

New Developments of Inertial Navigation Systems at Applanix

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Acknowledgements

Development

Applanix: Ray, Ian, Edith, Xue-Fen, Nilesh, Ruifeng, Alan, Steffen, Hani, Peter, Bob, Tatyana, Bruno, Mohamed

Trimble Terrasat: Ulrich, Adrian, Xiaobing, Ken, Xiaoming

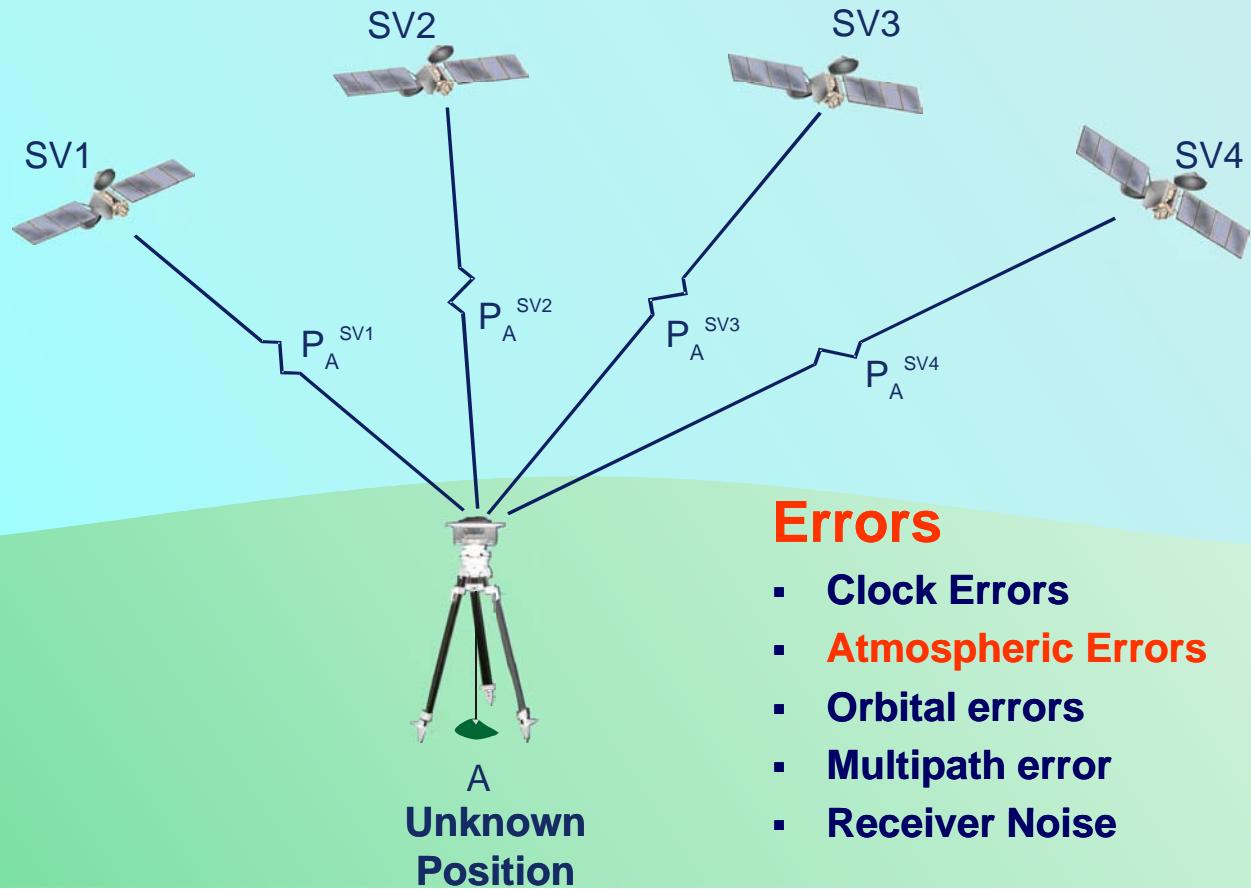
Beta Testers

BLOM, NOAA, NRL, PASCO, DND, Pictometry, John Chance

Flight data

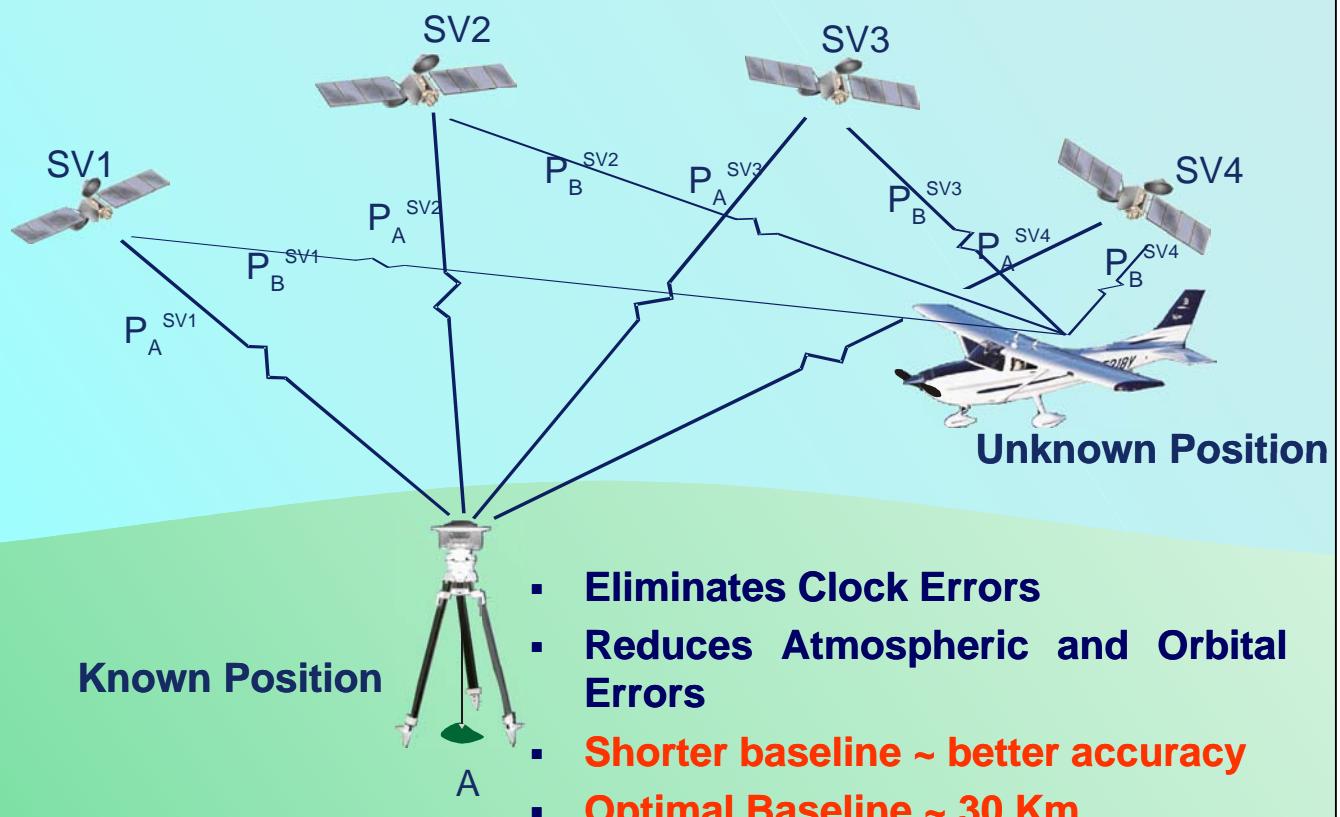
Airborne Sensing, Tuck Mapping, Pictometry, Blom, ESRI, Terra RS, Track'Air, PASCO, NOAA, NRL, DND

Point Positioning

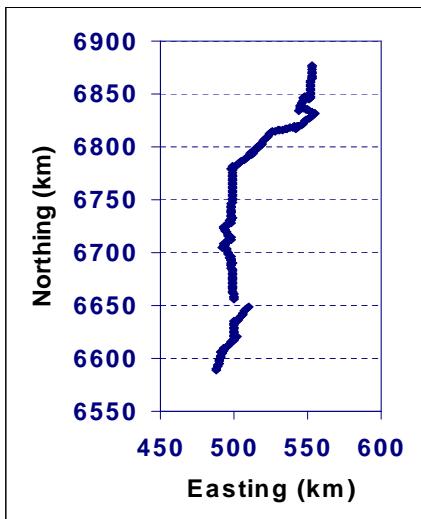


GNSS Augmentation Revisited

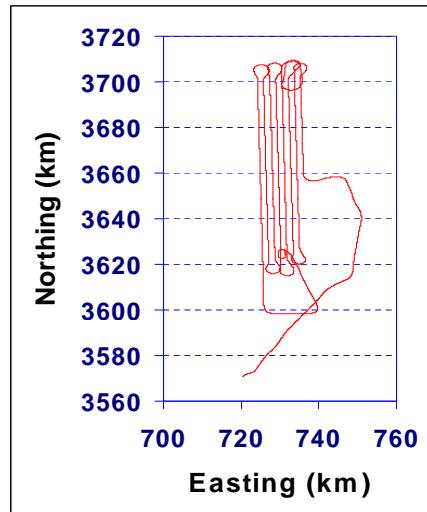
Relative Positioning - Airborne



- Typical airborne missions extend to more than the optimal base-to-rover separation for highest accuracy
 - Necessary for efficiency of collection
- Examples are Corridor Surveys and small-mid scale topographic mapping projects



Corridor Mapping



Topo Mapping

GNSS Augmentation Alternatives

GNSS Augmentation Technologies currently available in POSPac

- PPP: Precise Point Positioning - implemented in 2006
- SBAS: NavCom and OmniStar - implemented in 2004
- MBP: Multiple Basestation Processing – 2001 & 2006

Introducing

Applanix SmartBase™ Software

and Applanix IN-Fusion™ Technology

A novel GNSS augmentation method for high-accuracy airborne mapping

Implemented in POSPac Air 5 (patent pending)

