NSRP RA21-01
Mobile Laser Scan to CAD Analysis

Newport News Shipbuilding

A Division of HII

Cody Griffith
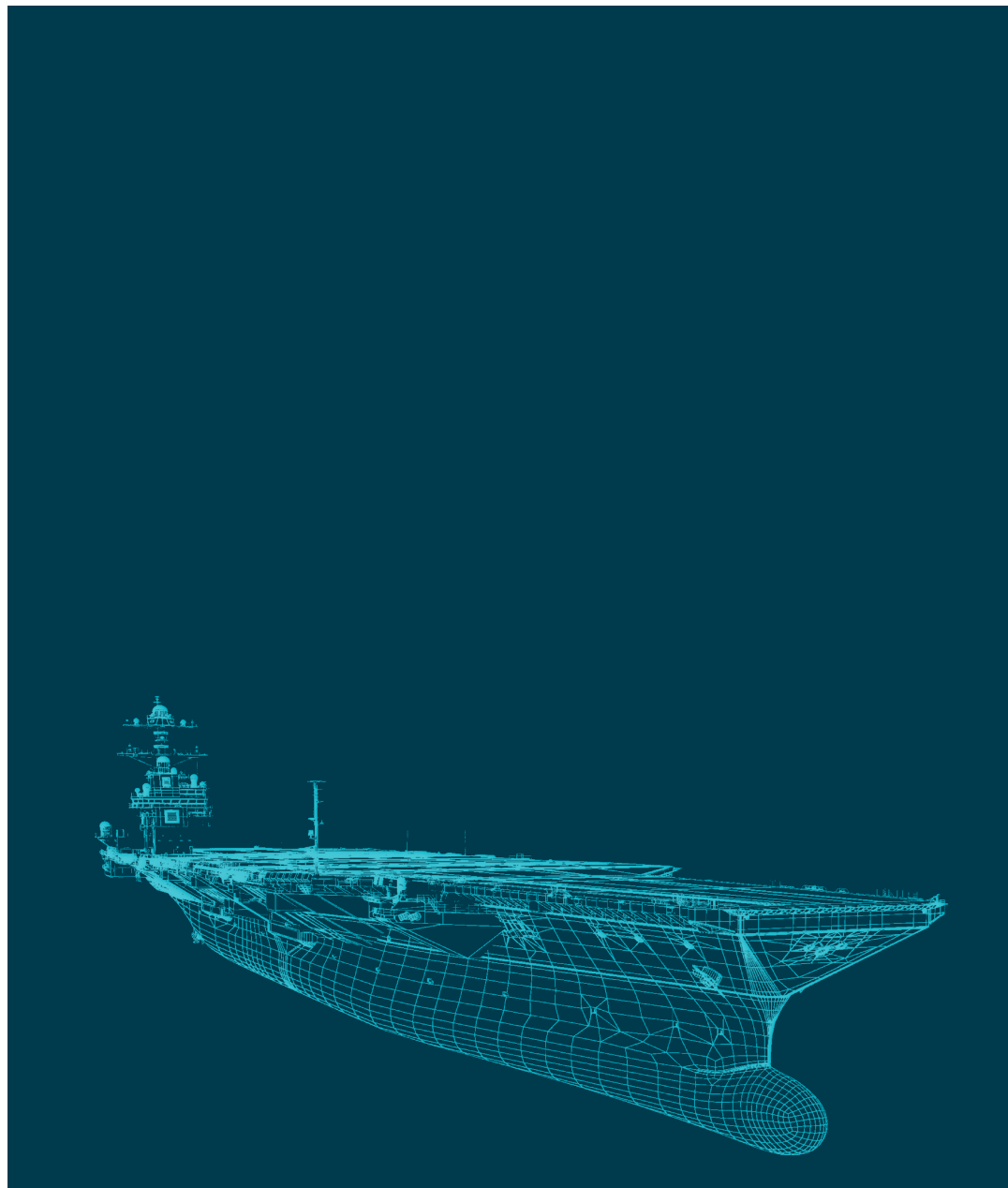
Agenda

- RA1901-01 "Laser Scan to CAD Analysis" Recap
- Project Overview
  - Project Team & Timeline
  - Problem & Objective
  - Technical Approach
  - Mobile vs Traditional Scanning
  - Test Data
- Wrap Up

RA1901-01 Laser Scan to CAD Analysis Recap

Laser Scan to CAD Analysis Recap

PROBLEM TO BE ADDRESSED:

The success of an in-service digital environment is predicated on a continued synchronization methodology between the most current ship's configuration and the 3D product model. There are two legacy processes that do not configuration manage unauthorized changes that will have to be changed to maintain accurate ship configuration.

