
Sector B:	120.00	Deg	Leg B:	120.00	Deg
Sector C:	240.00	Deg	Leg C:	240.00	Deg
Sector D:		Deg	Leg D:		Deg

Pointivo

Mount Azimuth (Degree) for Each Sector			Tower Leg Azimuth (Degree) for Each Sector		
Sector A:	283.70	Deg	Leg A:	323.20	Deg
Sector B:	85.90	Deg	Leg B:	83.20	Deg
Sector C:	177.70	Deg	Leg C:	203.20	Deg
Sector D:		Deg	Leg D:		Deg

Climbed mapping shows a tower face width of 5', while drone-based measurement shows correct width of 2'.

Pointivo



Climbed Report

Tower Face Width at Mount Elev. (ft.):	5

- Several climbers' offset measurement errors, important components in structural analysis, were accurately determined by Pointivo 's analytics.

Beyond the benefits of speed, safety, and accuracy already highlighted, NB+C found the Pointivo approach to mount mapping was beneficial because:

- It provided additional data, including where the tower was located and all tower metrics.
- Provided 600-1,200 images vs. fewer than 50 from tower climbers. The vast amount of high-res digital imagery allowed visual verification of the mount configuration from virtually any angle.
- It did not require expensive equipment. The drone used for data collection was a DJI Phantom 4 V2, which sells for about $2,400, with accessories.
- It provided an accurate, three dimensional rendering of the tower at a given point in time, which could be referred to later for additional reports or for maintenance purposes.
- It allowed for data collection even if the tower was judged too dangerous to climb (e.g., the discovery of a damaged climbing apparatus).

Table 1. **POINTIVO vs. TRADITIONAL ERROR RESULTS**

Error #	Tower	Data	Climber Data	Pointivo AI Data	Error
1	Tower 1	Sector A Azimuth	0°	12.64°	12.64°
2	Tower 1	Sector B Azimuth	120°	133.69°	13.69°
3	Tower 1	Sector C Azimuth	240°	253.27°	13.27°
4	Tower 1	Sector labels	Gamma faces North	Alpha faces North	Pointivo Correct
5	Tower 1	Horiz. Offsets A1	2”	19.70”	17.7"
6	Tower 1	Horiz. Offsets A2	2”	56.03”	46.03"
7	Tower 1	Horiz. Offsets A3	2”	92.29”	90.29"
8	Tower 1	Horiz. Offsets A4	2”	131.77”	129.77"
9	Tower 1	Horiz. Offsets B1	2”	26.84”	24.84"
10	Tower 1	Horiz. Offsets B2	2”	63.02”	61.02"
11	Tower 1	Horiz. Offsets B3	2”	86.52”	84.52"
12	Tower 1	Horiz. Offsets B4	2”	122.91”	120.91"
13	Tower 1	Horiz. Offsets C1	2”	20.00”	18"
14	Tower 1	Horiz. Offsets C2	2”	57.56”	55.56"
15	Tower 1	Horiz. Offsets C3	2”	97.85”	95.85"
16	Tower 1	Horiz. Offsets C4	2”	131.89”	129.89"
17	Tower 2	Sector A Azimuth	90°	347.15°	102.85°
18	Tower 2	Sector B Azimuth	210°	110.39°	99.61°
19	Tower 2	Sector C Azimuth	330°	229.52°	100.48°
20	Tower 2	Leg A Azimuth	0°	346.56°	13.44°
21	Tower 2	Leg B Azimuth	120°	226.56°	106.56°
22	Tower 2	Leg C Azimuth	240°	106.56°	133.44°
23	Tower 2	Horiz. Offsets A1	48.75”	7.72”	-41.03"
24	Tower 2	Horiz. Offsets A2	66.25”	55.74”	-10.51"
25	Tower 2	Horiz. Offsets A3	68.75”	104.01”	35.26"
26	Tower 2	Horiz. Offsets A4	48.75”	152.48”	103.73"
27	Tower 2	Horiz. Offsets B1	48.75”	8.46”	-40.29"
28	Tower 2	Horiz. Offsets B2	66.25”	54.48”	-11.77"
29	Tower 2	Horiz. Offsets B3	68.75”	104.62”	35.87"
30	Tower 2	Horiz. Offsets B4	48.75”	152.10”	103.35"
31	Tower 2	Horiz. Offsets C1	48.75”	7.68”	-41.07"
32	Tower 2	Horiz. Offsets C2	66.25”	53.90”	-12.35"
33	Tower 2	Horiz. Offsets C3	68.75”	102.82”	34.07"
34	Tower 2	Horiz. Offsets C4	48.75”	151.42”	102.67”"
35	Tower 3	Sector A Azimuth	0°	283.7°	76.3°
36	Tower 3	Sector B Azimuth	120°	85.9°	34.1°
37	Tower 3	Sector C Azimuth	240°	177.7°	62.3°
38	Tower 3	Leg A Azimuth	0	323.2°	36.8°
39	Tower 3	Leg B Azimuth	120	83.2°	36.8°
40	Tower 3	Leg C Azimuth	240	203.2°	36.8°
41	Tower 3	Tower Face Width	5’	2’	3’

THE RESULTS

KEY FINDINGS

- Pointivo's solution took 60 minutes to collect, upload, and review. The traditional process took 14 hours to collect, upload, and review.
- Pointivo's solution was more accurate in azimuths, offsets, and mount dimensions.
- Pointivo's solution keeps safety a priority.

THE CONCLUSION

When it comes to accuracy, efficiency, and speed-to-market scalability, Pointivo's AI driven software platform offers superior tower analytics and automated mount mapping reports compared to traditional tower-climb reports.

“What Pointivo is doing is a game changer in the telecom engineering space,” shared the chief engineer. “Their ability to capture structural member data and provide a detailed mount mapping report is taking traditional inspections to the next level of precision, efficiency, and risk management.”

Andrew Reynolds
Chief Engineer, NB+C

WHO WE ARE

Pointivo's software platform is built by a world-class team of AI and computer vision experts pioneering AI-driven 3D image analytics technologies for physical asset inspection. We give companies a deeper understanding of their assets to drive revenue, operational efficiencies, and cost reductions. Combining machine learning, computer vision, and advanced analytics, our customers are innovators relying on our platform and applications to deliver insights to enhance business processes for damage detection, equipment inventory, budgeting and risk mitigation.