An Overview of Applanix

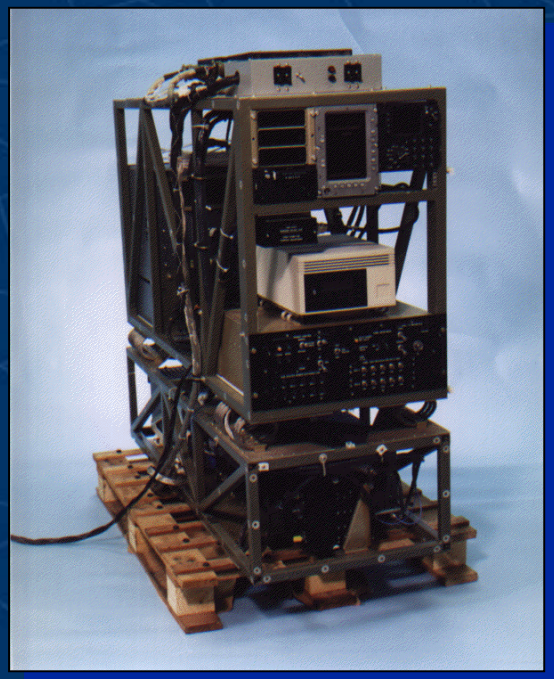
The Company

The Industry Leader in Developing Aided Inertial Technology

- Founded on Canadian Aerospace and Defense Industry Expertise
- Providing Precise Position and Orientation Systems for Airborne, Marine and Land-based Applications

- Firmly Established in the Commercial Sector since 1991
- A Subsidiary of Trimble Navigation

The Origins of POS Technology



Helicopter Integrated Navigation System (HINS)
1986-94

Position and Orientation System (POS)
1993-present

Military
- GeoReferenced Camera System
- SAR motion compensation

Commercial
- road inspection & survey
- railroad track geometry
- airborne survey & topo mapping
- seafloor mapping

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Aided Inertial Advantage

Position and Orientation System (POS)

IMU + **GPS** = **Aided Inertial Solution**

IMU Only

Advantages:

- Full 6 Degrees of Freedom solution
- High dynamic accuracy with broad bandwidth
- Self-contained, requires no external data

Limitations:

- Solution errors diverges slowly with time

GPS Only

Advantages:

- High-accuracy position & velocity
- Moderate accuracy orientation

Limitations:

- Low bandwidth
- Satellite signals easily blocked and subject to multipath errors
- Slow ambiguity resolution

Integrated Inertial/GPS

- **Integrates IMU sensed acceleration and orientation with precision GPS position and velocity**
- **Generates continuous, dynamically-accurate positioning solutions**
- **Engineered for use with a complete range of sensors**

Advantages:

- All inertial and GPS advantages

Limitations:

- No significant limitations

Key Technology Attributes
Position and Orientation System (POS)

Generates Very Precise Heading and Orientation Measurements
- Provides RTK or differential-level position and orientation with high-bandwidth (200 Hz) and low-latency (<3 msec)

Is Unaffected by Satellite Signal Loss
- Provides ***continuous*** position and orientation measurements during GPS dropout

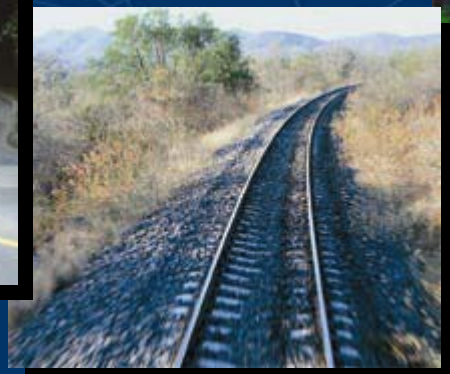
Comprises Off-the-Shelf Components
- Modular, rugged, interchangeable primary components

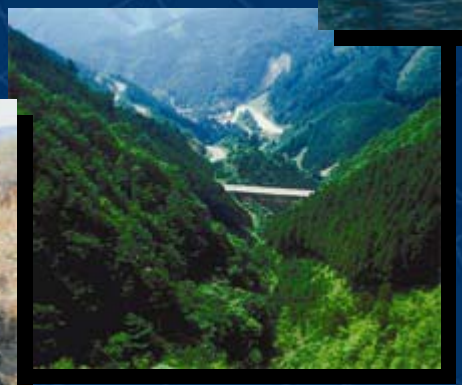
Is a Fully Supported Commercial Product
- Integrated turnkey operation, self-contained system, ready to integrate with various sensors (camera, rut-bar, laser scanner etc)

