NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

March 18, 2011

MATERIALS LABORATORY FACTUAL REPORT Report No. 11-030

A. ACCIDENT

Place	:	San Bruno, California
Date	:	September 9, 2010
Vehicle	:	Natural Gas Transmission Pipeline
NTSB No.	:	DCA10MP008
Investigator	:	Ravi Chhatre, RPH-20

B. DOCUMENT ATTACHED

Presentation by the Federal Bureau of Investigation regarding the laser scanning process used to document the condition of the pipe pieces at the National Transportation Safety Board's Training Center. The presentation was delivered at the 2011 SPAR International Conference in Houston, Texas, on March 23, 2011.

Carl R. Schultheisz
Materials Research Engineer

NATIONAL TRANSPORTATION
E PLURIBUS UNUM
SAFETY BOARD

DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION
FIDELITY
BRAVERY
INTEGRITY

operational
PROJECTS UNIT

FEDERAL BUREAU OF INVESTIGATION
LABORATORY DIVISION

Carl Adrian

Visual Information Specialist
FBI Laboratory
Operational Projects Unit

Dr. Carl Schultheisz

Engineer
National Transportation Safety Board
Office of Research and Engineering
Materials Laboratory Division

Laser Scanning & Modeling the San Bruno Gas Pipe

Disclaimer

- All information and opinions disclosed is that of the speakers and does not represent the official views of the FBI or NTSB; ***nor does the Federal Government endorse any company or provider of hardware or software.***

Need to Know:

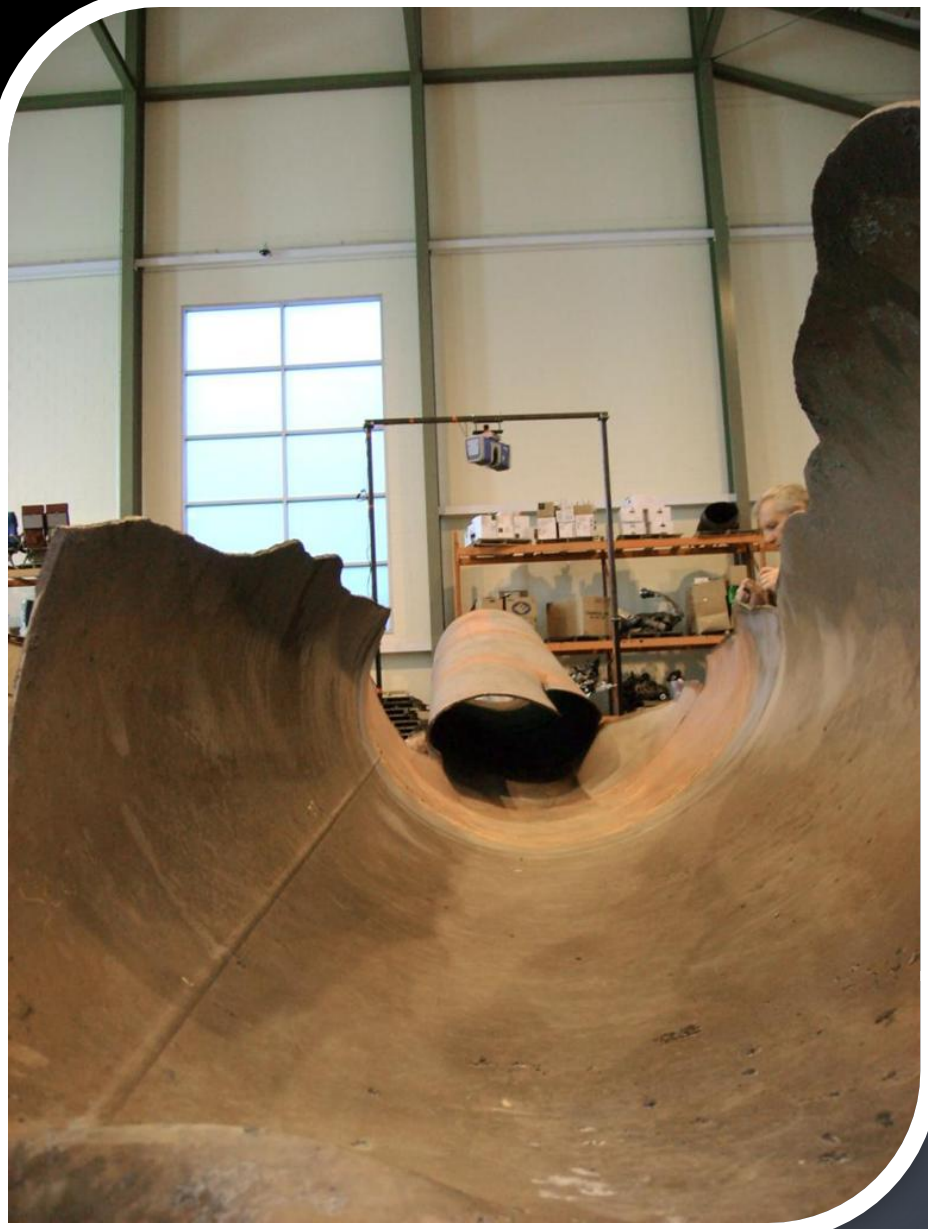
Location:

Size:

Weight:

Color:

LS selection:

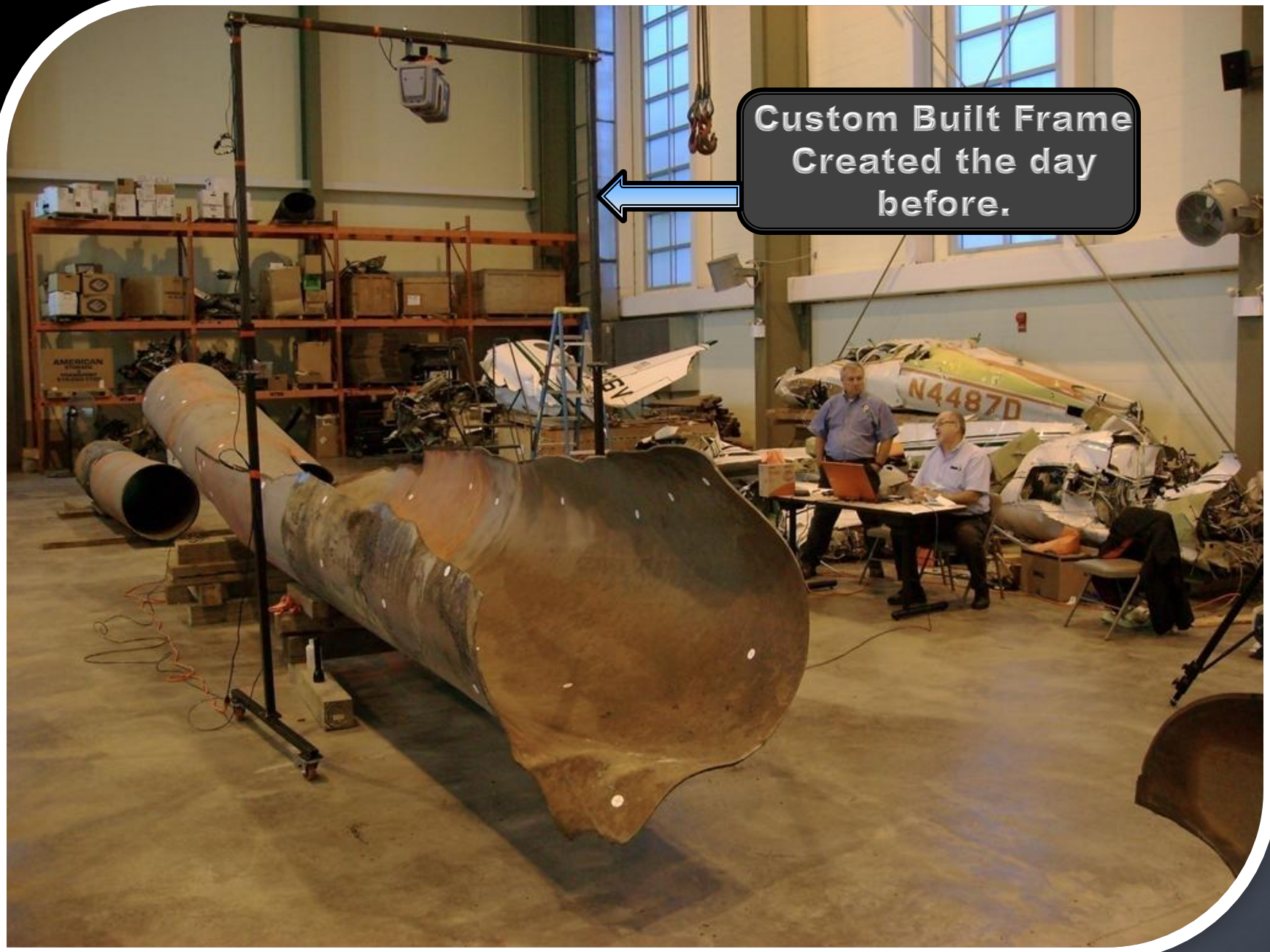


Pre-deployment:

- Initial phone call disclosed object location, size and weight
- Power accessibility
- Location access Security
- Custom build frame for scanner and create targets.