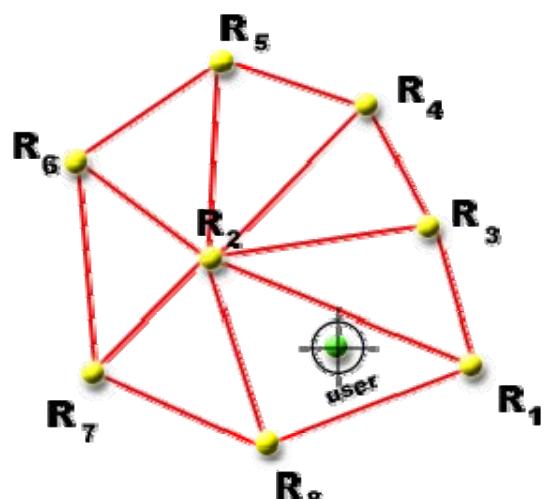
Applanix SmartBase™ The Concept

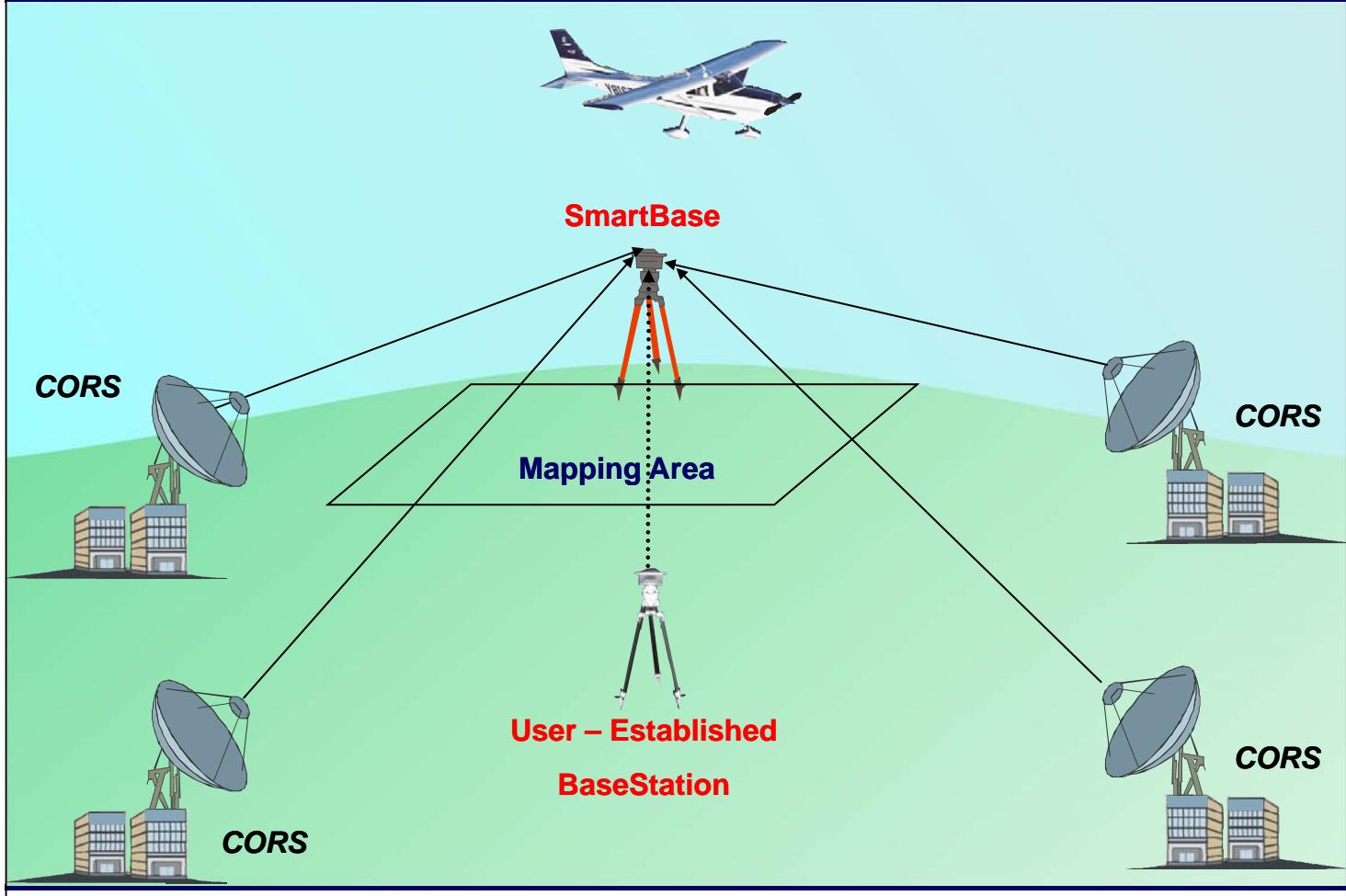
What is Applanix SmartBase™

- Post-processed Virtual Reference Station (PPVRS) software
- Joint development by Trimble GNSS Center of Excellence and Applanix based on **Trimble[®] VRS™ technology**

How Does it Work

- Uses a Network of Reference Stations (Quality Checked)
- Performs Ambiguity Fix Solution
- Spatially Models Ionospheric & Geometric Errors
 - At Base and Rover locations
- Generates new observation files