Technology Applications

Engineered for use in a wide variety of survey, mapping and positioning roles

- Airborne Survey and Mapping
- Marine Survey and Sensing
- Land Survey and Resource Exploration
- Road Survey and Mobile Applications
- Railroad Survey and Track Geometry





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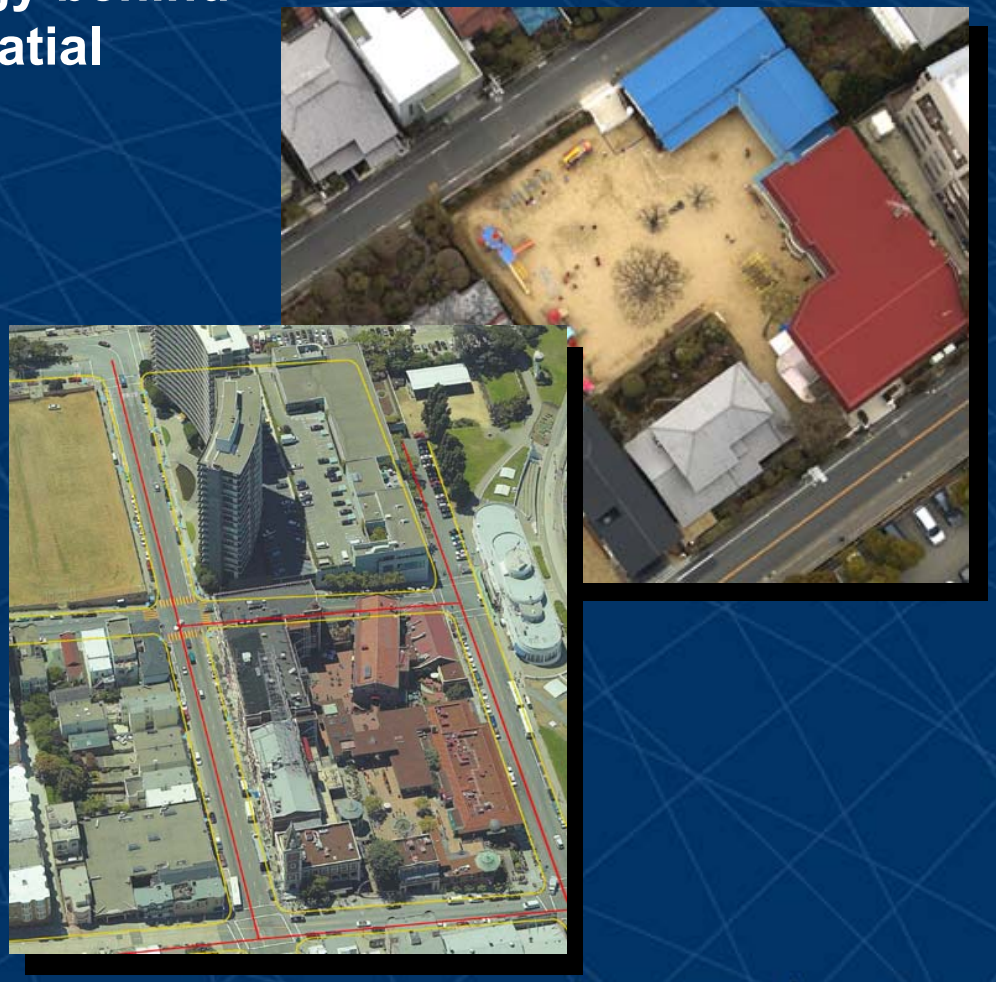
Technology Solution

Serving the professional and scientific communities

Providing the enabling technology behind the systems that generate geospatial information for:

- Urban and Regional planning
- Remote Sensing
- GIS Infrastructure
- Forestry
- Natural Resources
- Oceanography
- Oil and Gas Exploration
- Disaster Response Management
- Transportation Planning
- Agriculture
- Mining and Mineral Exploration