“Site contained necessary items to move pipes.”

Approach to task:


Custom Built Frame
Created the day
before.
N4487D

Surphaser 25HSX LS

Scanned a total of 41 positions; (2 test scans) used 39 in approximately 8.5 hours.

(This included hoisting and moving 3 pipe sections to scan bottoms.)

Targets Placed for Registration utilizing the Intensity Scans During Alignment in Polyworks

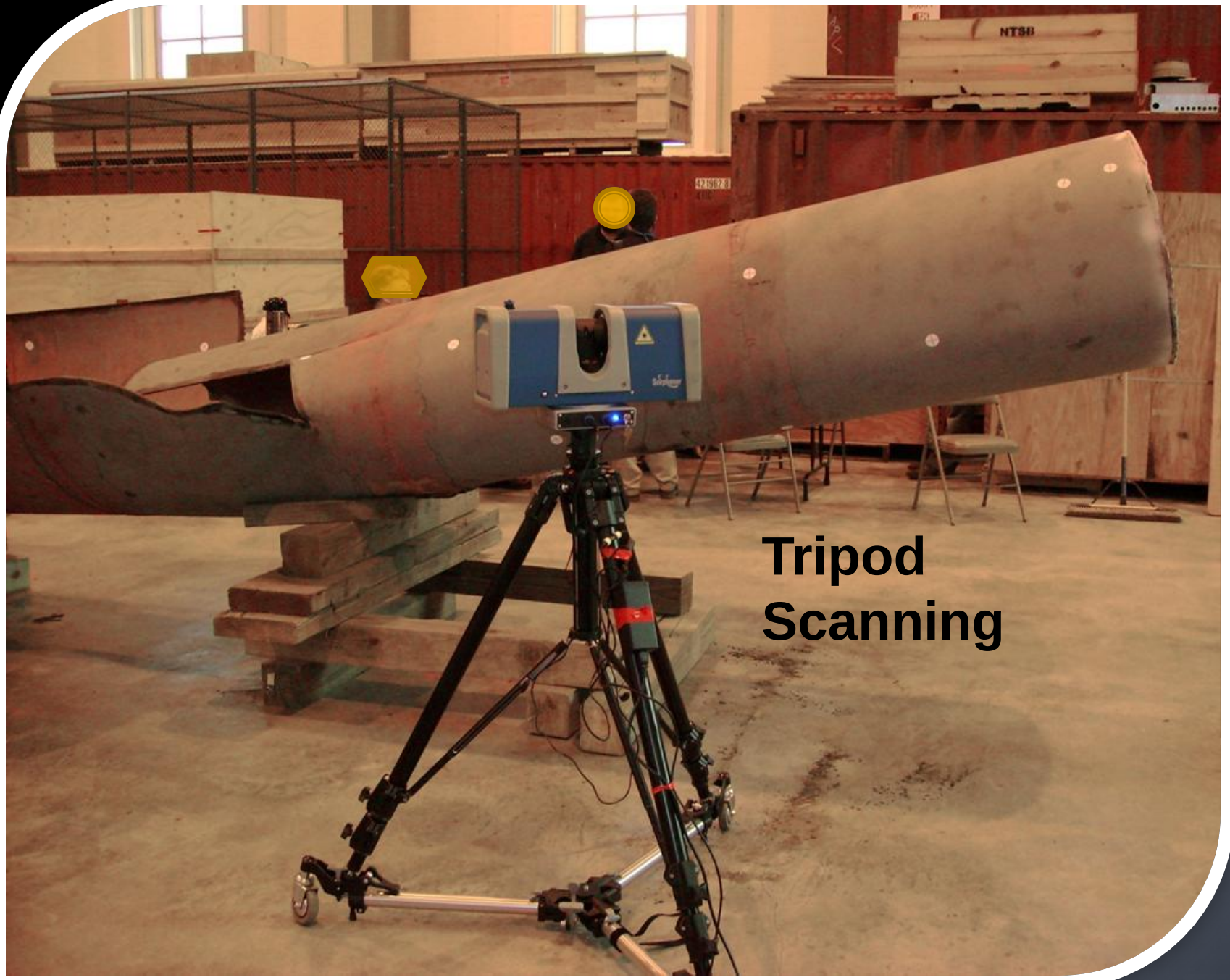
- **Top** - from frame scan upside down
- **Sides -** from tripod mount
- **Bottom** - move pipes to scan from floor

