Stanford

Todd Walter

Professor (Research) of Aeronautics and Astronautics

Curriculum Vitae available Online

Bio

BIO

I am the director of the Global Positioning System (GPS) laboratory at Stanford University. My work focuses on implementing high-integrity satellite navigation systems. I am also active in the international standards bodies coordinating the implementation of these systems.

ACADEMIC APPOINTMENTS

- Professor (Research), Aeronautics and Astronautics

HONORS AND AWARDS

- Exceptional Service Award, The Soaring Society of America (October 2017)
- Leadership Award in Signal Design, GPS World Magazine (September, 2015)
- Distinguished Service Award, Institute of Navigation (January, 2012)
- Kepler Award, Institute of Navigation (September, 2010)
- Thurlow Award, Institute of Navigation (January, 2008)
- Fellow of the ION, Institute of Navigation (June, 2006)
- Early Achievement Award, Institute of Navigation (June, 2000)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, National Space-Based Positioning, Navigation, and Timing Advisory Board (2019 - present)
- Member, IEEE (2014 - present)
- President, Institute of Navigation (2010 - 2012)
- Member, Institute of Navigation (1994 - present)

PROFESSIONAL EDUCATION

- Ph.D., Stanford University , Applied Physics (1994)
- M.S., Stanford University , Applied Physics (1990)
- B.S., Rensselaer Polytechnic Institute , Physics (1987)

LINKS

- GPS Lab: https://gps.stanford.edu

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

High integrity satellite navigation for guiding aircraft, including satellite based augmentation systems (SBAS) and advanced receiver autonomous integrity monitoring (ARAIM).

Teaching

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Keidai Iiyama, Samuel Low, Daniel Neamati, Asta Wu

Orals Chair

Tom Liu

Postdoctoral Faculty Sponsor

Halim Lee, Dongchan Min

Doctoral Dissertation Advisor (AC)

Jade Babcock-Chi, Anargyros Kriezis, Yu-Fang Lai, Rebecca Wang

Orals Evaluator

Keidai Iiyama, Romeo Valentin

Publications

PUBLICATIONS

- **Combinatorial Watermarking Under Limited SCER Adversarial Models** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Anderson, J., Lo, S., Walter, T.
  2025; 72 (2)
- **Determination of Fault Probabilities for ARAIM** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Walter, T., Blanch, J., Gunning, K., Joerger, M., Pervan, B.
  2019; 55 (6): 3505–16
- **An Overview of Advanced Receiver Autonomous Integrity Monitoring (ARAIM)**
  Walter, T., Inst Navigat
  INST NAVIGATION.2019: 896–914
- **Quantum-resistant authentication algorithms for satellite-based augmentation systems** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Neish, A., Walter, T., Enge, P.
  2019; 66 (1): 199–209
- **Broadband LEO Constellations for Navigation** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Reid, T. G. R., Neish, A. M., Walter, T., Enge, P. K.
  2018; 65 (2): 205–20
- **Worldwide Vertical Guidance of Aircraft Based on Modernized GPS and New Integrity Augmentations** *PROCEEDINGS OF THE IEEE*
  Walter, T., Enge, P., Blanch, J., Pervan, B.
  2008; 96 (12): 1918-1935
- **Robust Detection of Ionospheric Irregularities** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Walter, T., et al