Product Line

Airborne

- Airborne Vehicles
  POS AV™
- Digital Sensor System
  DSS™
- Post-processing Software
  POSPac™

Land

- Land Vehicles
  POS LV™
- Track Geometry
  POS TG™
- Land Survey
  POS LS™
- Post-processing software
  POSPac™

Marine

- Marine Vessels
  POS MV™
- GPS Interface
  GRAM-S™

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Airborne – POS AV

POS AV is the enabling technology behind these airborne sensors…

Aerial Cameras

Scanning Lasers (LiDAR)

Synthetic Aperture Radar

Digital Frame Cameras

Digital Scanners

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Airborne – POS AV

Position and orientation system designed specifically for Direct Georeferencing of airborne data

Key Attributes:

- Significantly reduces airborne survey cost and turn around time
- In-air-alignment capability
- Directly measures the sensor's position and attitude
- Achieves very high accuracy and data rate
- Offers real-time or post-processed data options
- Computes geometrically corrected and geographically coded data
- Reduces the need for labor-intensive ground control

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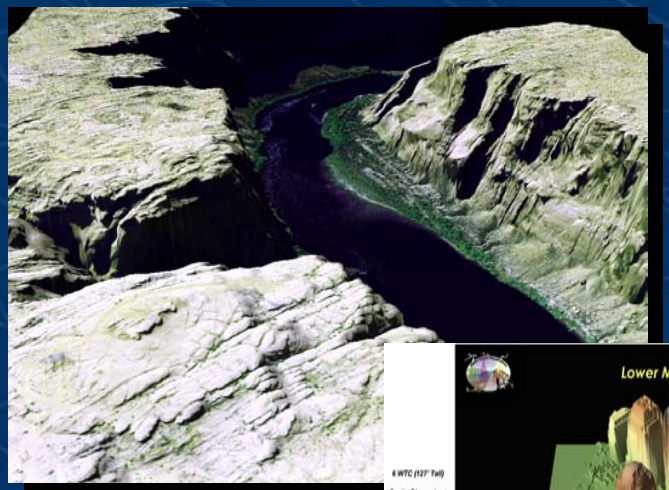
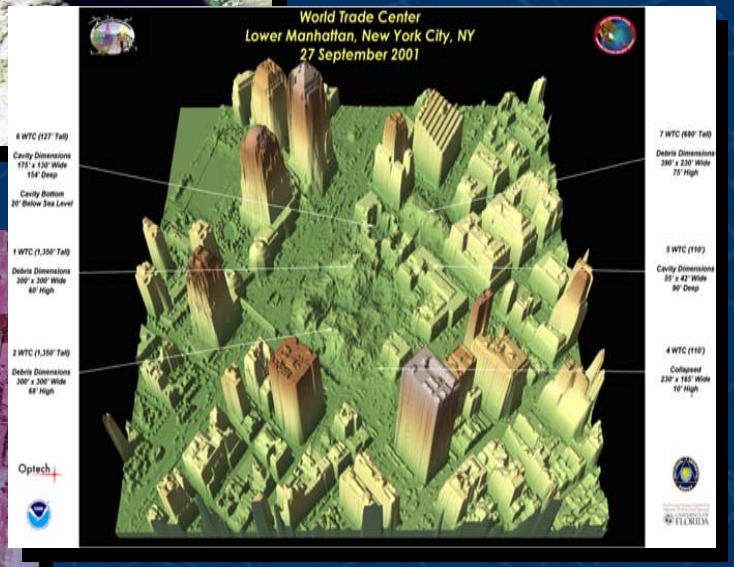
Airborne – POS AV

A revolution in airborne surveying and mapping

Applications:

- Digital mapping
- Corridor surveys
- DTM data capture
- Orthophoto generation
- Coastal surveying
- Block surveys
- Forestry





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Airborne – DSS Digital Sensor System

Digital, medium format, rapid response remote sensing solution

Key Attributes:

- Fully integrated, modular, compact
- All-inclusive system, stores, handles and processes data
- Installed and operational in less than an hour
- Pilot operated
- Ideal for single-engine aircraft and helicopter platforms

- Offers an increase in performance, reduction in operating costs when compared to large format cameras undertaking small, localized projects

