LiDAR payload for airborne topographic surveys.

LiDAR payload built around the Velodyne VLP16 LiDAR.

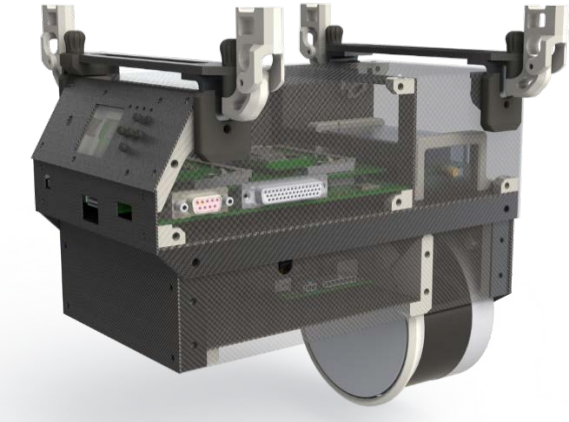
Summary:

A LiDAR payload has been developed for the Riverscapes project. It is compatible with the Riverscapes payload controller and uses the global navigation satellite system (GNSS) receiver and inertial navigation system (INS) unit from Novatel for geo-referencing the LiDAR point cloud. All LiDAR data is collected on the payload controller, using a format compatible with the Kitware VeloView software.

The payload:

The payload consists of the Velodyne VLP16 Puck LITE LiDAR and the aforementioned payload controller with a Novatel OEM7/ADIS16488 GNSS/INS unit. All LiDAR measurements are accurately timestamped using the GNSS receiver.

The LiDAR is mounted underneath the payload controller using a simple but robust mounting system. This makes it easy to switch between multiple payloads, if required.



The payload controller with the LiDAR payload.

The system consists of an embedded computer with built-in storage and a high precision GNSS/IMU. The payload controller connects to the LiDAR using Ethernet and 12V power.

The survey and sensor status can be monitored directly on the LCD display to ensure a successful survey.

Velodyne VLP16 Puck Lite specifications	
Channels	16
Range (m)	100
Range Accuracy	>32GB SD card
Field of view	Vertical: +15° to -15° Horizontal: 360°
Angular resolution	Vertical: 2.0° Horizontal:0.1° to 0.4°
Rotation rate	5 Hz – 20 Hz
Wavelength	903 nm
Power consumption	8W
3D data points #	Single return: ~300.000 Dual return: ~600.000
Weight	LiDAR: ~590 g Payload total: ~950 g System total: ~1700 g
Integrated web-server for status & monitoring	

GNSS/INS:.

The technical specifications for the GNSS/INS are listed in the table below:

GNSS/INS specifications	
GNSS Model	Novatel OEM7 series
INS Model	ADIS16488
Position accuracy (M), RMS	**Horizontal/vertical:** RTK: 0.02/0.03 PP: 0.01/0.02
Velocity accuracy (M/S) RMS	**Horizontal/vertical:** RTK: 0.02/0.01 PP: 0.02/0.01
Attitude accuracy (Deg.) RMS	**Roll/pitch/heading:** RTK: 0.035/0.035/0.15 PP: 0.012/0.012/0.074

The LiDAR provides high definition 3D information about the surrounding environment. To generate a 3D point cloud from the raw data points, it is necessary to process and georeference the LiDAR datasets. This can be done using the DTU developed processing scripts.

Applications:

The LiDAR payload is commonly used as an alternative to photogrammetry, as it is generally faster to process the datasets. Applications include:

- Airborne topography
- Digital elevation models (DEM)
- Micro-topography: Mapping of surface elevation in vegetated, forested areas

Contact: Daniel Olesen, danole@space.dtu.dk +4545259746, Johannes Linde jlinde@space.dtu.dk