❑ Changes preceding ship delivery that are documented on inspection reports (IRs) in lieu of 3D product model updates.

❑ During in-service operation, changes made by ship's force, executing yards, or participating acquisition resource managers (PARMs) and alteration installation teams

PROJECT OBJECTIVE:

❑ Develop capabilities to capture and maintain the current ship configuration through the use of laser scan data overlaid on the 3D product model.

❑ Manage configuration deviations between the ship laser scan and the 3D product model by visual display enabling the Hull Planning Yard to investigate the deviations & communicate with the organization that made the change.

❑ Provide an opportunity to educate organizations on the process and demonstrate total ownership cost (TOC) reduction benefit of preserving ship configuration management for in-service applications.

Laser Scan to CAD Analysis Recap
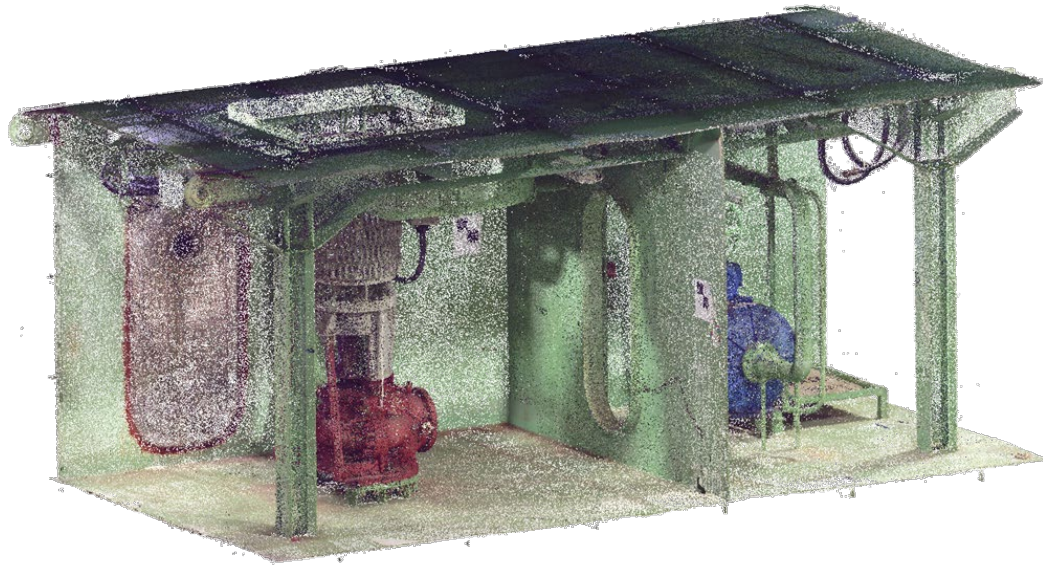
PoPP Point Cloud
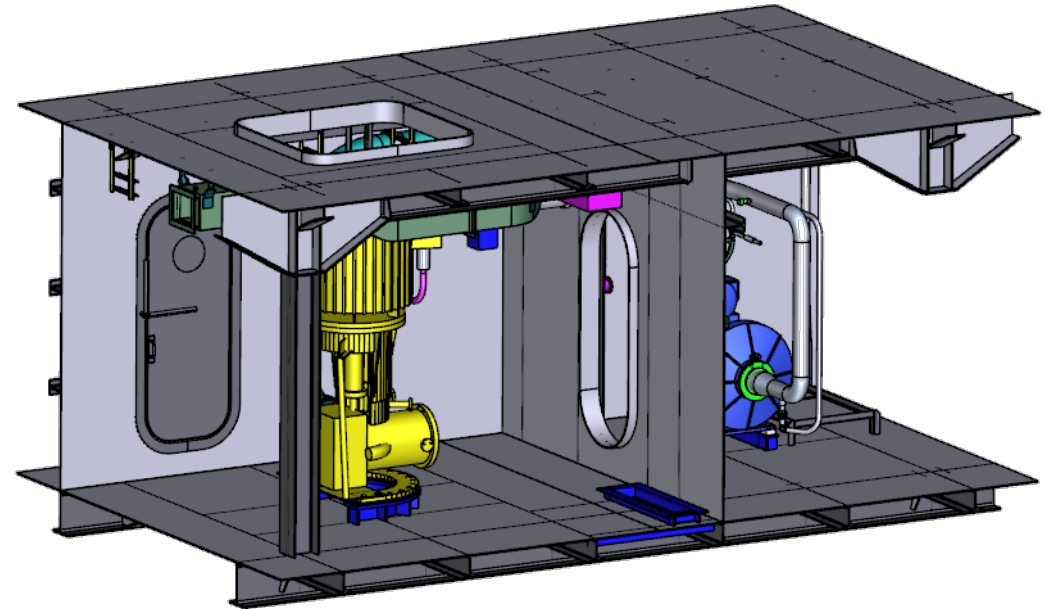
PoPP 3D Model