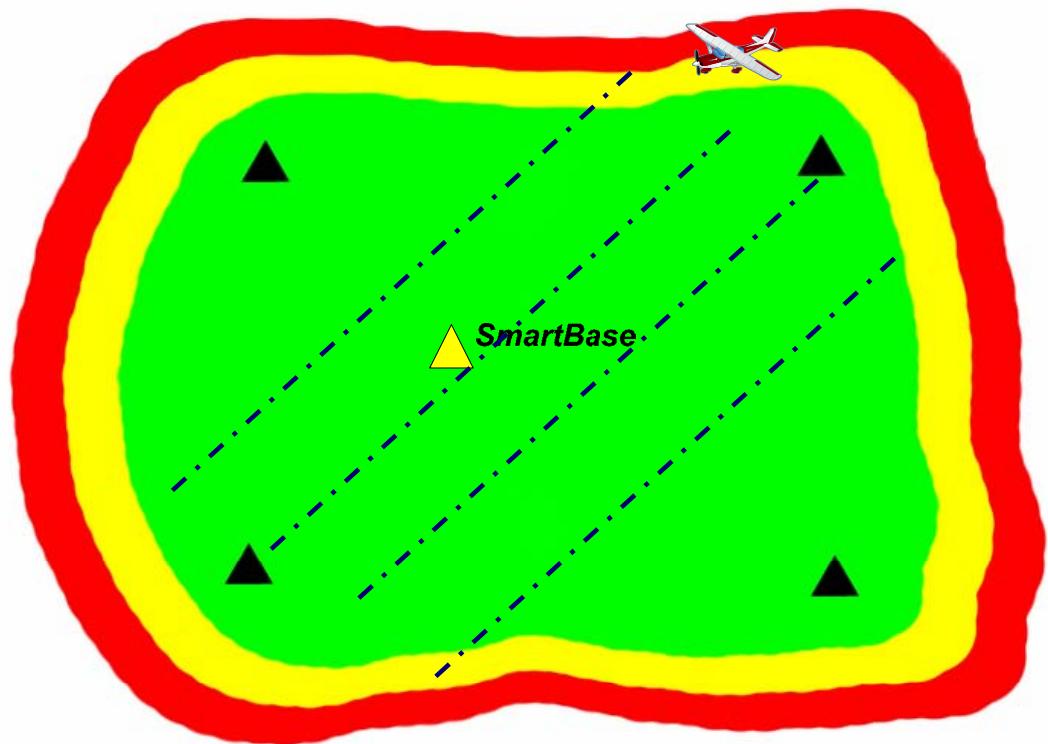


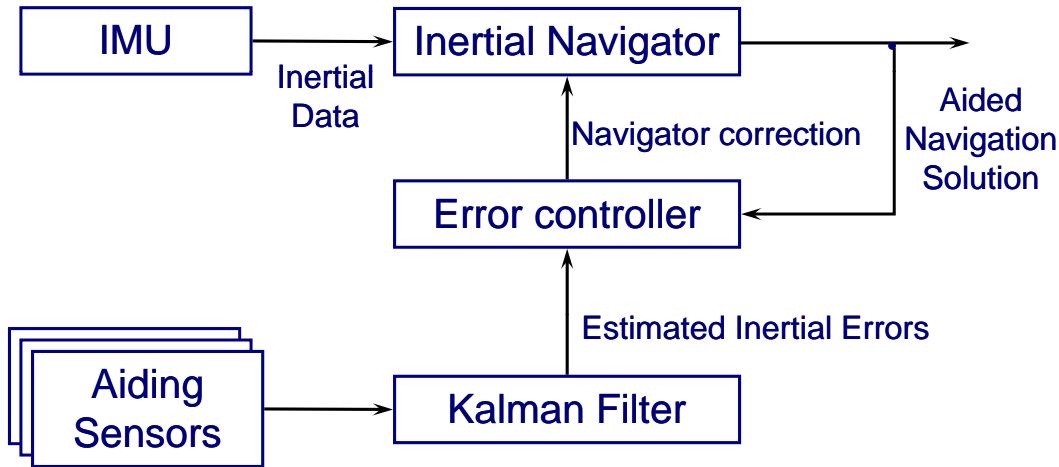
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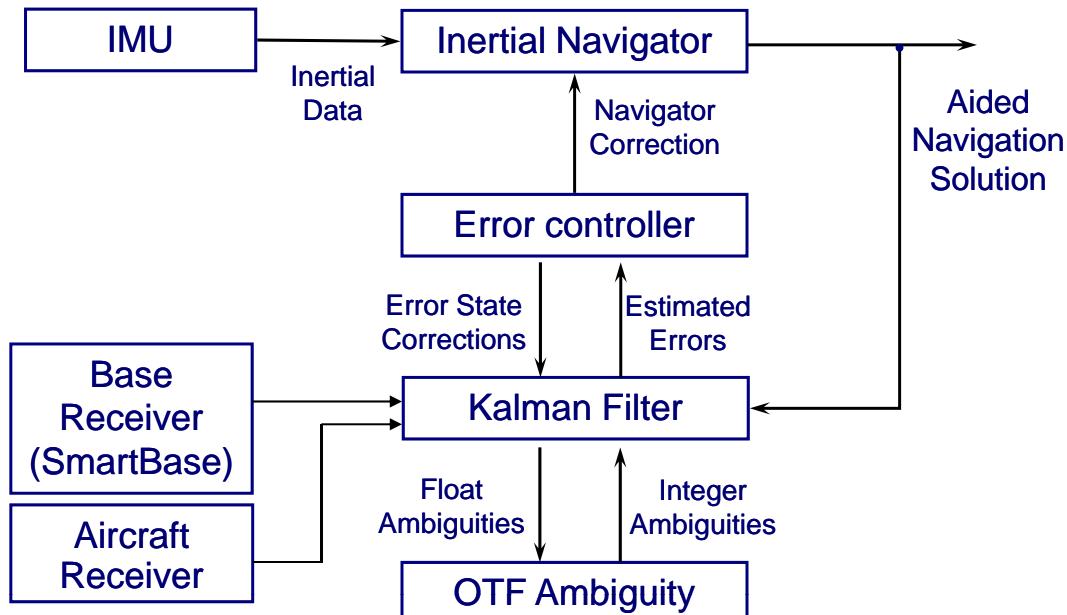
Applanix SmartBase™ - Concept





- GNSS data on its own:
 - Data Gaps
 - Partial Loss of Lock due to banking
 - Signal quality
- Will affect the navigation solution**