Airborne – DSS Digital Sensor System

Designed to generate high-quality, georeferenced, airborne Color and CIR digital imagery

The ideal solution for:

- Corridor/strip survey and irregular collects
- Small block survey
- Disaster response management when time-critical projects are at stake
- GIS analysis and feature identification
- 3D photogrammetric mapping
- Remote sensing applications
- Resource inventory survey

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Land Survey - POS LS

All- terrain land positioning/navigation system designed for pedestrian use…

Key Attributes:

- Maintains positional accuracy for hours in the absence of GPS
- Extremely accurate in areas where optical or GPS survey is impossible
- Simple to operate
- Minimizes environmental impact - no need for vegetation clearing line-of-sight
- Comprises a rugged, impact resistant, hard-shell backpack
- Improves productivity – faster production, less manpower

Land Survey - POS LS

Ruggedized system for accurate inertial positioning under the most demanding survey conditions

Applications:

- Single-pass survey operations
- Seismic surveys in rugged terrain with limited GPS reception
- Cadastral surveys in dense urban environments where high-rise buildings cause GPS dropout
- Continuous positioning in buildings - even underground

Land Vehicles – POS LV

Mobile position and orientation system for vehicle dynamics, road profiling and vehicle navigation

Key Attributes:

- Designed to operate under the most difficult GPS conditions found in urban and suburban environments
- Generates precise, high-rate (200 Hz), low-latency (<3 msec) real-time data
- Combines easy vehicle installation and user-friendly system operation

Land Vehicles – POS LV

The aided inertial advantage in a suburban environment – DGPS maps only 40% of the track area, POS LV maps 100%

Applications:

- Continuous data capture through:
  - Urban canyons
  - Under full tree canopy
  - In tunnels, under bridges
- Precision measurement of vehicle dynamics
- Pavement management data collection
- Vehicle testing
- Corridor surveys (video-logging)

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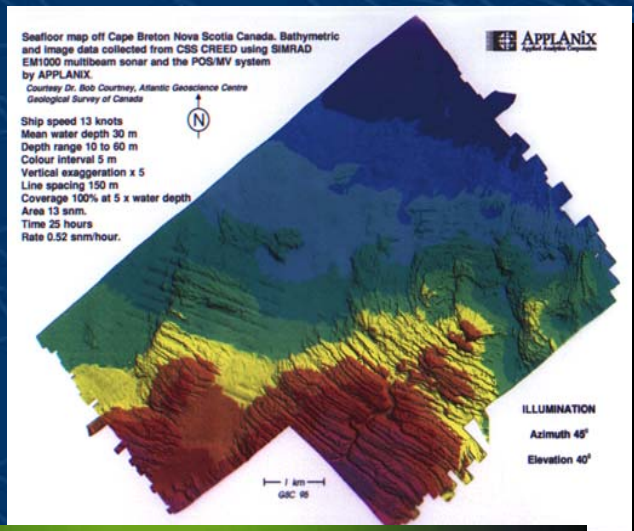
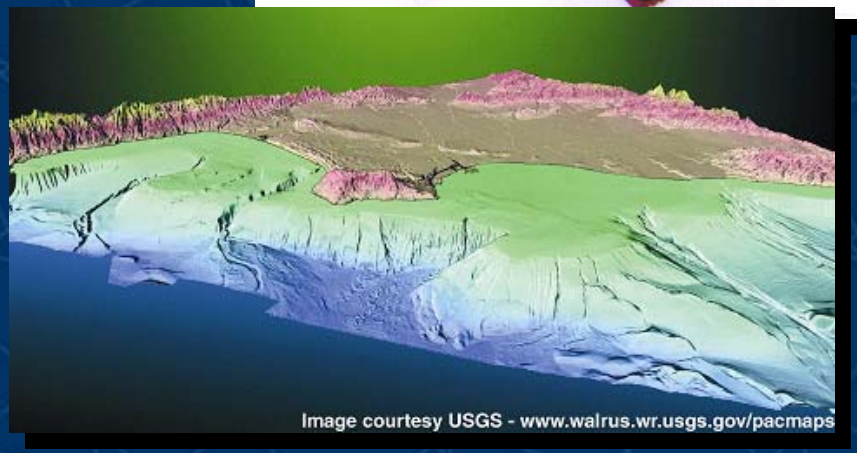
Marine – POS MV featuring TrueHeave