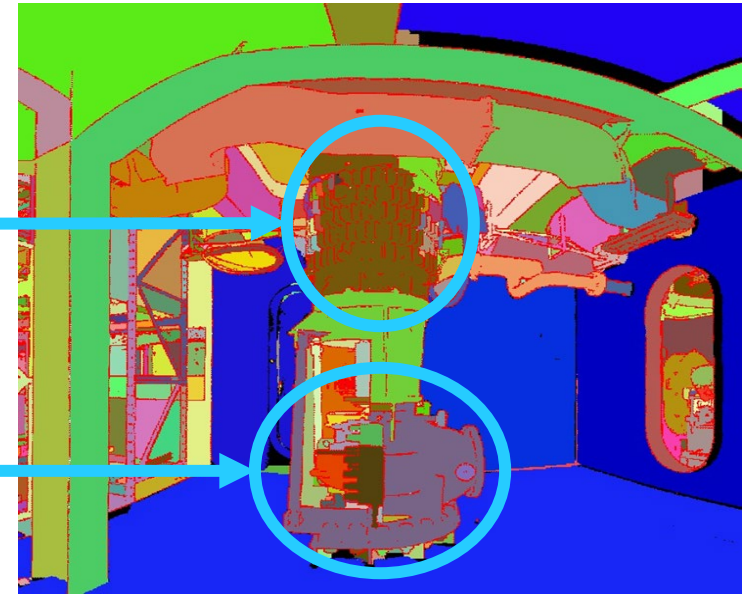# Laser Scan to CAD Analysis Recap

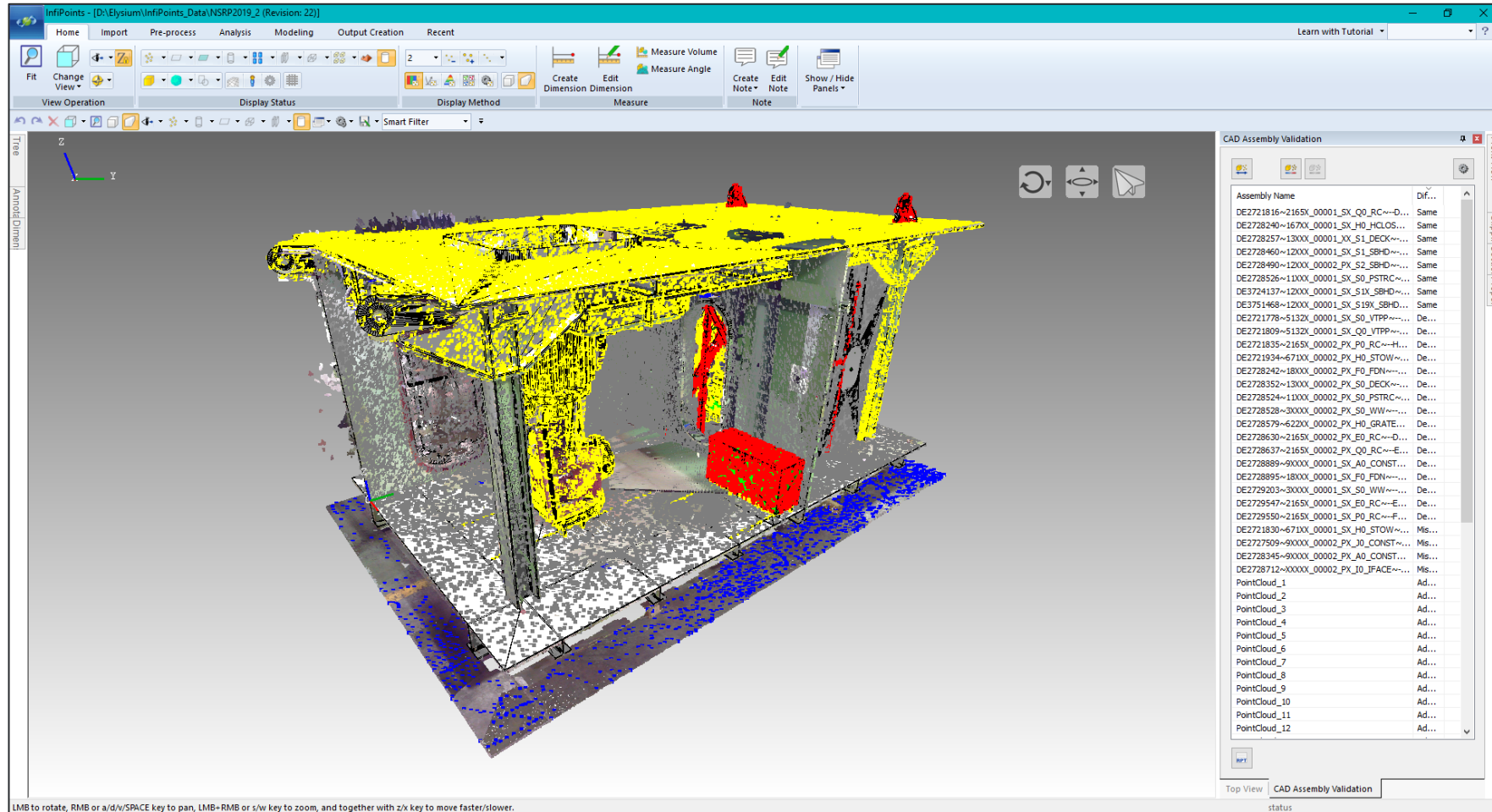Source Point Cloud

Phase 1 Segmentation

Phase 2 Segmentation

Expected process:
- ➤ Auto Segmentation
- ➤ Associate segmented point cloud to CAD components
- ➤ Perform comparison
- ➤ Issue report where the identified differences can be verified by the user