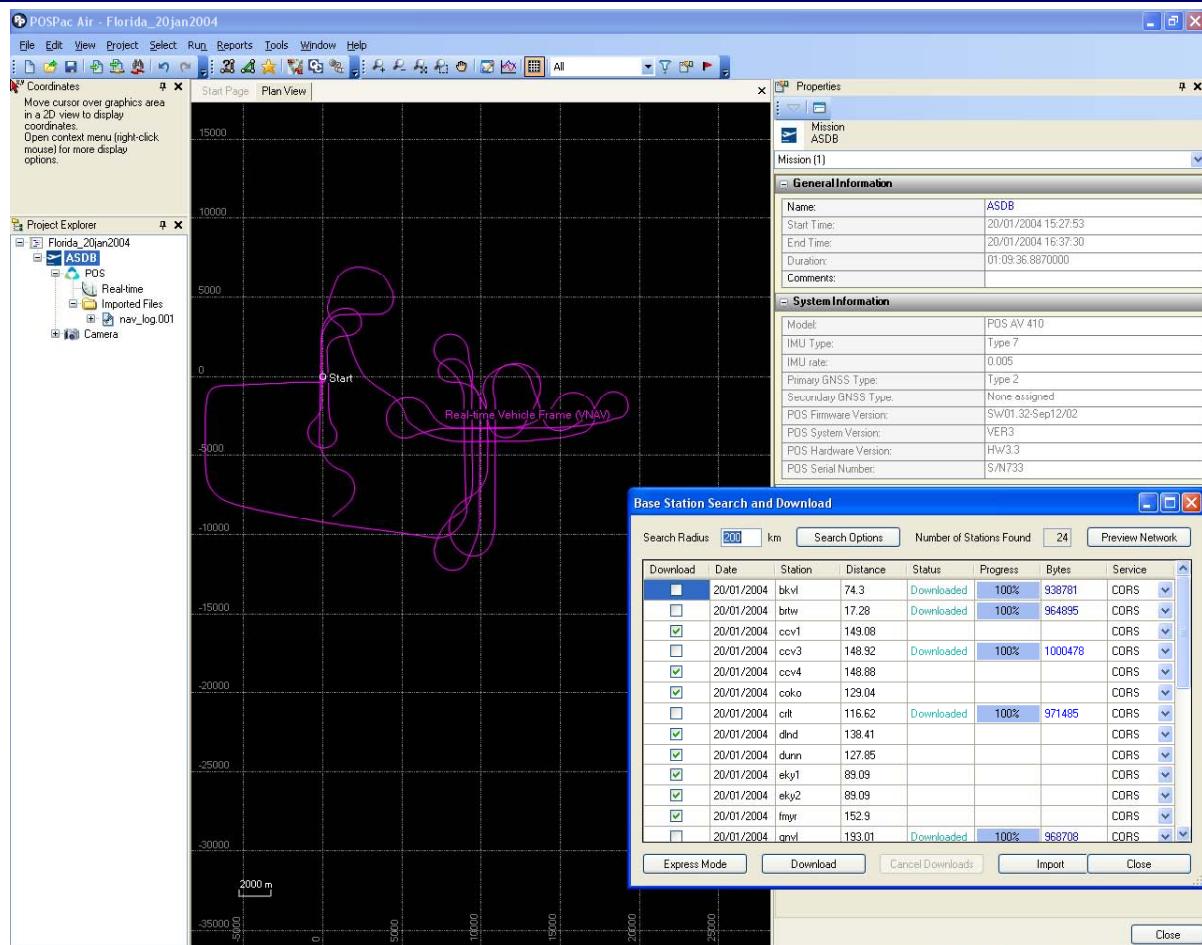
Applanix IN-Fusion™ Technology



- **GNSS and Inertial Observables are simultaneously manipulated in a “tightly coupled” fashion:**
 - **Inertially-Aided Kinematic Ambiguity Resolution (IAKAR)**
 - Seconds to recover correct ambiguities after loss of lock
 - Enables ability to fly sharp turns without concern for cycle slips or signal blockage