2001; 48 (2): 89–100

- **Wide area augmentation of the global positioning system** *PROCEEDINGS OF THE IEEE*
  Enge, P., Walter, T., Pullen, S., Kee, C., Chao, Y. C., Tsai, Y. J.
  1996; 84 (8): 1063-1088
- **Weighted RAIM for precision approach** *8th International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GPS-95)*
  Walter, T., Enge, P.
  INST NAVIGATION.1995: 1995–2004
- **WAAS and the Ionosphere - A Historical Perspective: Mitigating Mesoscale Irregularities** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Sparks, L., Altshuler, E., Blanch, J., Walter, T., McCord, E., Sanchez, R.
  2026; 73
- **WAAS and the Ionosphere - A Historical Perspective: Threat Model Evolution** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Sparks, L., Altshuler, E., Blanch, J., Walter, T., McCord, E., Sanchez, R.
  2026; 73
- **Locating GNSS Interference Sources using ADS-B with Non-linear Least Squares** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Liu, Z., Lo, S., Blanch, J., Chen, Y., Walter, T.
  2025; 72 (3)
- **Time Synchronization of TESLA-Enabled GNSS Receivers** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Anderson, J., Lo, S., Walter, T.
  2025; 61 (4): 9550-9566
- **Exploitation of Modernized GPS Crosslinks to Improve User Integrity and Availability with ARAIM**
  Oak, S., Pullen, S., Lo, S., Blanch, J., Walter, T., Crews, M., Jackson, R., Frey, C., IEEE
  IEEE.2025: 226-234
- **Determining Protection Levels Using Multiple Antennas under Spoofing Conditions**
  Blanch, J., Lo, S., Chen, Y., Kriezis, A., Walter, T., IEEE
  IEEE.2025: 345-352
- **Overbounding Time-correlated Errors for a Multi-constellation Precise Point Positioning Integrity Service**
  Wang, R., Blanch, J., Walter, T., IEEE
  IEEE.2025: 235-243
- **Authentication Security of Combinatorial Watermarking for GNSS Signal Authentication** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Anderson, J., Lo, S., Walter, T.
  2024; 71 (3)
- **Software Defined Radio for GNSS Radio Frequency Interference Localization.** *Sensors (Basel, Switzerland)*
  Taylor, F., Gattis, E., Trapani, L., Akos, D., Lo, S., Walter, T., Chen, Y.
  2023; 24 (1)
- **Calibration of RFI Detection Levels in a Low-Cost GNSS Monitor**
  Miguel, N., Chen, Y., Lo, S., Walter, T., Akos, D., IEEE
  IEEE.2023: 520-535
- **An Evaluation of the Advanced RAIM Threat Model**
  Blanch, J., Walter, T., IEEE
  IEEE.2023: 408-413
- **WAAS and the Ionosphere - A Historical Perspective: Monitoring Storms** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Sparks, L., Altshuler, E., Pandya, N., Blanch, J., Walter, T.
  2022; 69 (1)

- **Authentication of Satellite-Based Augmentation Systems with Over-the-Air Rekeying Schemes** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Anderson, J., Lo, S., Neish, A., Walter, T.
  2022; 70 (3)
- **A Framework for GNSS Spoofing Detection Through Combinations of Metrics** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Rothmaier, F., Chen, Y., Lo, S., Walter, T.
  2021; 57 (6): 3633-3647
- **GNSS spoofing detection through spatial processing** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Rothmaier, F., Chen, Y., Lo, S., Walter, T.
  2021
- **Performance of 6 Different Global Navigation Satellite System Receivers at Low Latitude Under Moderate and Strong Scintillation** *EARTH AND SPACE SCIENCE*
  de Paula, E. R., Martinon, A. F., Moraes, A. O., Carrano, C., Neto, A. C., Doherty, P., Groves, K., Valladares, C. E., Crowley, G., Azeem, Reynolds, A., Akos, D. M., Walter, T., et al
  2021; 8 (2)
- **Fast Protection Levels for Fault Detection With an Application to Advanced RAIM** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Blanch, J., Walter, T.
  2021; 57 (1): 55–65
- **GNSS Spoofing Mitigation in the Position Domain**
  Rothmaier, F., Chen, Y., Lo, S., Walter, T., Inst Navigat
  INST NAVIGATION.2021: 42-55
- **Ionospheric Scintillation Effects on Satellite Navigation** *IONOSPHERE DYNAMICS AND APPLICATIONS*
  Datta-Barua, S., Altshuler, E., Walter, T., Pullen, S.
  edited by Huang, C., Lu, G., Zhang, Y., Paxton, L. J.
  2021; 260: 493-510
- **Message Authentication Candidates for the SBAS Dual Frequency Multi-Constellation Standard**
  Fernandez-Hernandez, I., Walter, T., Mabilleau, M., Tosato, L., Chiara, A., Pozza, D., Pozzobon, O., Calabrese, A., Anderson, J., Chatre, E., INST NAVIGAT
  INST NAVIGATION.2021: 443-452
- **Developing a Practical GNSS Spoofing Detection Thresholds for Receiver Power Monitoring**
  Lo, S., Rothmaier, F., Miralles, D., Akos, D., Walter, T., INST NAVIGAT
  INST NAVIGATION.2021: 803-815
- **A FAULT DETECTION AND EXCLUSION ESTIMATOR DESIGNED FOR INTEGRITY**
  Blanch, J., Walter, T., INST NAVIGAT
  INST NAVIGATION.2021: 1672-1686
- **GNSS Interference Detection Using Machine Learning Algorithms on ADS-B Data**
  Liu, Z., Lo, S., Walter, T., INST NAVIGAT
  INST NAVIGATION.2021: 4305-4315
- **Analysis of GNSS Constellation Performance for Advanced RAIM**
  Blanch, J., Liu, X., Gunning, K., Walter, T., INST NAVIGAT
  INST NAVIGATION.2021: 1410-1434
- **SBAS Message Schemes to Support Inline Message Authentication**
  Walter, T., Anderson, J., Lo, S., INST NAVIGAT
  INST NAVIGATION.2021: 474-484
- **Ground Monitoring to Support ARAIM for Military Users: Alternatives for Rapid and Rare Update Rates**
  Pullen, S., Lo, S., Katz, A., Blanch, J., Walter, T., Katronick, A., Crews, M., Johnson, R., INST NAVIGAT

