



Terratec Airborne Lidar Bathymetry with the CZMIL SuperNova

IHO NSHC meeting - 28 April 2021
Charles de Jongh

TERRATEC



250 employees, 9 companies in group in 5 countries. Main office in Oslo, Norway.



9 Aircrafts, 2 Mobile Mapping Systems and various rotary-wing setups



~ 16 sensors – lidar (topographic and bathymetric), cameras, multispectral and hyperspectral



In 2020 Terratec acquired ~1 200 000 photos and ~61 000 km² of LiDAR data



Surveying

Land surveying and geodesy is core business at Terratec. We have state-of-the-art equipment and employees with extensive experience.



Property and building processess

Are you planning on building? Terratec can assist you in many phases of the construction project. Municipal applications, legal advice, project placement and control of the new building are fields we know well.



Airborne data capture

Terratec offers high-resolution photography for both oblique photography and traditional vertical digital camera shooting.



Mobile mapping

Mobile laser scanning is a well-established production method in Terratec's toolbox, and this is an effective way of gathering a comprehensive data base.



Mapping services

Terratec offers a number of products based on the data we collect. The map is an image, a presentation, or representation of the real geographical world.



3D models

Terratec can deliver object based and "mesh" 3D city models in LOD1, LOD2, LOD3 or LOD4 (BIM). Terrain models (DTM/DEM) and surface models (DOM/DSM). We also offer a wide range of 3D file formats. We have integrated with leading software systems for displaying 3D data.



Analysis and advice

Digital sensor data collected from different platforms are valuable data for further analysis. Terratec has extensive experience in performing such analyzes.



Industrial surveying

Terratec handles industrial measurement for the oil and gas industry, mechanical industry, process industry, power plants, etc. Projects can be both large and small with varying durations.



Geophysical surveys

See the invisible! Are you interested in knowing what's beneath the ground? - Terratec offers georadar measurements for surface detection and mapping.

Advantages of Airborne Lidar Bathymetry

- Fast & reliable bathymetric survey method.
- Ability to reach very shallow areas.
- Seamless mapping of land & water in the coastal zone.
- Ability to reach up to 3 times visible water depth.



Teledyne Optech CZMIL SuperNova



- **CZMIL: Coastal Zone Mapping and Imaging Lidar.** Deep penetrating lidar with powerful laser.
- Original **CZMIL** (2012) & **CZMIL Nova** (2015) developed by US government and Teledyne Optech for the National Coastal Zone Mapping program.
- CZMIL sensors used by US Army Corps of Engineers (USACE), US Navy, NOAA and other government mapping agencies around the world.



National Coastal Mapping Program Progress-to-date

2009-2010
2014-2015
2020-2021

2006-2008
2011-2013
2018-2019

2005
2010
2018
2024

surveys



2005
2010
2017
2023

2005
2010
2016
2023

2009
2015
2022

2004
2010
2015-16
2022

US Coastal Areas mapped/planned to be mapped with airborne lidar bathymetry - Mapped with CZMIL / CZMIL Nova from 2012

Source: 20th Annual JALBTCX Airborne Coastal Mapping and Charting Technical Workshop USACE presentation (2019).

https://jalbtcx.blob.core.windows.net/website/workshops/2019/Day_01_pdf/d1sle_Wozencraft.pdf



PROBLEM

Regional coastal elevation data and imagery are required to characterize coastal change and manage sediment as a resource to support navigation, flood risk reduction and ecosystem restoration. The data are also needed to engineer entire coastlines for resilience to acute and long-term coastal hazards.

SOLUTION

The Joint Airborne LIDAR Bathymetry Technical Center of Expertise (JALBTCX) fielded the Coastal Zone Mapping and Imaging LIDAR (CZMIL) in 2012. This third-generation airborne coastal mapping and charting system, developed by Corps researchers, improves sensor performance in challenging environments, accelerates data delivery, and enables new and better information extraction from collected datasets.

IMPACT

JALBTCX uses CZMIL to collect nationally consistent, regional coastal data for the NCMP, for Corps and FEMA post-hurricane surveys, and for Naval Oceanographic Office Tactical Nautical Charting Surveys. Within the Corps, CZMIL data support regional sediment management, comprehensive coastal studies, smart planning, coastal asset management, and coastal storm modeling. Outside the Corps, CZMIL data are used to produce NOAA nautical charts, USGS coastal studies, and FEMA flood maps. State and local governments use CZMIL data for numerous coastal zone management applications.

Why the US Government uses the CZMIL

44+
THOUSAND
DATA DOWNLOADS

SAVES
\$18 THOUSAND
& 12 DAYS
PER MILE OF SHORELINE
COMPARED WITH TRADITIONAL
SURVEY TECHNIQUES

COASTAL ZONE MAPPING & IMAGING LIDAR

Priority coastal areas for the Corps, such as surf zone and turbid waters, present challenges for current LIDAR sensors. Advances in processing bathymetric LIDAR signals and fusion of these signals with ancillary sensor data, such as hyperspectral imagery, have revealed opportunities for more progressive environmental applications of the data. The Coastal Zone Mapping and Imaging LIDAR (CZMIL) is an ongoing sensor development effort within the Corps' National Coastal Mapping Program (NCMP). The program produces high-quality, high-resolution information products from airborne LIDAR bathymetry, topography and accompanying Red-Green-Blue and hyperspectral imagery data around the U.S. coasts on a recurring basis. New information products have been developed for the Corps and the Nation by further analyzing and fusing CZMIL's LIDAR and imagery data streams. The current product suite includes: LIDAR point clouds, digital elevation models, laser reflectance images, air photo and hyperspectral image mosaics, a shoreline vector, and elevation shoreline and beach volume change. Products currently in development are beach and dune geomorphology metrics, dune vegetation and submerged aquatic vegetation metrics, coastal structure metrics, and water quality parameters.

Terratec's Bathymetric Lidar Sensor



- **CZMIL SuperNova** (2021) is an upgrade with many improvements, e.g.:
 - Double point density of Nova.
 - Best penetration of deep and turbid waters.
 - Improved accuracy - shallow channels within IHO Special Order.
 - CARIS processing software.
- Terratec is the first commercial company owning a CZMIL type sensor & first CZMIL system available in Europe.
- First project for the CZMIL SuperNova: Marine Base Maps for the Coastal Zone for the Norwegian Hydrographic Service.



Kartverket



TERRATEC

Terratec Services

- With airborne bathymetric lidar large coastal areas can be surveyed in an efficient and economically advantageous way.
- With the CZMIL SuperNova Terratec has a top-notch bathymetric lidar system in house.
- Terratec has experience with bathymetric lidar projects and is ready to deliver a full solution.





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