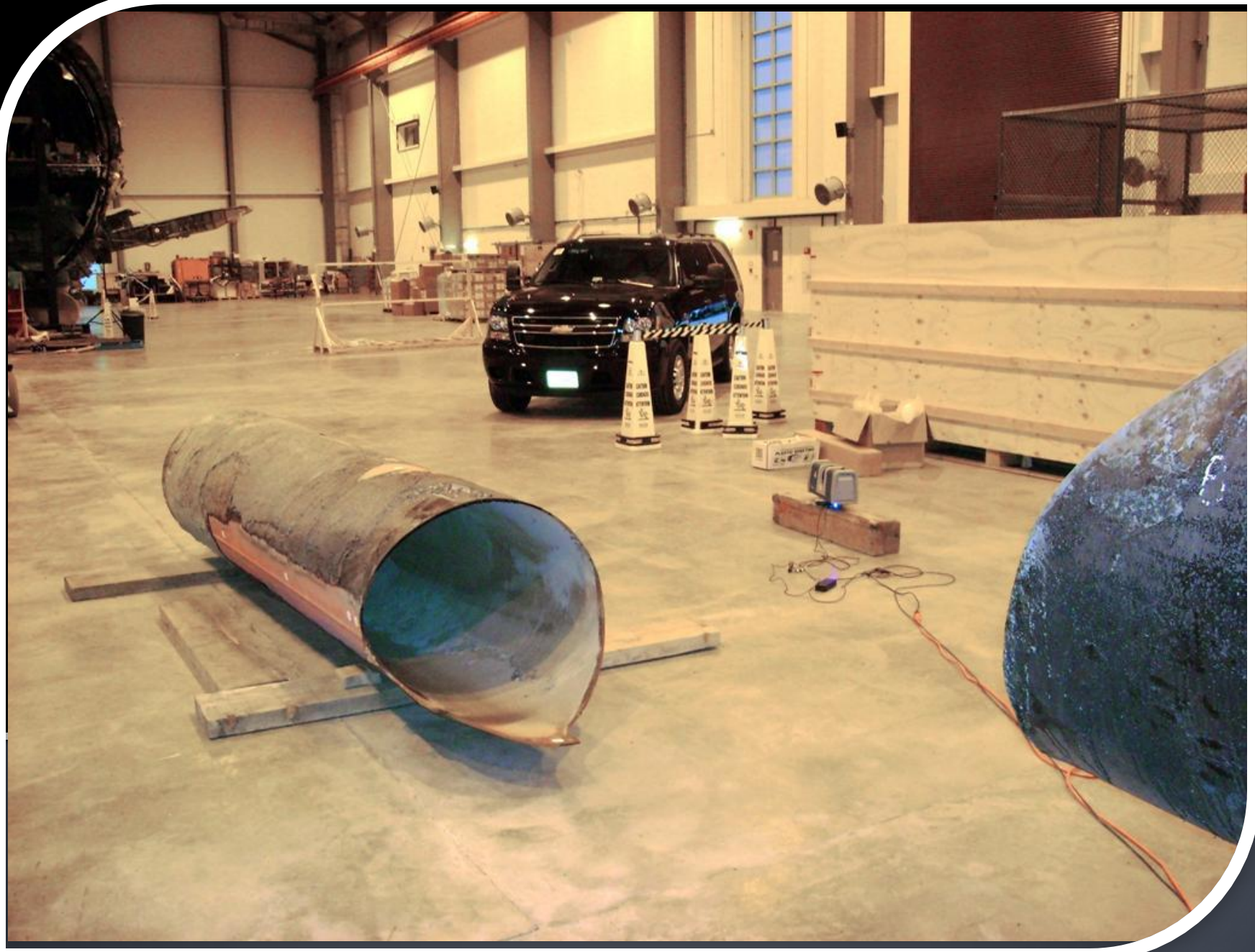
Basic Scanning Positions

Overall Scale

Carl Adrian &
William Atkins

Custom Built Frame
N4487D

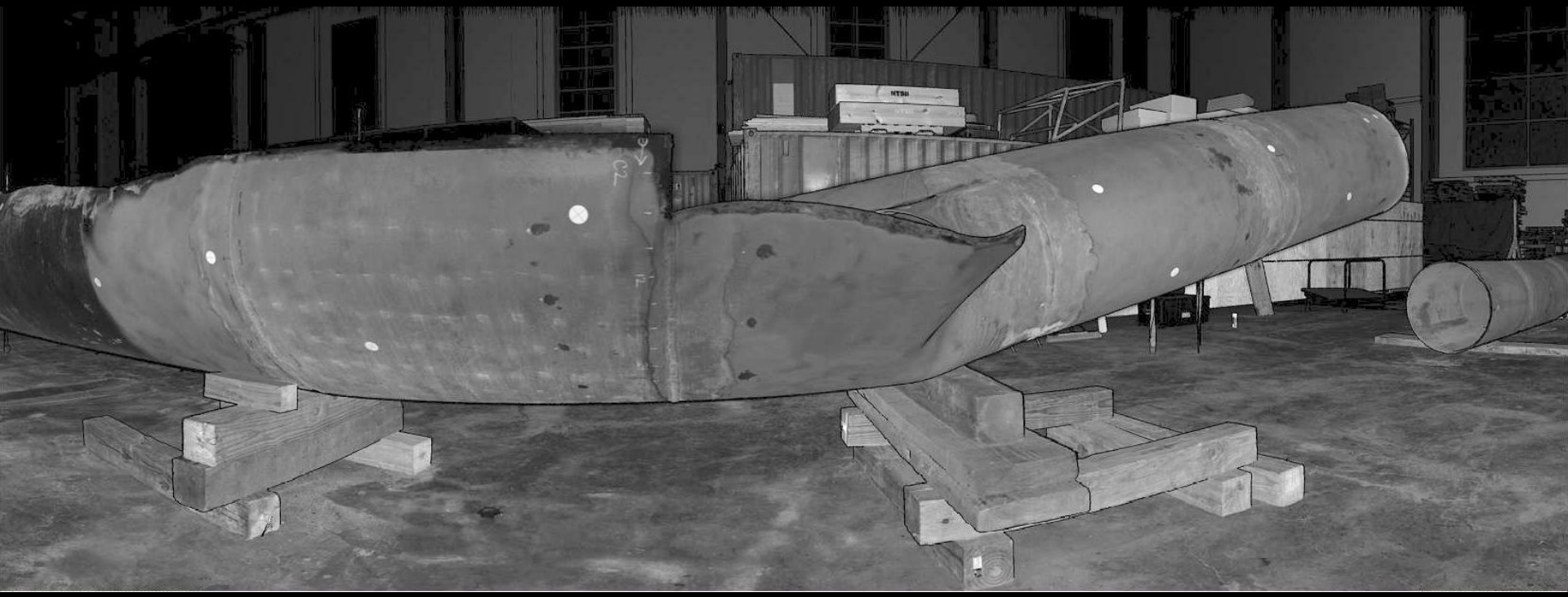

NTSB
Tripod
Scanning



AMERICAN
STORAGE
&
TRANSPORT

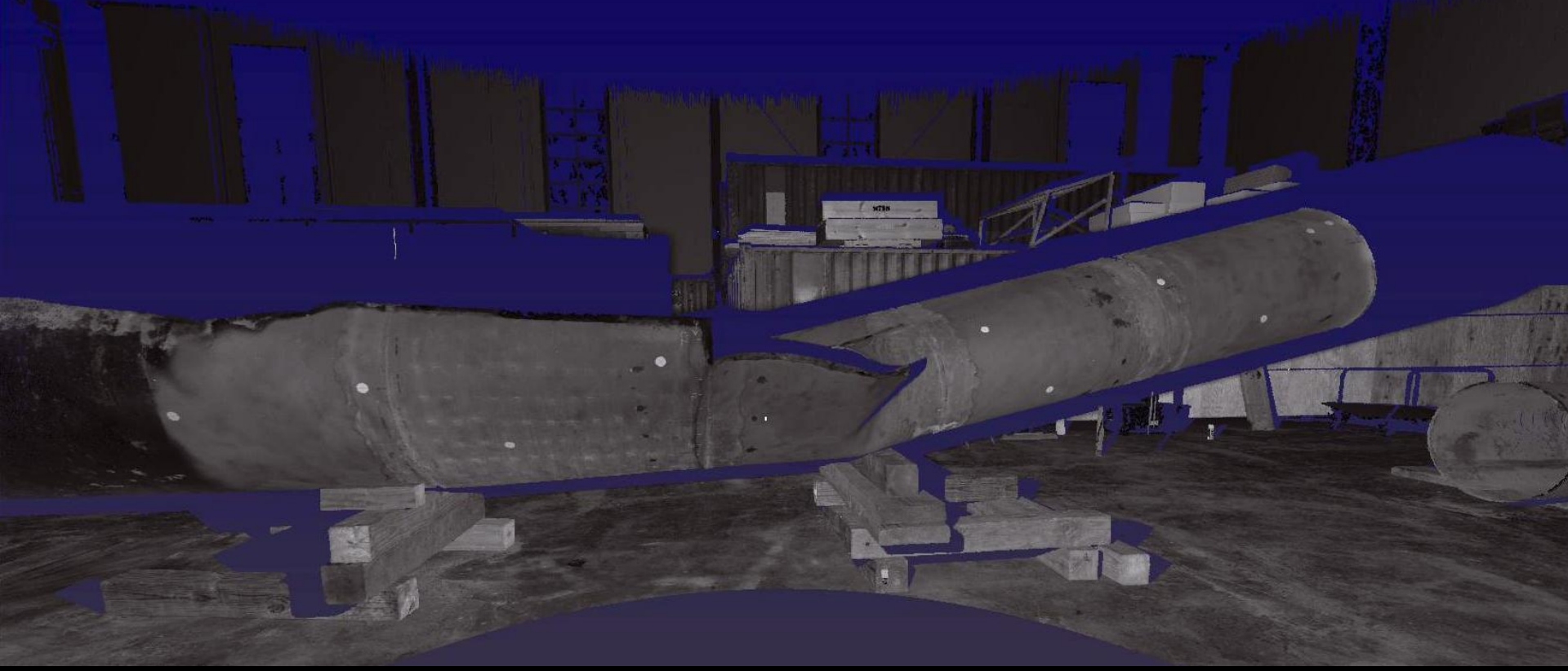
- Time for initial alignment and modeling: 40 hours
  - 32 bit machine and 64bit machine utilized
  - Time needed for making watertight models with minimal knowledge: 3 weeks
  - Difficulties found with working with broken pipe edges and thickness.