INST NAVIGATION.2021: 1481-1507

- **GNSS Spoofing Detection through Metric Combinations: Calibration and Application of a general Framework**
  Rothmaier, F., Taleghani, L., Chen, Y., Lo, S., Phelts, E., Walter, T., INST NAVIGAT
  INST NAVIGATION.2021: 4249-4263
- **Providing Continuity and Integrity in the Presence of GNSS Spoofing**
  Rothmaier, F., Chen, Y., Lo, S., Blanch, J., Walter, T., INST NAVIGAT
  INST NAVIGATION.2021: 1828-1842
- **Adopting Neural Networks in GNSS-IMU integration: A Preliminary study**
  Shin, Y., Lee, C., Kim, E., Walter, T., IEEE
  IEEE.2021
- **Reevaluating the Message Loss Rate of the Wide Area Augmentation System (WAAS) in Flight**
  Hirschberger, M. J., Lo, S., Walter, T., Inst Navigat
  INST NAVIGATION.2021: 218-228
- **SBAS message authentication: a review of protocols, figures of merit and standardization plans**
  Fernandez-Hernandez, I., Walter, T., Neish, A. M., Anderson, J., Mabilleau, M., Vecchione, G., Chatre, E., Inst Navigat
  INST NAVIGATION.2021: 111-124
- **Investigation into September 2020 GPS SVN 74 Performance Anomaly**
  Walter, T., Liu, Z., Blanch, J., Pham, K., Mick, J., Wanner, W., Inst Navigat
  INST NAVIGATION.2021: 189-200
- **Assessment of Ionospheric Correction Behavior for Use with Precise Point Positioning (PPP)**
  Walter, T., Blanch, J., de Groot, L., Norman, L., Inst Navigat
  INST NAVIGATION.2021: 616-624
- **ARAIM for Military Users: ISM Parameters, Constellation-Check Procedure and Performance Estimates**
  Katz, A., Pullen, S., Lo, S., Blanch, J., Walter, T., Katronick, A., Crews, M., Jackson, R., Inst Navigat
  INST NAVIGATION.2021: 173-188
- **GAUSSIAN BOUNDING IMPROVEMENTS AND AN ANALYSIS OF THE BIAS-SIGMA TRADEOFF FOR GNSS INTEGRITY**
  Blanch, J., Liu, X., Walter, T., Inst Navigat
  INST NAVIGATION.2021: 703-713
- **An Assessment of GPS Spoofing Detection Via Radio Power and Signal Quality Monitoring for Aviation Safety Operations** */EEE INTELLIGENT TRANSPORTATION SYSTEMS MAGAZINE*
  Miralles, D., Levigne, N., Bornot, A., Rouquette, P., Akos, D. M., Chen, Y., La, S., Walter, T.
  2020; 12 (3): 136–46
- **Receiver States for SBAS Data Authentication**
  Neish, A., Walter, T., Fernandez-Hernandez, I., Inst Navigat
  INST NAVIGATION.2020: 1059–69
- **Characterization of ADS-B Performance under GNSS Interference**
  Liu, Z., Lo, S., Walter, T., Inst Navigat
  INST NAVIGATION.2020: 3581-3591
- **Independent Time Synchronization for Resilient GNSS Receivers**
  Fernandez-Hernandez, I., Walter, T., Neish, A., O'Driscoll, C., Inst Navigat
  INST NAVIGATION.2020: 964–78
- **Stress Testing Advanced RAIM Airborne Algorithms**
  Blanch, J., Walter, T., Inst Navigat
  INST NAVIGATION.2020: 421–39
- **Evaluating the Application of PPP Techniques to ARAIM Using Flight Data**
  Phelts, R., Gunning, K., Blanch, J., Walter, T., Inst Navigat