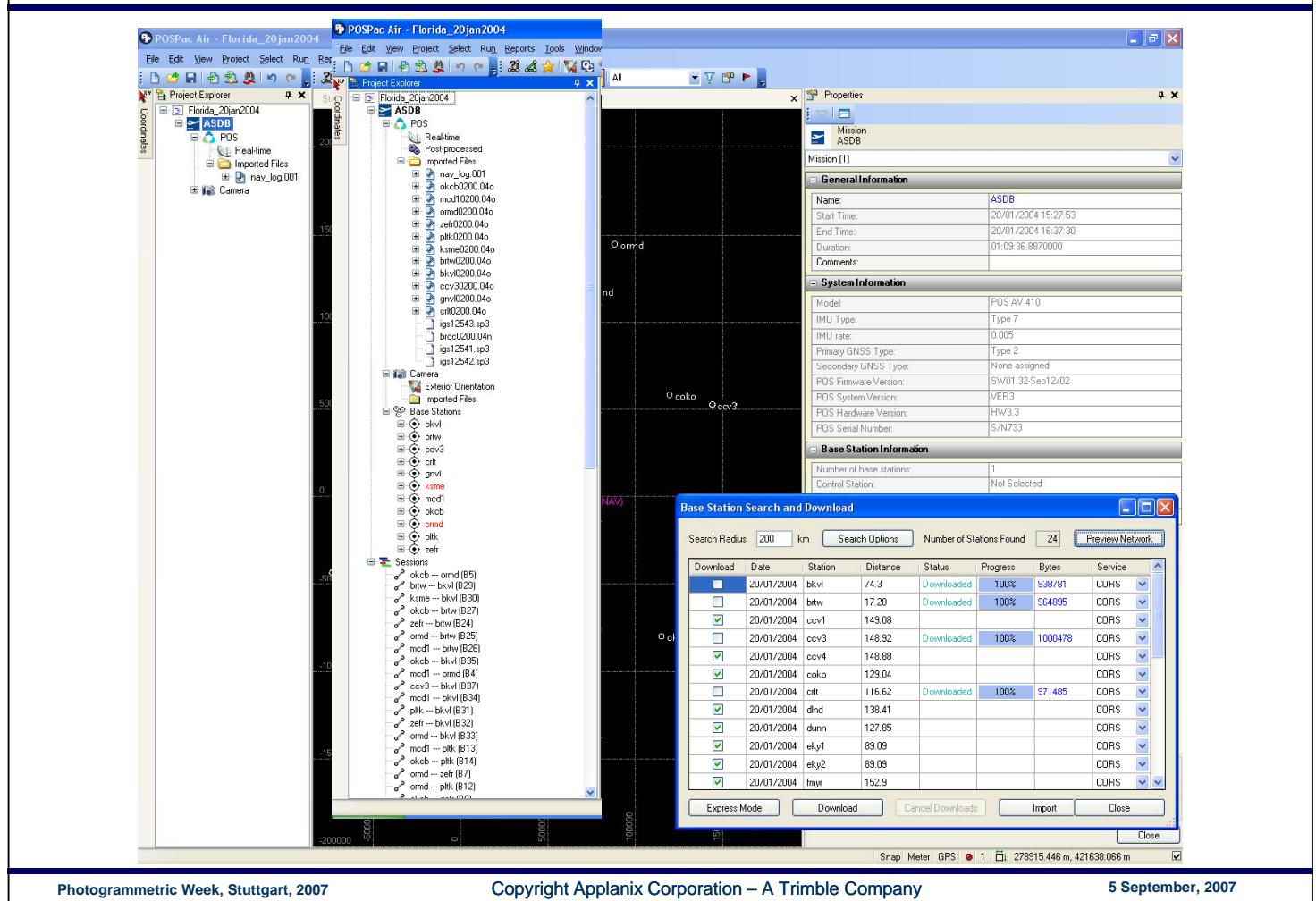
- Together allow high-accuracy airborne positioning **without** the need of
 - Starting close to a reference station to initialize (ie < 30 km)
 - Flying close to a reference station to meet required accuracy
 - Flying flat turns
 - Setting up a dedicated reference station or network
- Improves accuracy, robustness and reliability of the trajectory
- Improves productivity

POSPac Air 5 in Practice



POSPac Air 5 in Practice

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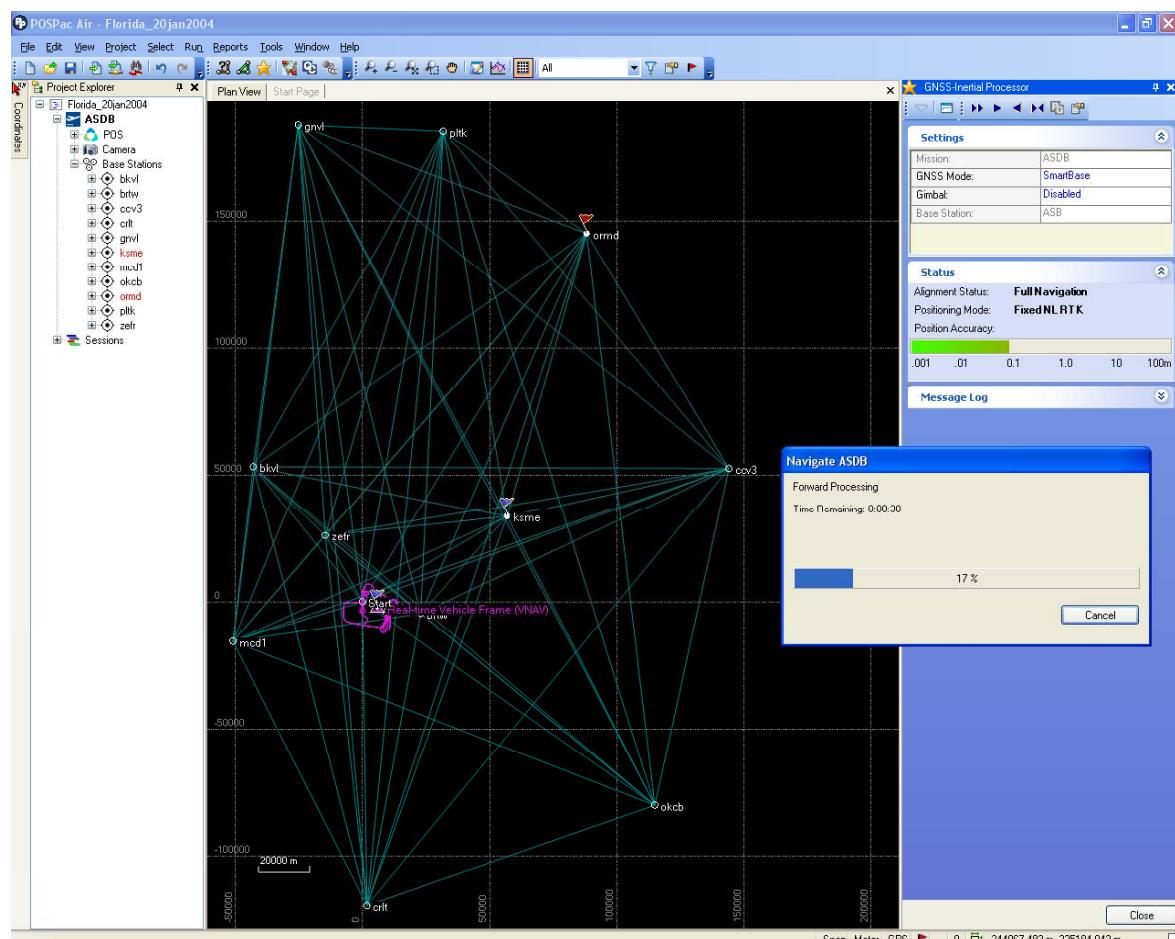
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POSPac Air 5 in Practice