Laser Scan to CAD Analysis Recap

Validation Processes

Laser Scan to CAD Analysis Recap

Validation Processes

Laser Scan to CAD Analysis Recap

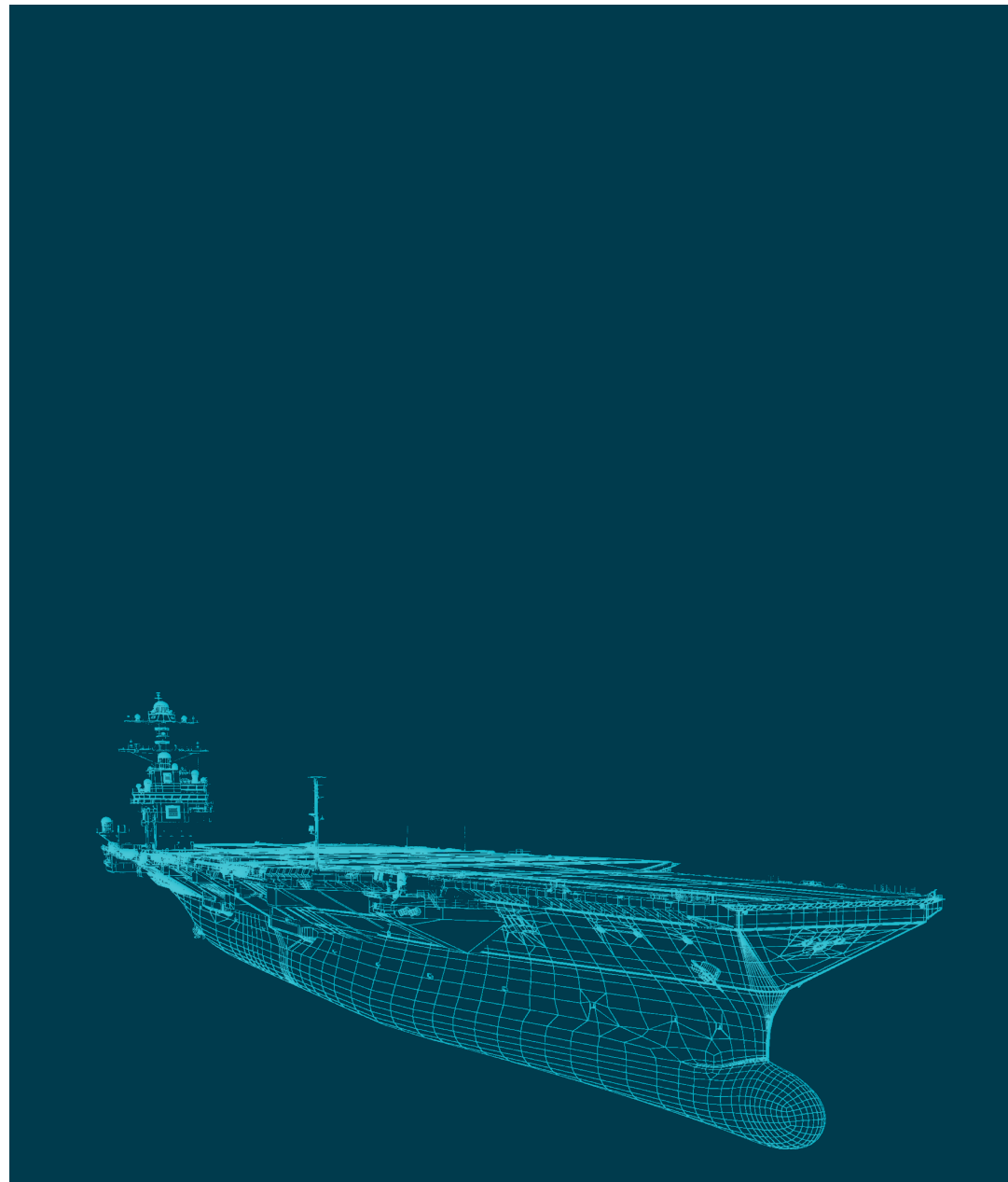*Alpha Numeric Character Recognition*

Mobile Laser Scan to CAD Analysis

Project Team & Timeline

ELYSIUM

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GENERAL DYNAMICS
Bath Iron Works

NAVSEA
NAVAL SEA SYSTEMS COMMAND

Two Phases: 18 Months

Phase #1: 10 Months
Requirements, Use-Cases &
Environment Configurations

Phase #2: 8 Months
Environment Validation
& Pilot Activities

Problem & Objective

PROBLEM TO BE ADDRESSED:

The success of an in-service digital environment is predicated on a continued synchronization methodology between the most current ship's configuration and the 3D product model. There are two legacy processes that do not configuration manage unauthorized changes that will have to be changed to maintain accurate ship configuration.

❑ Changes preceding ship delivery that are documented on inspection reports (IRs) in lieu of 3D product model updates.

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PROJECT OBJECTIVE:

❑ Develop capabilities to capture and maintain the current ship configuration through the use of laser scan data overlaid on the 3D product model.

❑ Manage configuration deviations between the ship laser scan and the 3D product model by visual display enabling the Hull Planning Yard to investigate the deviations & communicate with the organization that made the change.

❑ Provide an opportunity to educate organizations on the process and demonstrate total ownership cost (TOC) reduction benefit of preserving ship configuration management for in-service applications.

Problem & Objective

PROBLEM(S) TO BE ADDRESSED:

Traditional or terrestrial laser scanners are not capable of capturing areas hidden from direct line of sight, they can only capture what is directly visible from the laser scanner and that will leave dead/blackout areas. A significant amount of time required to capture & register laser scans using traditional or terrestrial laser scanners, they require multiple scans to be captured in a given space which is extremely inefficient.
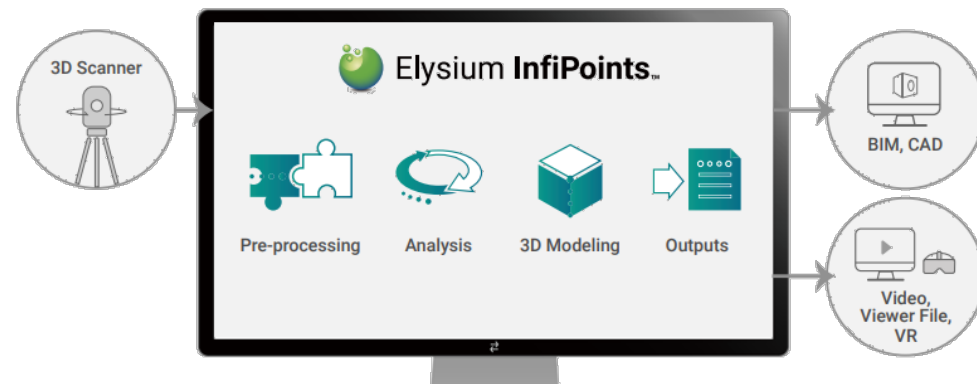
PROJECT OBJECTIVE:

Evaluate and develop capabilities to capture and maintain the current ship configuration utilizing mobile scanning technologies which will:
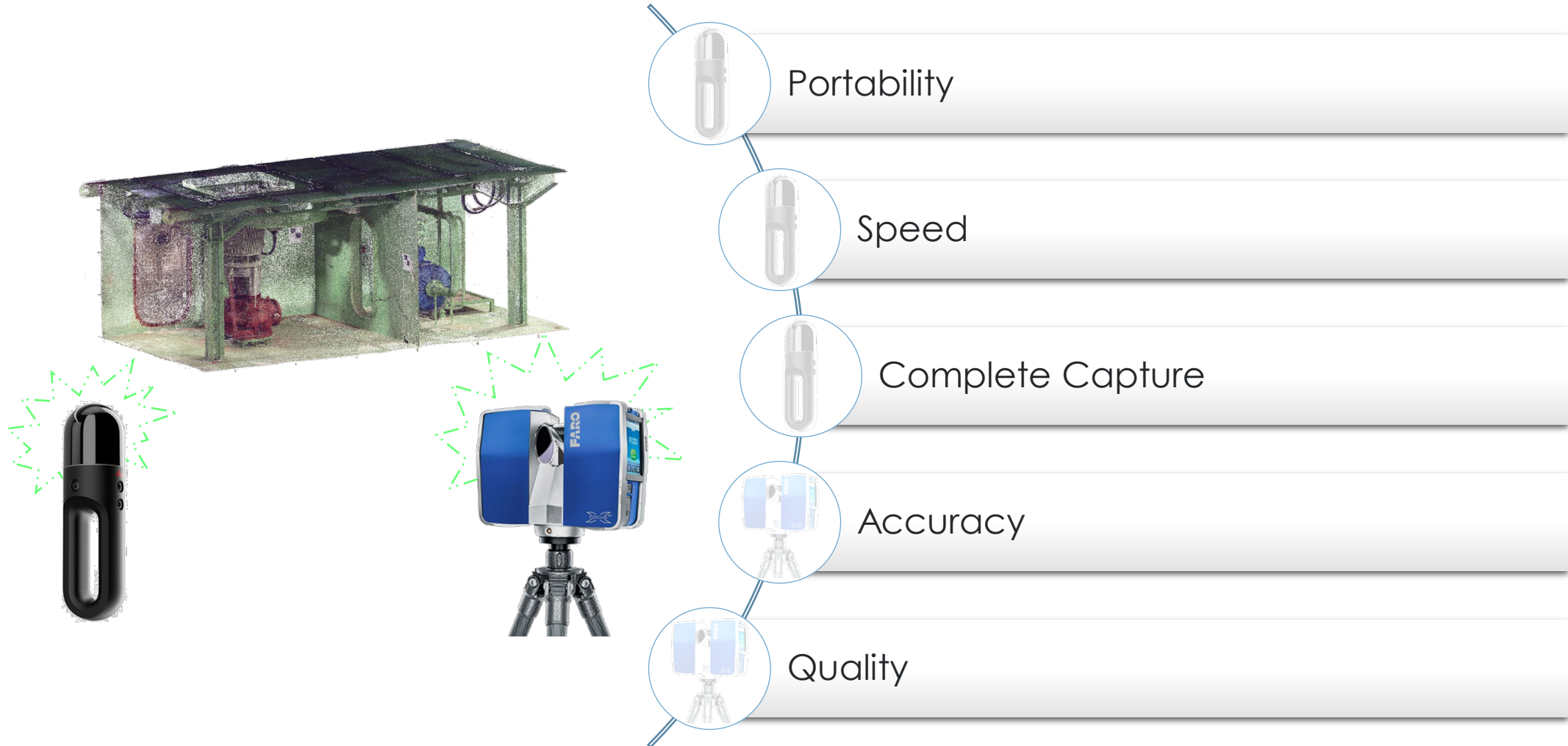
❑ Enable technology advances to evolve our core laser scan processes to those based on mobile scanning