Sets the International Hydrographic Organization industry standard

Key Attributes cont…

- Continuity of all data during drop-outs
- Self-calibrating for rapid deployment
- Extreme roll, pitch and true heading accuracy in all dynamics
- Enhanced heave processing for near real-time QC of heave data





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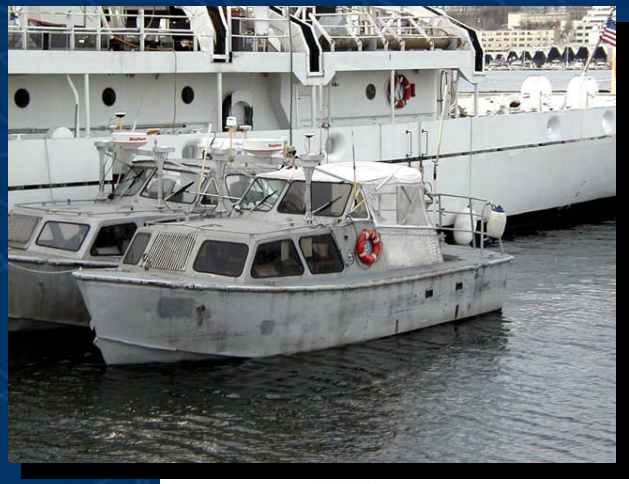
Marine – POS MV featuring TrueHeave

Proven high-accuracy aided inertial navigation system for the marine industry



Key Attributes:

- The most reliable system for multibeam sonar motion compensation
- Virtually eliminates line run-ins
- Enables data collection through turns
- Provides immunity to long period swell heave errors

Applanix Marine Products

POS MV 320

- Roll and pitch accuracy to 0.01° in all dynamics
- True heading accuracy to 0.01° independent of latitude and dynamics

POS MV 220

- Roll and pitch accuracy to 0.05° in all dynamics
- True heading accuracy to 0.05° independent of latitude and dynamics

Marine – GRAM-S GPS Interface

A Precise Positioning GPS interface for military applications

Key Attributes:

- Plug-and-play GRAM-S compliant interface for military applications
- Specifically designed to accommodate Trimble Force 5 receivers
- The Force 5 corrects for Selective Availability

Applications:

- The Force 5 is used under military conditions with single/multibeam sonar systems

Track Geometry – POS TG

A precision measurement system designed to compute railroad track geometry

Key Attributes:

- Provides mm accuracy Track Geometry measurements using non-contact technology at revenue-traffic speeds
- Integrates with onboard display & control systems for a turnkey, track geometry solution of the highest quality and accuracy
- Provides submeter geographic positioning for railroad surveys
- A cost-effective and extremely accurate alternative to traditional measurement methods

Software – POSPac

Modular, precision-enhanced post-processing software

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Key Attributes:

- Integrated suite of software tools
- Maximizes POS system data accuracy using forward and reverse processing techniques
- Multiple GPS base-station processing
- Automatic setup, straightforward operation

Applications:

- Computes boresight directly from POS data and ground control
- New POSEO/POSCal Modules for airborne photogrammetry
- Eliminates the need for third party aerotriangulation
- QA/QC tools allow for complete data analysis
- Computes camera/IMU calibration parameters
- Generates Direct Georeferenced output data

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GAMS

GPS Azimuth Measurement Subsystem

GAMS Function

- GAMS provides heading aiding to POS MV
- Without heading aiding, POS MV has the following performance attributes:
  - Heading accuracy is 0.25° RMS (frequent manoeuvres) to 2.0° RMS (few manoeuvres) once POS MV is aligned fully.
  - To obtain a faster alignment and better accuracy, the survey vessel must turn or perform a calibration manoeuvre once every 10 minutes.
  - Heading accuracy degrades at higher latitudes.

GAMS Function

- With heading aiding, POS MV has the following performance attributes:
  - Heading accuracy is 0.02° RMS independent of manoeuvres and latitude
  - Alignment occurs within two minutes
  - Tolerance of GAMS outages lasting several tens of minutes with no significant heading accuracy degradation
  - Re-resolution of ambiguities is 1 second