Working with the Point Cloud Data



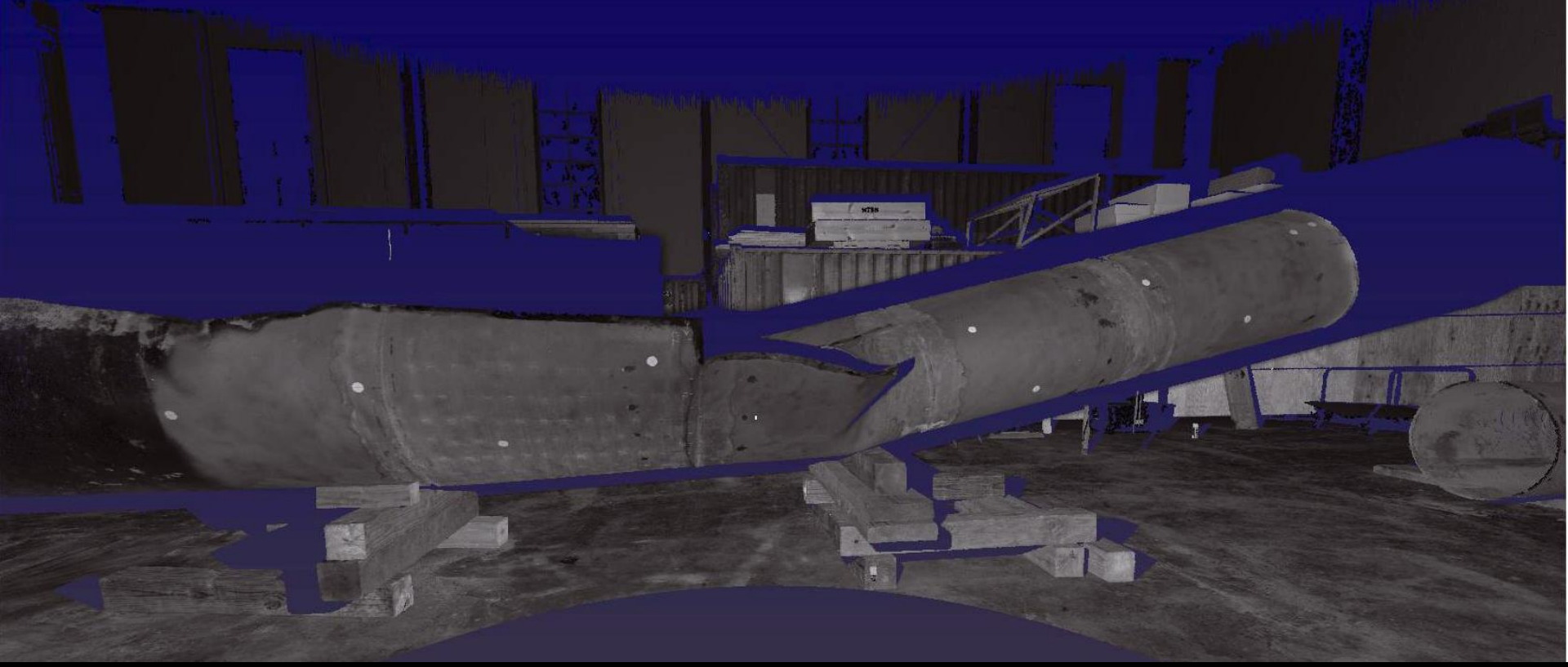
Side scan

(Intensity Image)



Side Scan

(Point Cloud with Intensity image turned on)

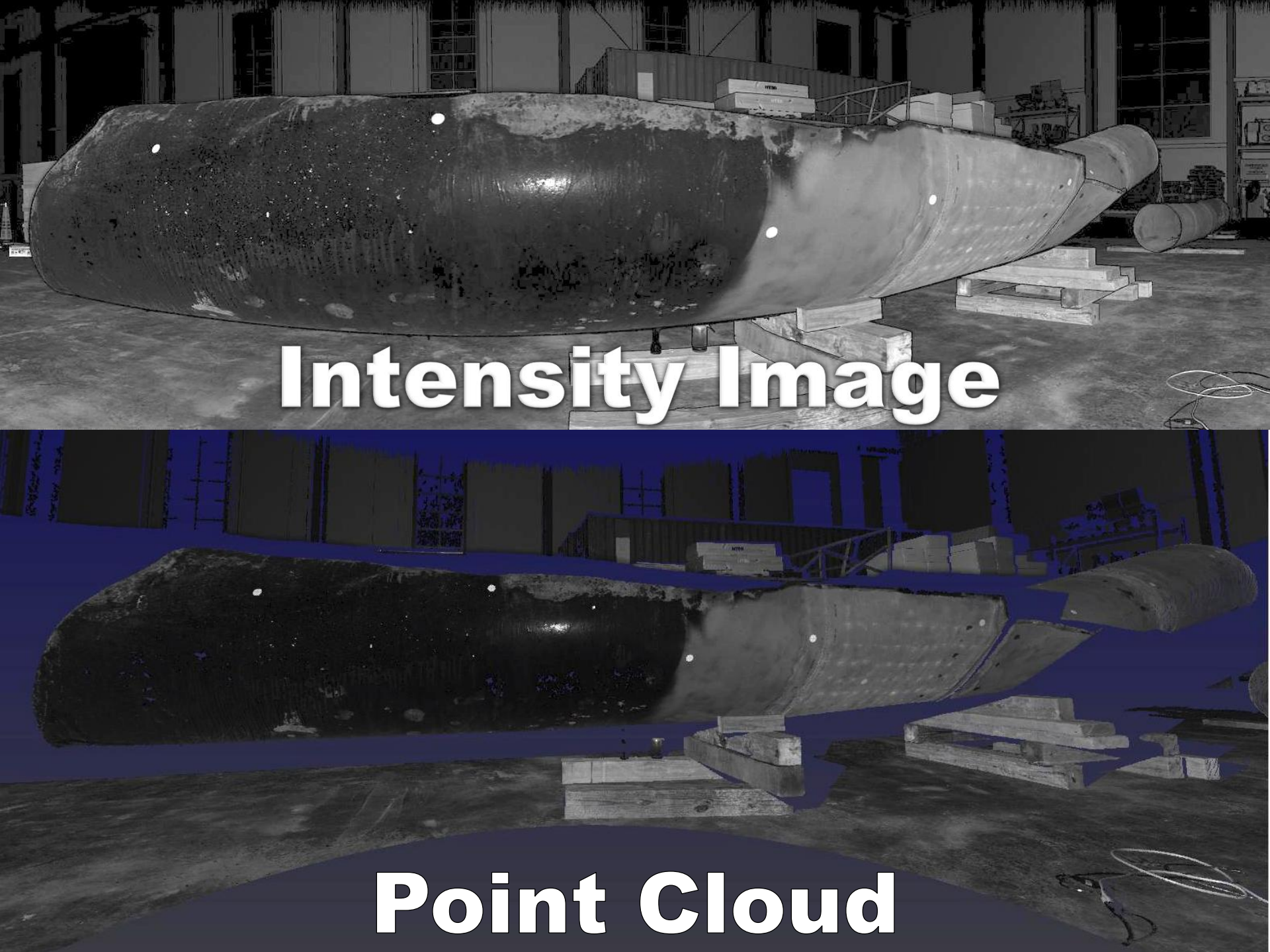


- To see the targets; utilize the Intensity image on point clouds

Alignment of scans “POLYWORKS”