❑ Provide a more complete compartment scans by including hard to access spaces

❑ Extend use-cases to include shipbuilder assembly / inspection

❑ Serve as a long term supplement or replacement for traditional style scanners and processing techniques

❑ Upgrade RA 1901-01 Laser Scan (As-built) & CAD (As-designed) validation for mobile point cloud formats
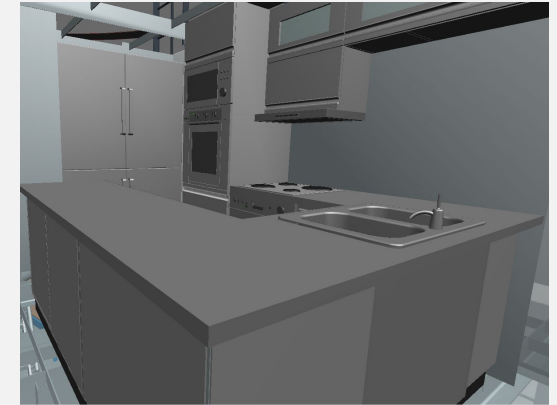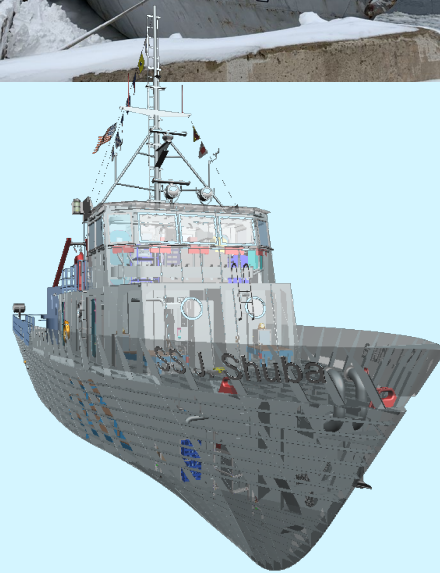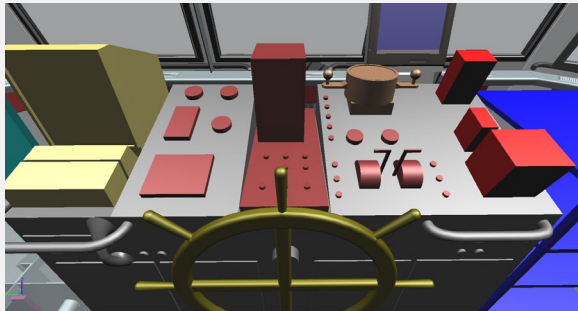
Technical Approach

- **Build upon the successful RA19-01 Project "Laser Scan to CAD Analysis"** to enhance capabilities utilizing mobile scanning technologies

- **Utilize and integrate digital data from the product model along with on-board ship laser scan information** to provide needed 3D product-model ship-sustainment information in an environment where 2D drawings do not exist.

- **Concentrate on data at the ship compartment level.** Typically ship scans are conducted and configuration managed at the compartment level. This compartment scan data will match 3D product model partitions that are at the compartment level for in-service use. Thus a direct comparison of the current configuration and the baseline HPY 3D product model can be made.

- **Leverage Elysium's state-of-the art technical capabilities** for software development and integration. Elysium has vast experience and knowledge of the NNS 3D product-model environment and was responsible for the migration and validation code development when NNS transitioned for CATIA to a NX 3D CAD environment.

Mobile vs Traditional Scanning

- Portability
- Speed
- Complete Capture
- Accuracy
- Quality

Test Case

Torpedo Weapons Retriever; Scanned with Leica BLK2GO

Thank You