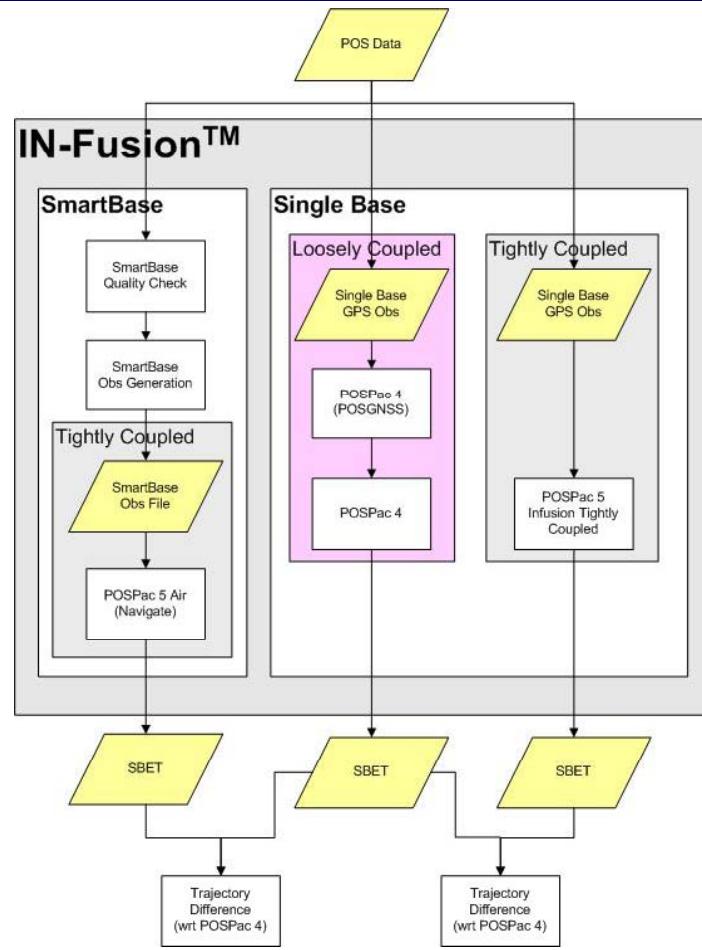
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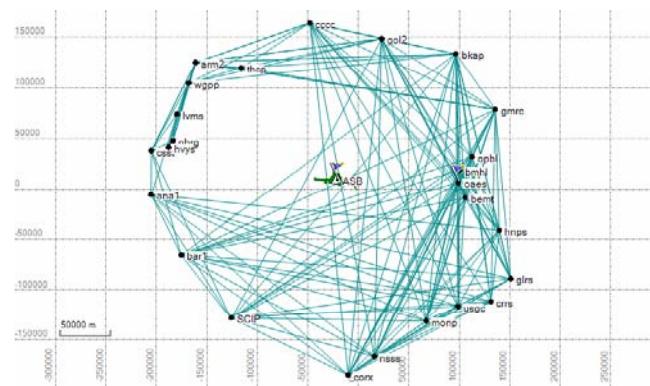
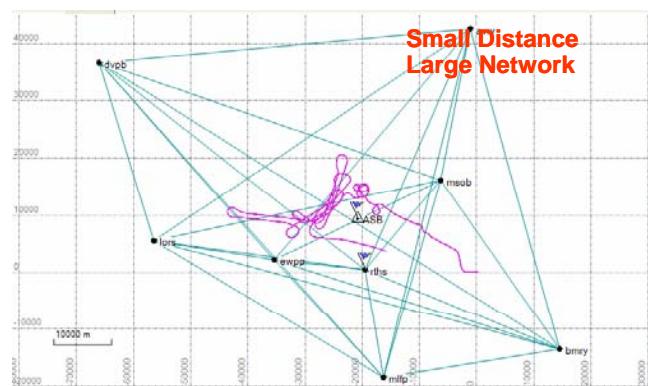
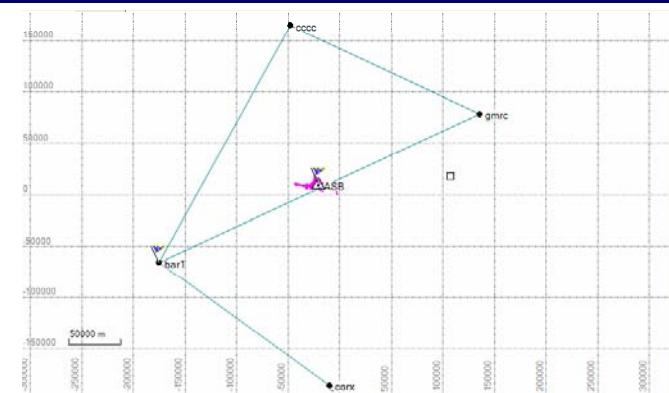
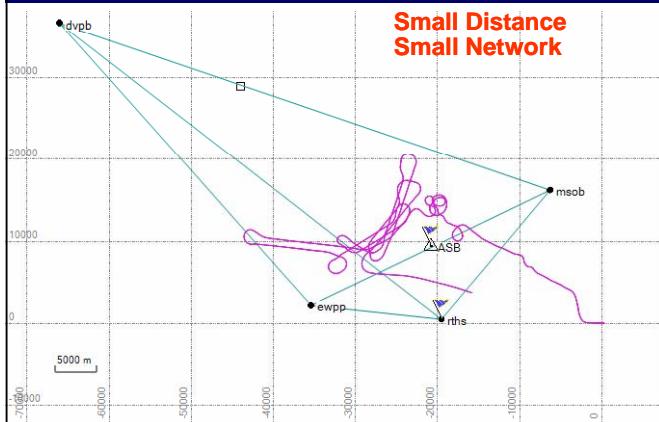
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Results