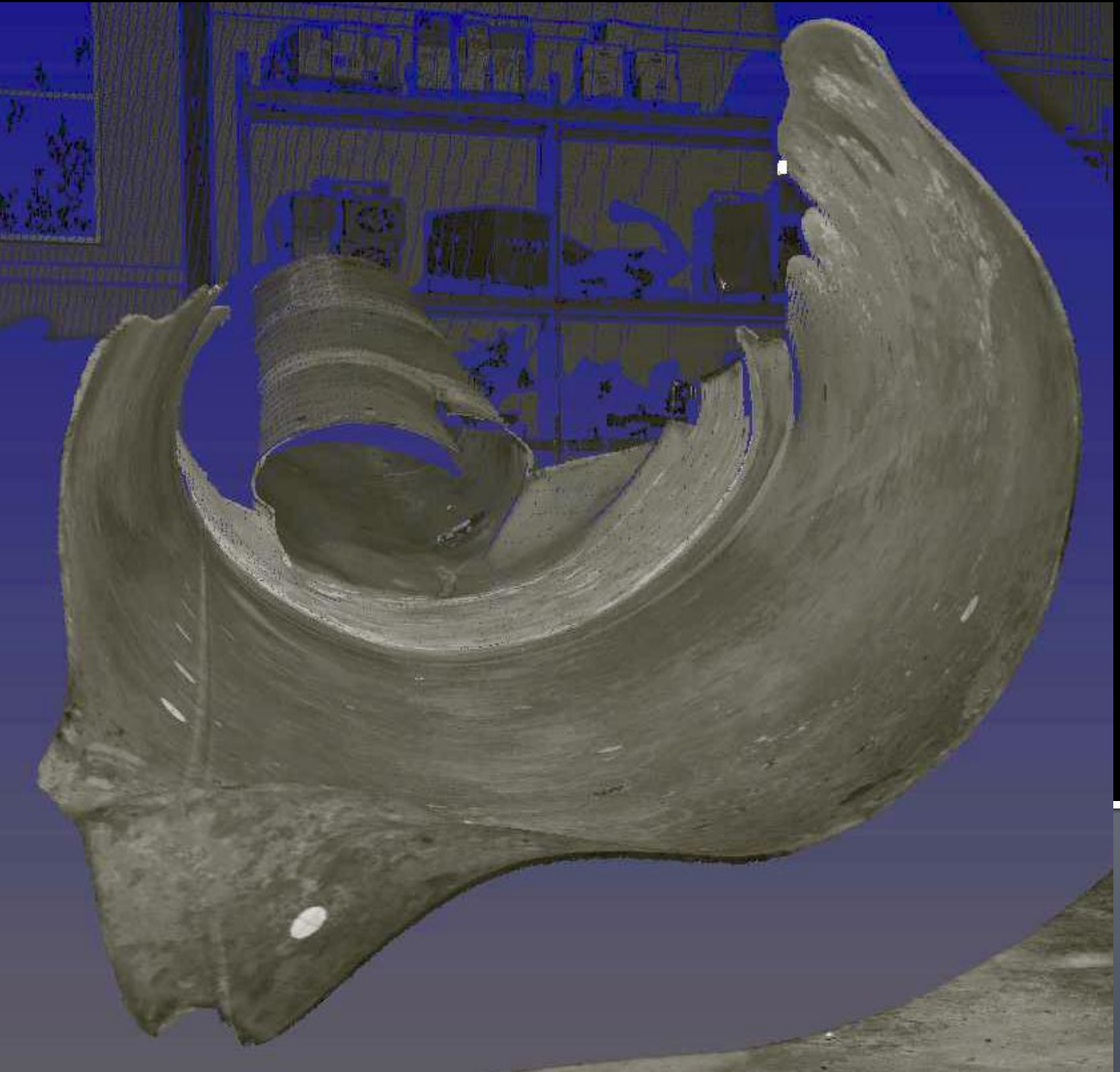
Bottom Scanning

Bottom Scanning

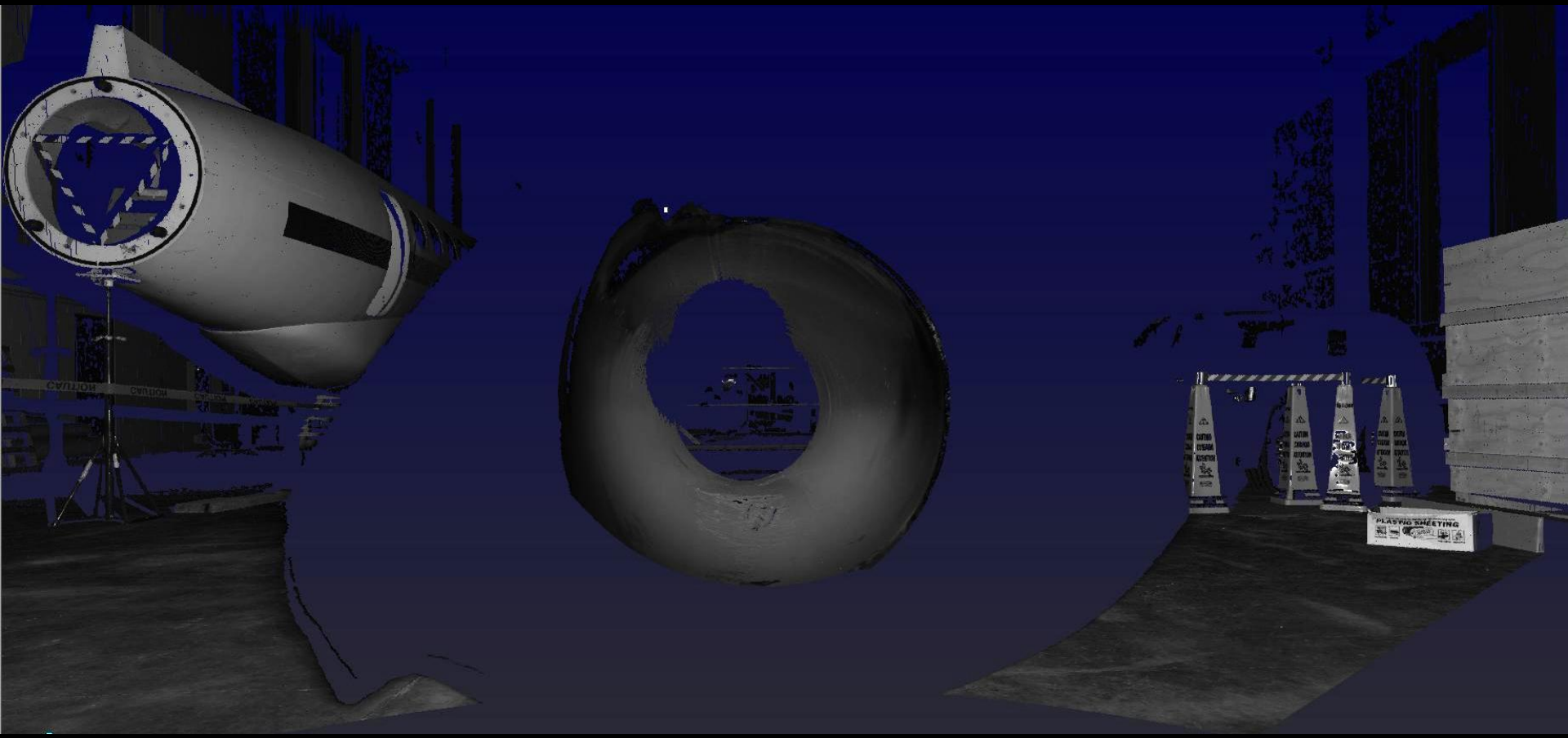

Intensity Image
Point Cloud

Point cloud

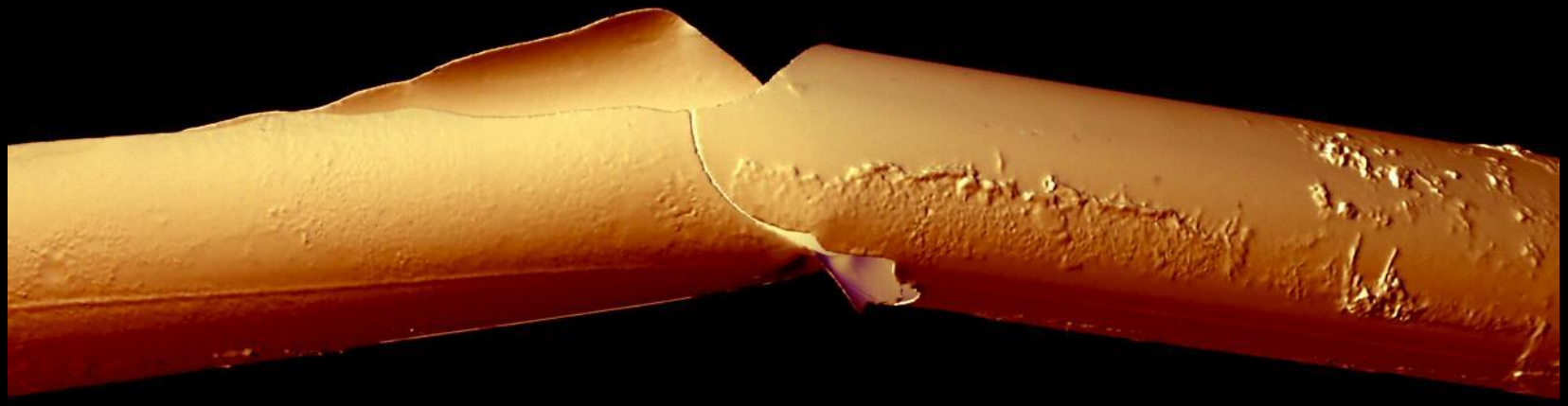
