



APPLANIX

LANDMark™

Mark Your Territory

Mobile Mapping is a proven method to acquire and characterize information that is vital for infrastructure management. No matter what the goal -- acquiring video log data for right-of-way and pavement condition analysis, property assessment, electric pole inventories, street/trackside asset management projects to satisfy government regulations -- mobile mapping is the single most cost efficient way to acquire quality civil infrastructure GIS data. With ever increasing emphasis on prevention and comprehensive asset lifecycle maintenance, officials need robust information on all assets in their inventory to maximize the value of their investment in GIS as a decision making tool. However, acquiring accurate data poses certain challenges:

- Many asset managers settle for generic data they can more easily acquire rather than the customized data that better serves their needs
- The scope of many projects presents a daunting task with hundreds of thousands or even millions of assets requiring data to be collected and cataloged on a frequent basis
- Despite innovations, mobile mapping accuracy remains a concern to some; a fear left over from early experiences using survey vehicles equipped with GPS alone, which may have been economical to build but would often fail in urban environments due to lack of GPS reception which dramatically increased the need for data reacquisition
- For government transportation agencies and city planners, building a vehicle to satisfy data acquisition needs of many departments is a cost prohibitive and technically laborious exercise
- For engineering companies and GIS consultants providing data acquisition services, mapping assets is a labor intensive exercise requiring constant operator involvement that prolongs data acquisition cycles

The Applanix LANDMark System (LMS) was created to increase productivity and return on investment for both data acquisition companies and end users. This is the industry's first mobile mapping solution that offers:

- Full consulting and customization of hardware and software for your specific application
- Full on-site installation and training
- Optional automatic asset / feature extraction that doubles operator productivity
- Modular configuration for easy system transfer between vehicles
- Expandable system architecture can be modified as application needs grow: Use with a single camera, six or more integrated cameras, or introduce a combination of cameras with incorporated laser systems for automated feature detection with legacy hardware
- Integration with industry leading POS LV position and orientation system provides sub-meter and decimeter level accuracy (depending on model required for mission) with inertially aided RTK as standard equipment
- Data viewing, extraction and IMU/GPS post processing for the highest level of accuracy as standard equipment
- Only COTS Mobile Mapping Solution with Global Navigation Satellite System (GNSS) capability (Q2 2007)
- Multiple data formats supported for export into various GIS databases
- ODBC connectivity -- optimized for multi-user environment



Applanix - Support Services

Applanix Support is committed to answering all customer needs. Whether you're looking for information on using your LANDMark system or simply need to outsource some data post-processing during a busy period, Applanix customer support is dedicated to helping you get the most value out of your product. We provide industry-leading, personalized emergency support - 24 hours a day, 7 days a week. For more information on how our team of Applanix Support specialists can help you to better meet your objectives using POS LV, please visit our website or send your questions via email to support@applanix.com.

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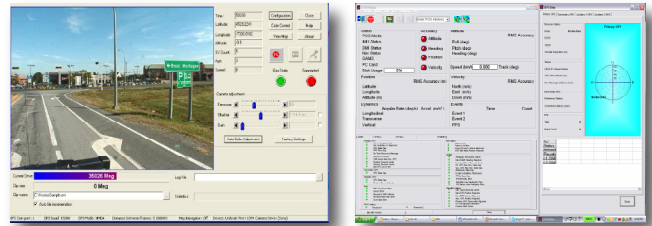
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LANDMark™ WORKFLOW

STEP ONE: DATA ACQUISITION

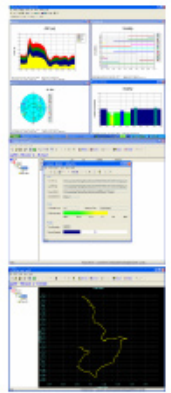
During Data Acquisition, the GEOImage software synchronizes the position and orientation data from the POS LV with the digital imagery in real time (.avi or .jpg format). The operator can also view critical data during the mission to ensure proper system performance. POSView Controller (Left) shows detailed POS LV system status while GEOImage Viewer (Right) displays current video imagery and position, allows for camera adjustments to be made and monitors hard drive usage.



