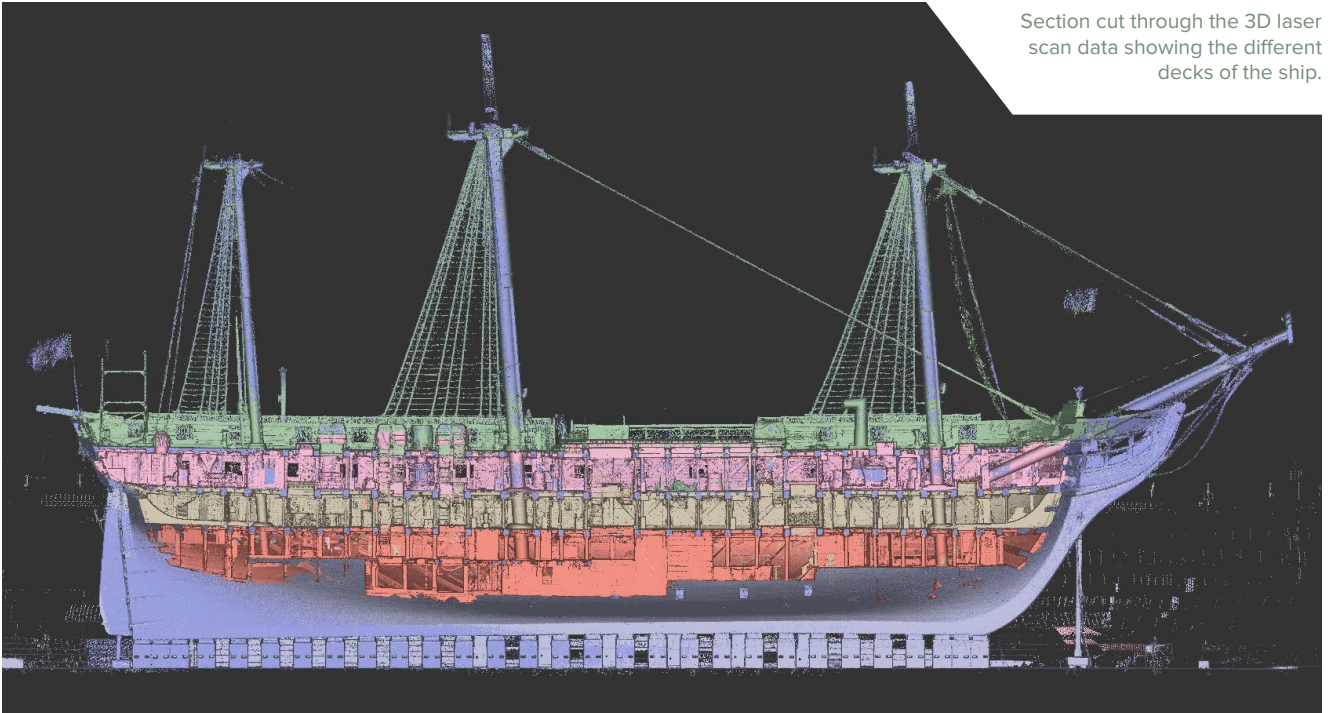


Section cut through the 3D laser scan data showing the different decks of the ship.



Documenting Historic Naval Architecture with 3D Laser Scanning

The mission of documenting historic sites and structures with laser scanning often includes artifacts of naval history such as historic wooden ships. Given the amazing human effort to design and build these vessels back in the day, without computers and CAD software, these vestiges of engineering feat at least deserve the benefits of modern day laser scanning for historical documentation and digital preservation.

Such was our delight when presented with the opportunity to scan one of America's original frigates—the *USS Constellation*, distinguished as the first U.S. Navy vessel to put to sea and the first U.S. Navy vessel to engage and defeat an enemy vessel. Originally constructed in 1797, decommissioned in 1853, and completely rebuilt in 1854, she still floats today in the inner harbor of Baltimore, Maryland as a renowned educational and tourism venue for the city.

While in dry dock for repairs first in 2011 and then again in early 2015, we performed extensive laser scanning throughout the vessel capturing virtually every surface on every deck and open space. Our original scanning in 2011 was with a FARO *Photon*, a *Surphaser*, and a handheld *Mantis F5*. In 2015 we used three FARO *Focus* scanners and captured color scans as well.

Between both scanning trips we amassed a total of over 225 spherical

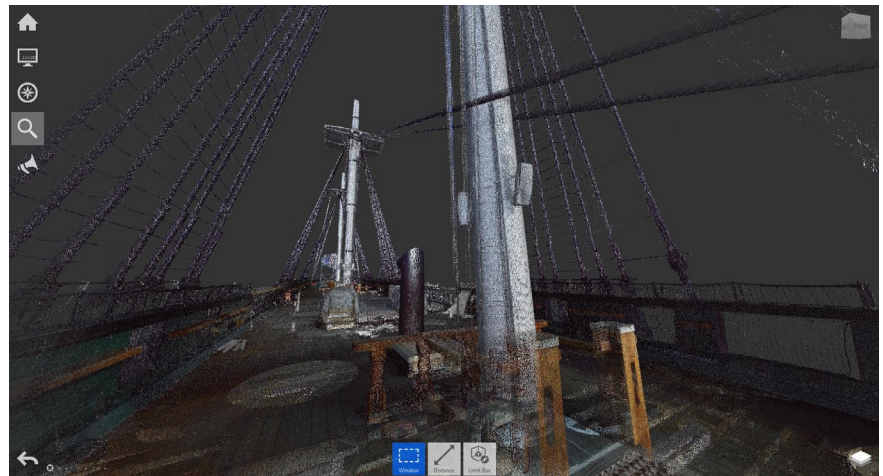
BY MICHAEL RAPHAEL




Above image shows section through the scan data exposing the various decks and spaces within the USS Constellation.

scans inside and out of the ship all registered together with Innovmetric's *PolyWorks* software for cloud-to-cloud alignment—affording no need for targets. These images were created in Autodesk's *ReCap* software which also helps with sharing the giant point cloud files (totaling over 85GB) with others such as the restoration team and naval architects.

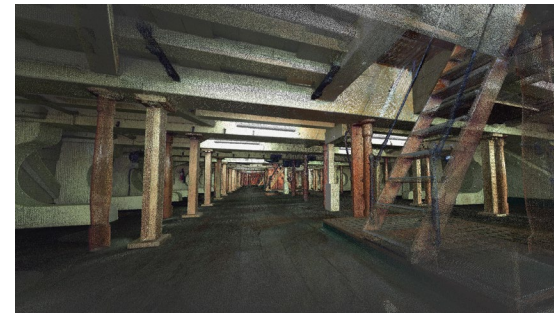
Initially the data was used to obtain certain basic measurements and to prove out the scanning process for future projects. We also supported a similar scanning project for the USS Constitution in Boston. It would certainly be great to engage with a team of historic ship aficionado's to recreate the hull line drawings to complete the documentation efforts



full circle for both of these great historic surviving naval vessels. If anyone is interested in contributing their technical efforts, please contact us at www.directdimensions.com. 

Michael Raphael is the founder and CEO of Direct Dimensions, Inc. in Baltimore, Maryland and has been involved in LIDAR for more than 20 years.

Images below showing perspective view of the scan data within a deck space and the main deck within the Autodesk ReCap software.



LEARN MORE ABOUT THE USS CONSTELLATION

- See **Historic Ships in Baltimore** for information on visiting the USS Constellation.
- See **The Baltimore Sun** for information and pictures of the ships being repaired in dry dock.