INST NAVIGATION.2020: 379–85

- **Evaluating the Application of PPP Techniques to ARAIM Using Flight Data**
  Phelts, R., Gunning, K., Blanch, J., Walter, T., Inst Navigat
  INST NAVIGATION.2020: 379–85
- **Design and analysis of a public key infrastructure for SBAS data authentication** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Neish, A., Walter, T., Powell, J. D.
  2019; 66 (4): 831–44
- **Gaussian Bounds of Sample Distributions for Integrity Analysis** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Blanch, J., Walter, T., Enge, P.
  2019; 55 (4): 1806–15
- **Signal Deformation Monitoring for Anomalous Multipath Threats**
  Phelts, R., Walter, T., Inst Navigat
  INST NAVIGATION.2019: 1023–30
- **Development of Advanced RAIM Minimum Operational Performance Standards**
  Blanch, J., Walter, T., Berz, G., Burns, J., Clark, B., Joerger, M., Mabilleau, M., Martini, I., Milner, C., Pervan, B., Lee, Y., Inst Navigat
  INST NAVIGATION.2019: 1381–91
- **SBAS Data Authentication: A Concept of Operations**
  Neish, A., Walter, T., Powell, J., Inst Navigat
  INST NAVIGATION.2019: 1812–23
- **Integrity for Tightly Coupled PPP and IMU**
  Gunning, K., Blanch, J., Walter, T., de Groot, L., Norman, L., Inst Navigat
  INST NAVIGATION.2019: 3066–78
- **Going Back for the Future: Large/Mega LEO Constellations for Navigation**
  Reid, T., Gunning, K., Perkins, A., Lo, S., Walter, T., Inst Navigat
  INST NAVIGATION.2019: 2452–68
- **Increasing International Civil Aviation Resilience: A Proposal for Nomenclature, Categorization and Treatment of New Interference Threats**
  Fernandez-Hernandez, I., Walter, T., Alexander, K., Clark, B., Chatre, E., Hegarty, C., Appel, M., Meurer, M., Inst Navigat
  INST NAVIGATION.2019: 389–407
- **SBAS Corrections for PPP Integrity with Solution Separation**
  Gunning, K., Blanch, J., Walter, T., Inst Navigat
  INST NAVIGATION.2019: 707–19
- **Development and Evaluation of Airborne Multipath Error Bounds for L1-L5**
  Blanch, J., Walter, T., Phelts, R., Inst Navigat
  INST NAVIGATION.2019: 53–61
- **Reducing Computational Load in Solution Separation for Kalman Filters and an Application to PPP Integrity**
  Blanch, J., Gunning, K., Walter, T., De Groot, L., Norman, L., Inst Navigat
  INST NAVIGATION.2019: 720–29
- **Safety Analysis of Ranging Biases on the WAAS GEOs**
  Walter, T., Blanch, J., Altshuler, E., Inst Navigat
  INST NAVIGATION.2019: 113–30
- **Paper Trends in ION Conferences from 2007-2018**
  Perkins, A., Walter, T., Inst Navigat
  INST NAVIGATION.2019: 340–48
- **Design and Analysis of a Public Key Infrastructure for SBAS Data Authentication**
  Neish, A., Walter, T., Powell, J., Inst Navigat