Intensity Image



Point cloud



Point Cloud

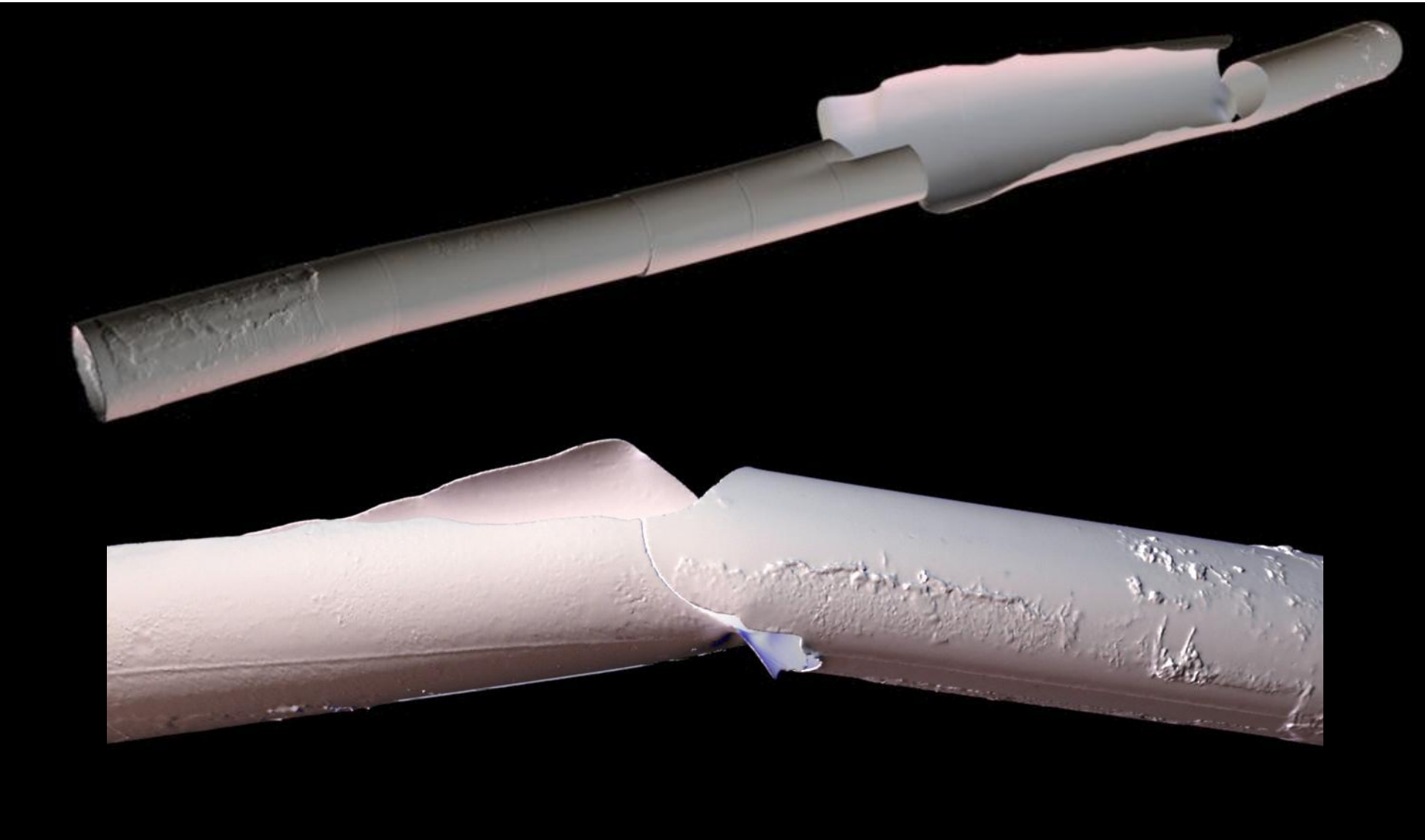


Pointools View Pro

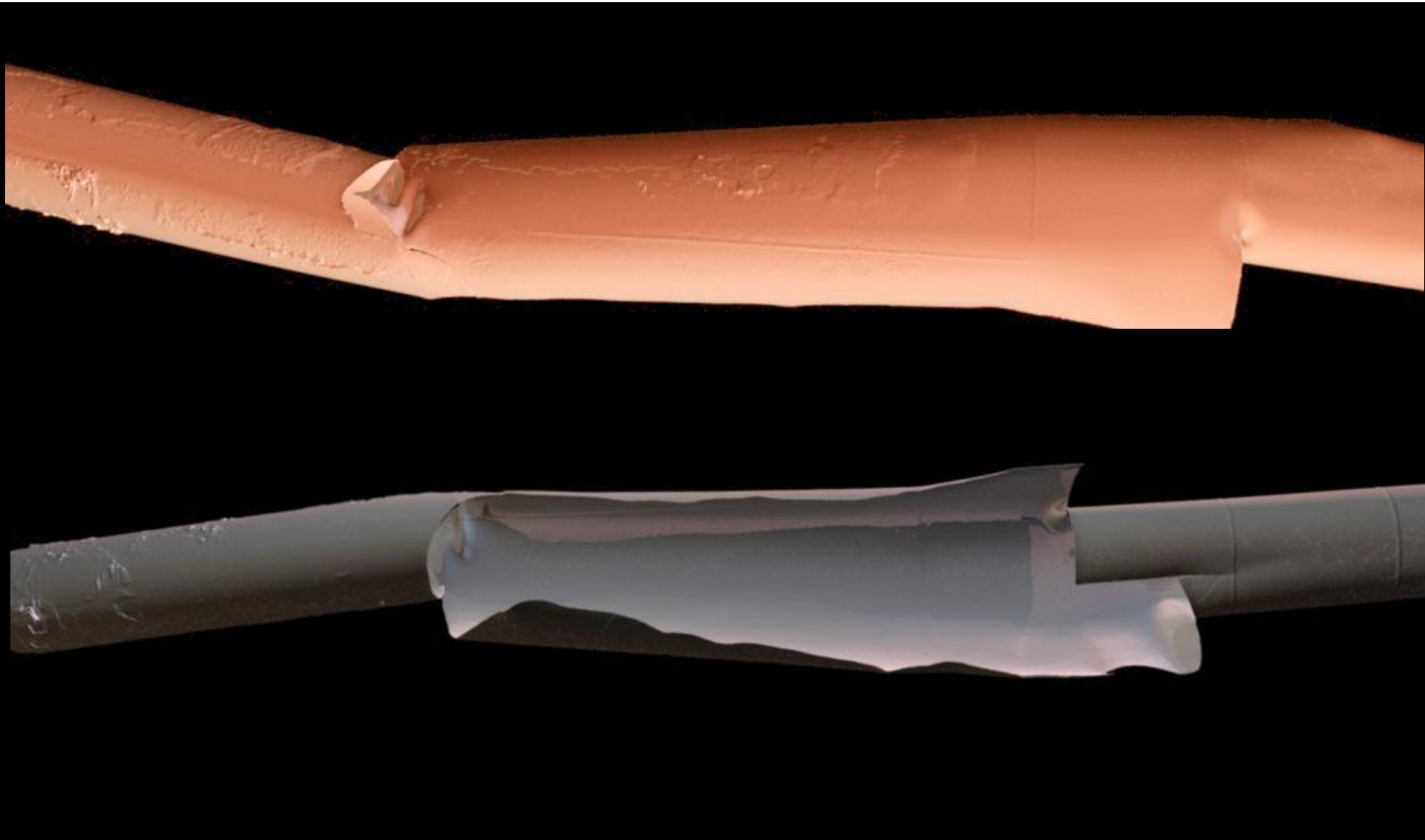
Free viewer to view models

Polyworks IMViewer