STEP TWO: POST PROCESSING

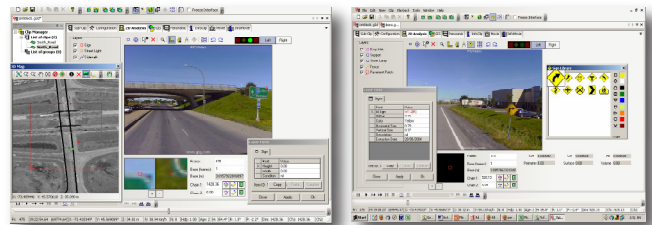
To achieve the highest level of accuracy in mobile mapping missions, POSpac LAND sets the new industry standard for accurate, reliable, and repeatable results under the most difficult GPS conditions. The complete post-processing toolbox delivers a streamlined field-to-office workflow to provide the best results possible.

- **PLANNING:** A powerful standalone tool with the ability to support various types of satellite data. Visible satellite plots can be generated to help you determine the best times for data collection to ensure field time is productive.
- **EXTRACT:** Designed to extract real-time navigation and sensor data from the raw data logged by the POS LV system.
- **NAVIGATE:** Imports the output data generated using the extract module to produce a robust navigation solution. The GPS, DMI, GAMS integrated navigation data is post-processed in both forward and reverse directions culminating in a smoothing routine to produce the best results possible.
- **OUTPUT:** Transforms the real-time or post-processed data from WGS84 to various user-defined coordinate systems
- **DISPLAY:** Plots and tabulates the output data for easy analysis and QA/QC tasks.
- **BATCH:** Schedules the execution of the various modules to provide a turnkey software solution.



STEP THREE: GEOImage™

GEOImage is a comprehensive analysis and feature extraction software that allows users to view and document features of interest in the digital video imagery. When the LMS is ordered with a laser for automatic feature extraction, reflected laser energy is located on the image bitmap and combined with pattern recognition using a sign library to identify the sign and its location.



STEP FOUR: GIS DATABASE

The Applanix LANDMark System utilizes stereo photogrammetric algorithms to accurately position objects using only one camera. Spatial accuracy is determined by the type of POS LV system paired with the LMS. Even in the most challenging GPS environments with long duration outages, sub-meter and even decimeter level results are attained with post-processing. The following chart details the POS LV system performance metrics after a one kilometer GPS outage (1 minute):

POS LV	200	200	200	220	220	220	420	420	420	610	610	610
	PP	IARTK	DGPS	PP	IARTK	DGPS	PP	IARTK	DGPS	PP	IARTK	DGPS
X, Y Position (m)	0.32	1.27	2.51	0.24	0.69	0.88	0.12	0.34	0.45	0.10	0.28	0.41
Z Position (m)	0.13	0.35	0.60	0.13	0.35	0.61	0.10	0.27	0.56	0.07	0.10	0.51

Applanix LANDMark RETURN ON INVESTMENT

- Manual asset feature extraction / characterization takes 120 sec. per asset
- Automated functionality of the Applanix LMS is less than 60 sec. per asset
- Operator performs QA/QC function only and doubles operator productivity
- POS LV virtually eliminates the need for data reacquisition
- Reliable and repeatable sub-meter accuracy even during extended GPS outages

Real-Time CDGPS	Avg.std.dev.(m)		Heading, Position errors		Usable data	
	POS LV	GPS	POS LV	GPS	POS LV	GPS
Rural - Highway	0.71	1.09	0.12%	1.94%	99.88%	96.79%
Urban - Highways*	1.28	2.59	0.05%	5.76%	99.95%	74.16%
Semi - Urban **	0.46	0.98	0.17%	6.94%	99.83%	93.06%
Urban	0.86	2.40	0.05%	13.25%	99.95%	52.56%

* With over 3 km of tunnels

** Winter Data ... No Leaf Cover

Applanix LANDMark COMPONENTS

- GEOImage data acquisition and feature extraction software: controls critical functions, monitors system performance, and performs feature extraction that can be exported in a variety of formats for GIS databases
- Camera(s) with various resolutions
- LMS Roof Rack, a strong base for camera(s) and GPS antennas (modular, can be transferred to other vehicles seamlessly and with little effort)
- POS LV System with POSpac Land Inertial / GPS post-processing (four variants providing differing levels of positioning and orientation accuracy)
- LMS multiplexer, used to trigger signals coming from LMS Server which can manage 6 installed cameras while ensuring signal quality, noise reduction, and proper camera synchronization
- Computer (Pentium 4, 1.6GHz or faster)
- Hard drives with removable trays to record georeferenced imagery in real-time

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