Performance Testing - Network Configuration

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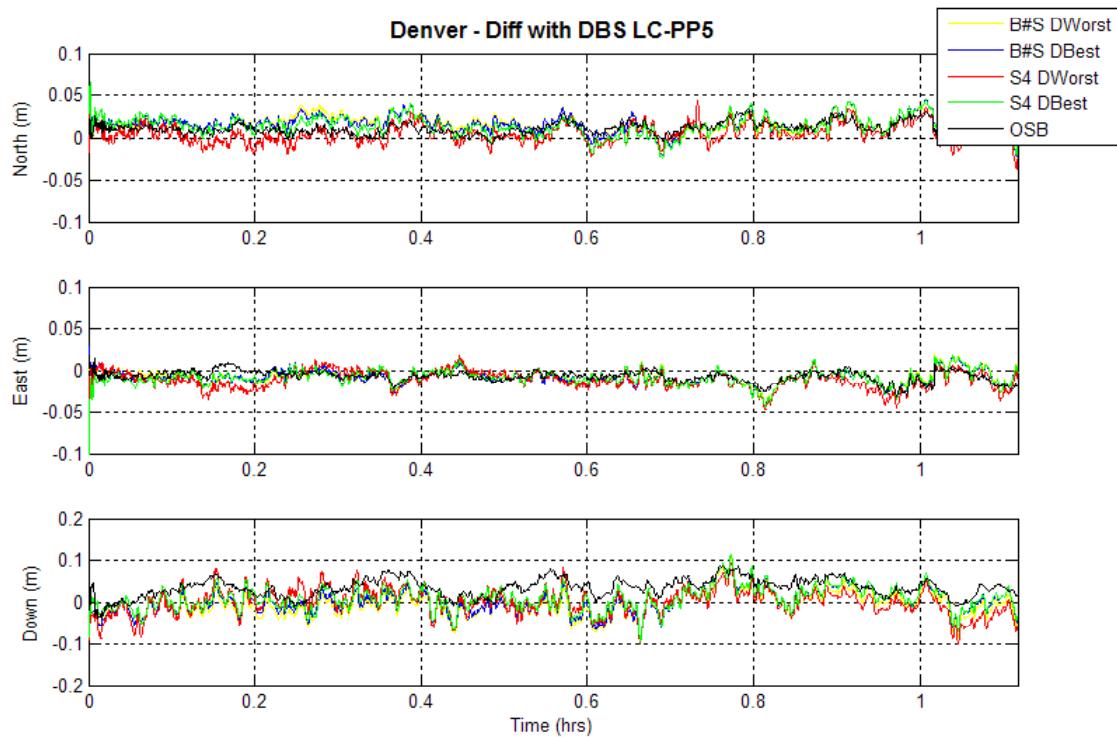
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Performance Testing – An Example

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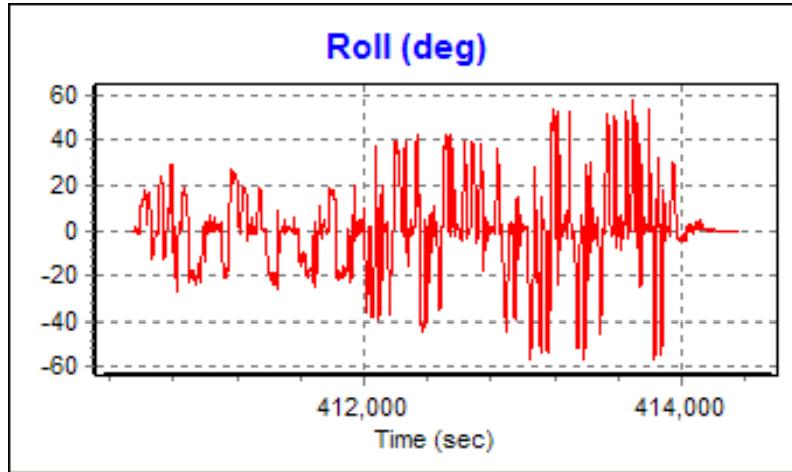


	MEAN	SIGMA	RMS	Min	Max
NPOS (cm)	1.2	0.7	1.4	-3.4	0.7
EPOS (cm)	-0.7	0.7	0.9	-1.9	3.2
DPOS (cm)	3.5	2.2	4.2	-8.7	3.8

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- Sharp Turn Flights of up to 60 deg roll have been tested and evaluated
- Resulting accuracy is consistent with flat turn flights

Interface with Existing Systems

Systems

- UltraCamD, X
- DMC
- ADS40, ALS50
- DSS
- RC
- LMK, RMK
- Optech
- Riegl
- TopoSys

POSPac Air 5

SoftCopy

- InPHO
- ISAT
- LPS
- Socet Set
- ORIMA
- BLUH
- BINGO
- ESRI
- CAD

- POSPac Air 5 with Applanix SmartBase and Applanix IN-Fusion technology represents a leap forward in accuracy, robustness, and productivity for high-accuracy airborne mapping
- Ideally suited for exploiting the increase in dedicated VRS networks being installed around world such as in Germany, Japan, and USA

Thank you for your Attention...

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