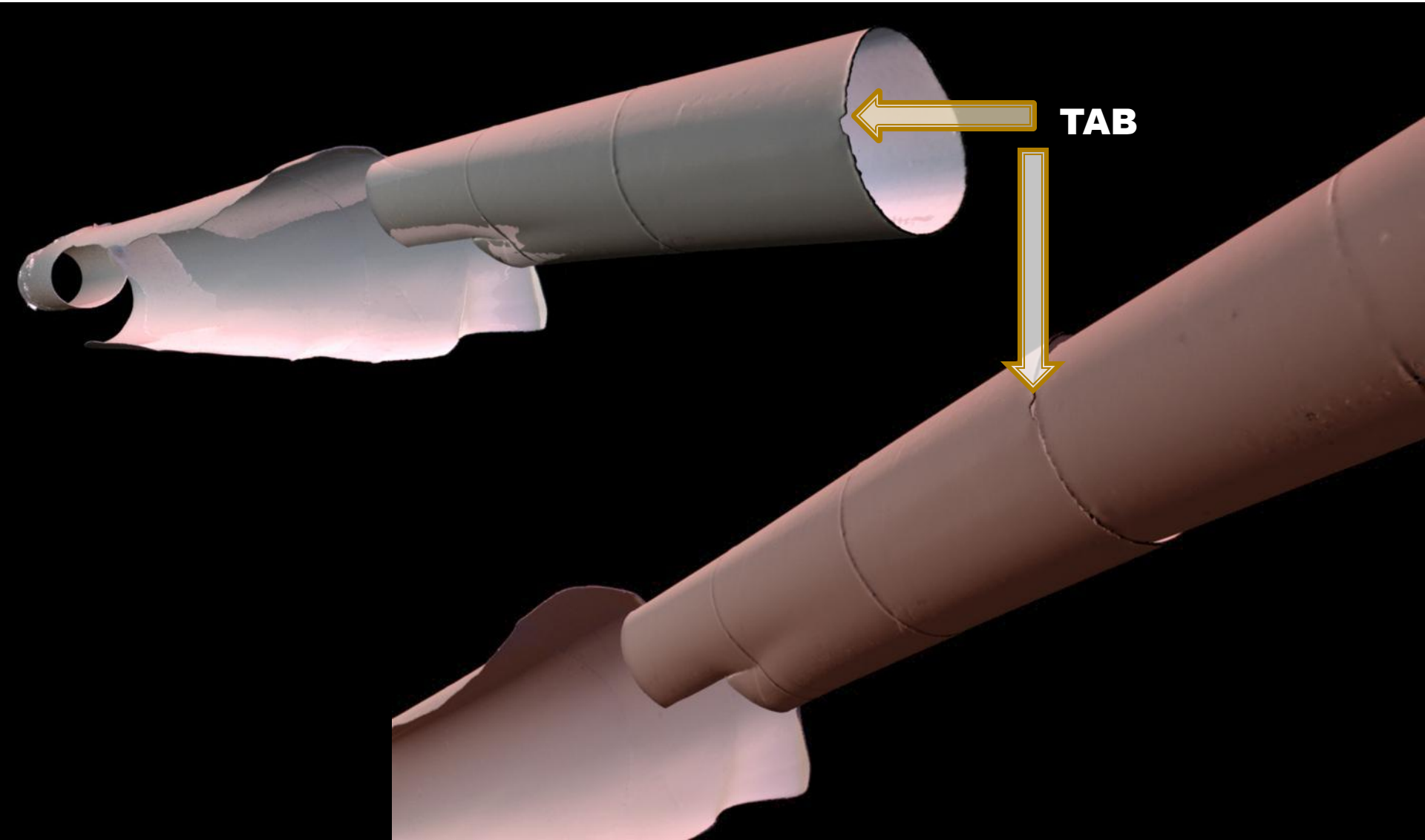
Aligning Pipe Sections to each other.



Aligning Pipe Sections (cont.)

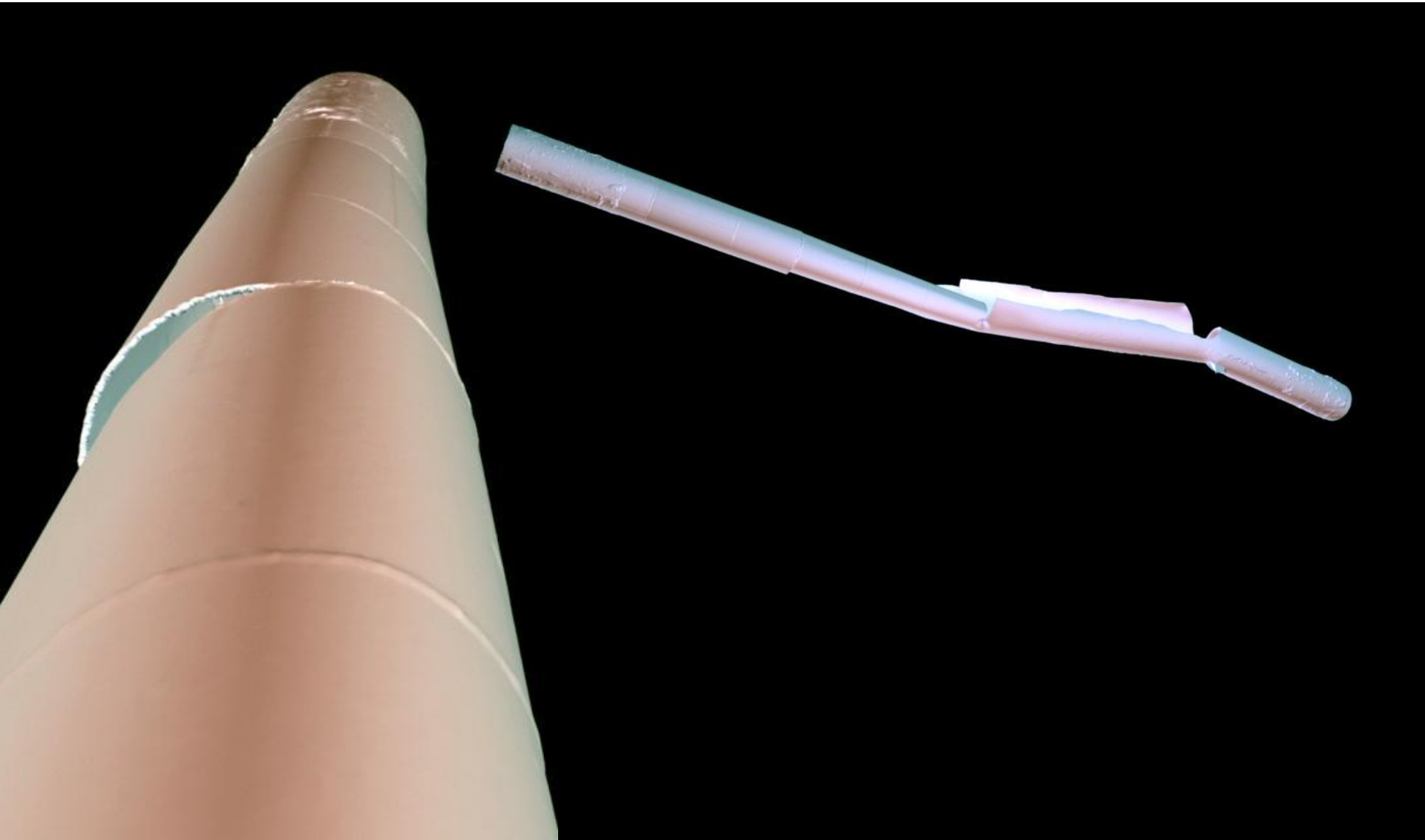


Aligning Pipe Sections (cont.)

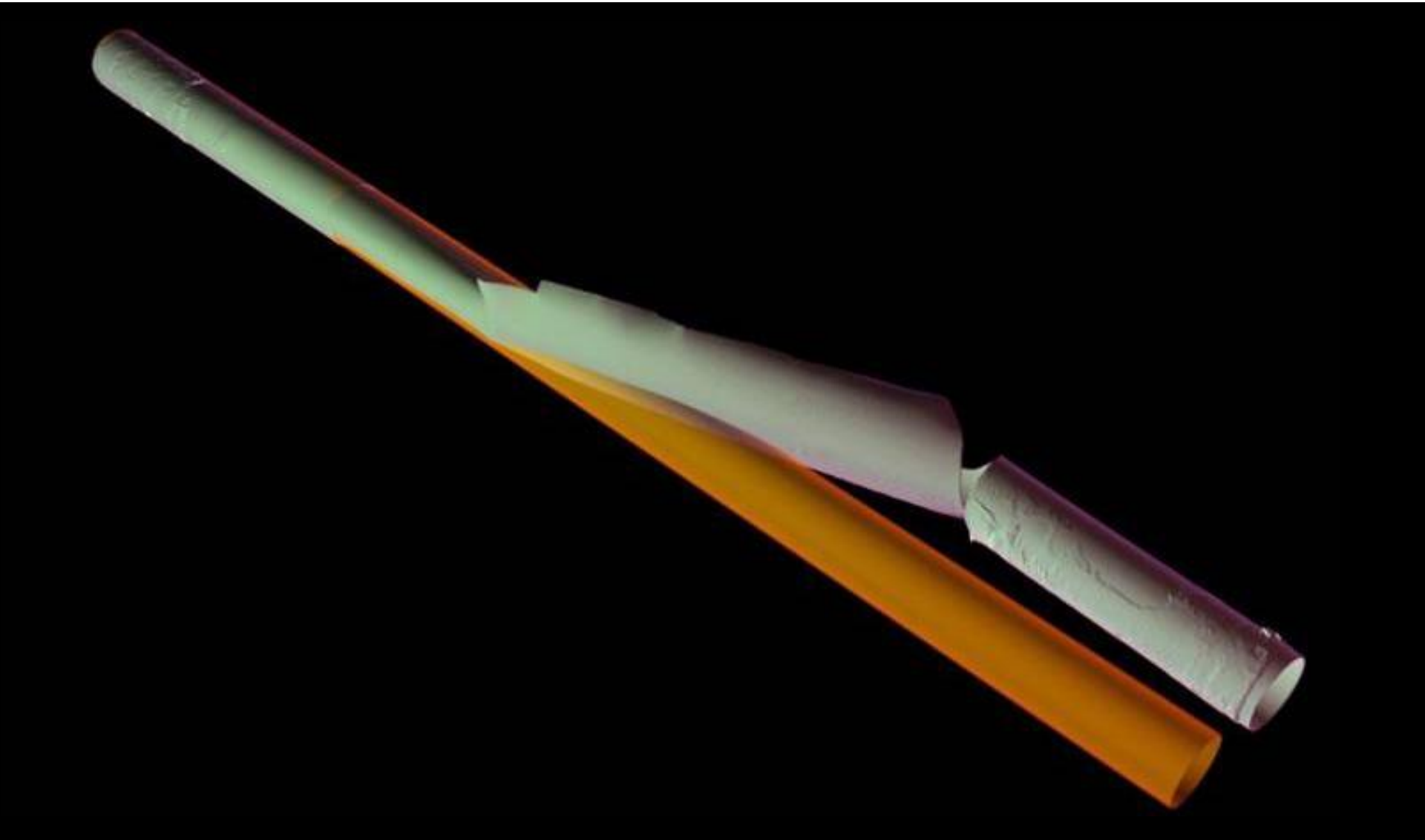


Aligning Pipe Sections (cont.)

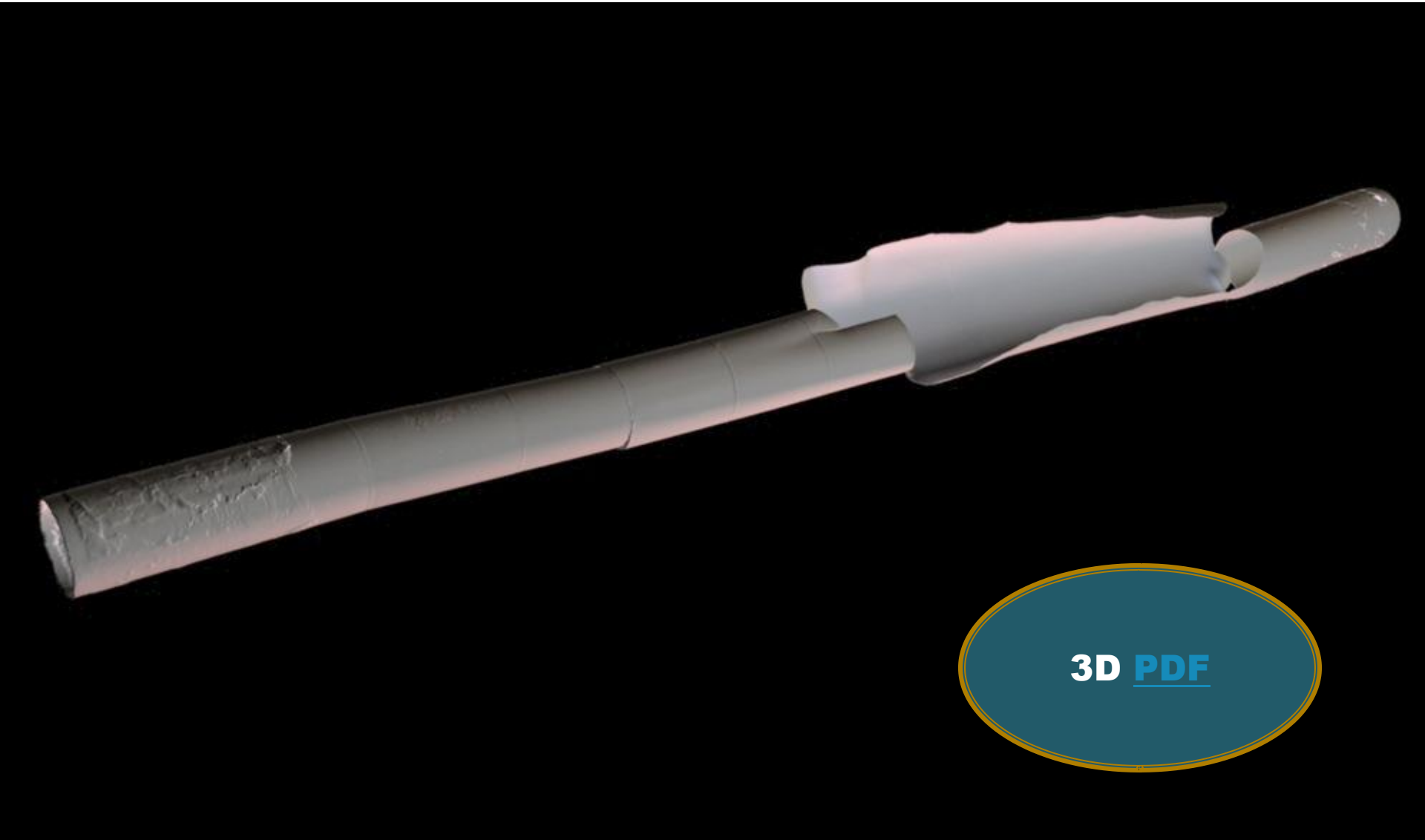
Aligning Pipe Sections(cont.)



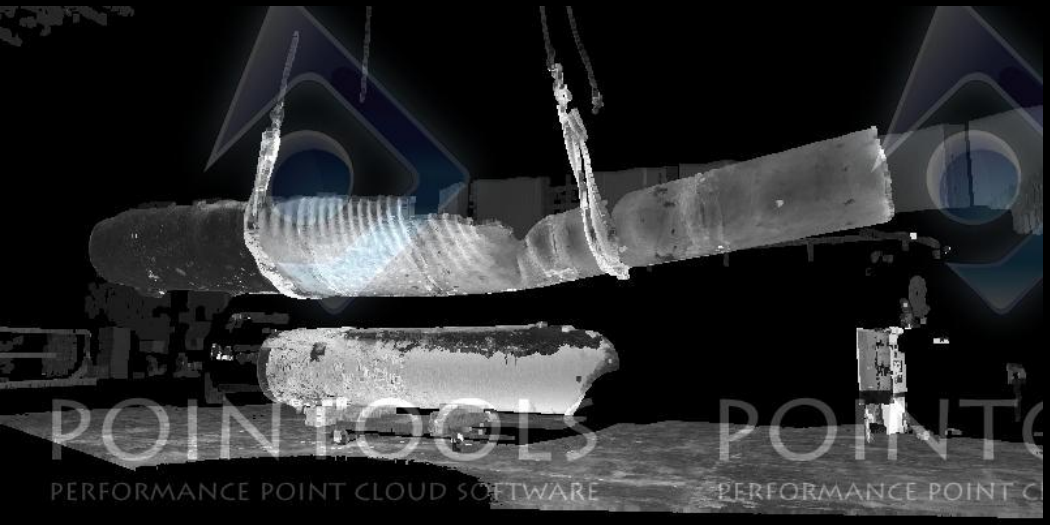
Aligning Pipe Sections



Aligning Pipe Sections (cont.)



How Did I do This?



Rippled PIPE

“QUESTIONS?”

Thank you for your time.

"STAY SAFE"