INST NAVIGATION.2019: 964–88

- **Lower Bounds in Optimal Integrity Monitoring**
  Blanch, J., Walter, T., Inst Navigat
  INST NAVIGATION.2019: 915–24
- **SIS Monitoring for ARAIM in the Absence of Precise Clock Estimates**
  Gunning, K., Walter, T., Powell, D., Inst Navigat
  INST NAVIGATION.2019: 785–801
- **Standards for ARAIM ISM Data Analysis**
  Walter, T., Blanch, J., Gunning, K., Inst Navigat
  INST NAVIGATION.2019: 777–84
- **WAAS at 15** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Walter, T., Shallberg, K., Altshuler, E., Wanner, W., Harris, C., Stimmler, R.
  2018; 65 (4): 581–600
- **Validation of the Unfaulted Error Bounds for ARAIM** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Walter, T., Gunning, K., Phelts, R., Blanch, J.
  2018; 65 (1): 117–33
- **Effective GPS Spoofing Detection Utilizing Metrics from Commercial Receivers**
  Manfredini, E., Akos, D. M., Chen, Y., Lo, S., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2018: 672–89
- **Spoofing Detection for Airborne GNSS Equipment**
  Hegarty, C., Odeh, A., Shallberg, K., Wesson, K., Walter, T., Alexander, K., Inst Navigat
  INST NAVIGATION.2018: 1350–68
- **Design and evaluation of integrity algorithms for PPP in kinematic applications**
  Gunning, K., Blanch, J., Walter, T., de Groot, L., Norman, L., Inst Navigat
  INST NAVIGATION.2018: 1910–39
- **A Proposed Concept of Operations for Advanced Receiver Autonomous Integrity Monitoring**
  Blanch, J., Walter, T., Enge, P., Burns, J., Mabilleau, M., Martini, I., Boyero, J., Berz, G., Inst Navigat
  INST NAVIGATION.2018: 1084–90
- **Parameter Selection for the TESLA Keychain**
  Neish, A., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2018: 2155–71
- **Effect of Aircraft Banking on ARAIM Performance**
  Phelts, R., Blanch, J., Gunning, K., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2018: 2632–41
- **GNSS Multipath Error Modeling for Automotive Applications**
  Khanafseh, S., Kujur, B., Joerger, M., Walter, T., Pullen, S., Blanch, J., Doherty, K., Norman, L., de Groot, L., Pervan, B., Inst Navigat
  INST NAVIGATION.2018: 1573–89
- **Ionospheric Rates of Change**
  Walter, T., Blanch, J., de Groot, L., Norman, L., Joerger, M., Inst Navigat
  INST NAVIGATION.2018: 4158–70
- **Fixed Subset Selection to Reduce Advanced RAIM Complexity**
  Blanch, J., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2018: 88–98
- **A Formula for Solution Separation without Subset Solutions for Advanced RAIM**
  Blanch, J., Walter, T., Enge, P., IEEE

IEEE.2018: 316–26

- **GNSS Multipath Detection in Urban Environment Using 3D Building Model**
  Zhang, S., Lo, S., Chen, Y., Walter, T., Enge, P., IEEE
  IEEE.2018: 1053–58
- **WASS at 15**
  Walter, T., Shallberg, K., Altshuler, E., Wanner, W., Harris, C., Stimmler, R., Inst Navigat
  INST NAVIGATION.2018: 301–21
- **Quantum Resistant Authentication Algorithms for Satellite-Based Augmentation Systems**
  Neish, A., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2018: 365–79
- **Protection Levels after Fault Exclusion for Advanced RAIM** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Blanch, J., Walter, T., Enge, P.
  2017; 64 (4): 505–13
- **Improved User Position Monitor for WAAS** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Walter, T., Blanch, J.
  2017; 64 (1): 165–75
- **Theoretical Results on the Optimal Detection Statistics for Autonomous Integrity Monitoring** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Blanch, J., Walter, T., Enge, P.
  2017; 64 (1): 123–37
- **Multi-GNSS Constellation Anomaly Detection and Performance Monitoring**
  Gunning, K., Walter, T., Enge, P., INST NAVIGAT
  INST NAVIGATION.2017: 1051–62
- **Characterization of GLONASS Broadcast Clock and Ephemeris: Nominal Performance and Fault Trends for ARAIM**
  Gunning, K., Walter, T., Enge, P., INST NAVIGAT
  INST NAVIGATION.2017: 170–83
- **Catalog and Description of GPS and WAAS L1 C/A Signal Deformation Events**
  Shallberg, K. W., Ericson, S. D., Phelts, E., Walter, T., Kovach, K., Altshuler, E., INST NAVIGAT
  INST NAVIGATION.2017: 508–20
- **Validation of the Unfaulted Error Bounds for ARAIM**
  Walter, T., Gunning, K., Phelts, R., Blanch, J., Inst Navigat
  INST NAVIGATION.2017: 1–19
- **The Benefit of Low Cost Accelerometers for GNSS Anti-Spoofing**
  Lo, S., Chen, Y., Reid, T., Perkins, A., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2017: 775–96
- **WAAS Signal Deformation Monitor Performance: Beyond the ICAO Threat Model**
  Phelts, R., Shallberg, K., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2017: 713–24
- **A MATLAB Toolset to Determine Strict Gaussian Bounding Distributions of a Sample Distribution**
  Blanch, J., Walter, T., Enge, P., INST NAVIGAT
  INST NAVIGATION.2017: 4236–47
- **Feasibility of fault exclusion related to advanced RAIM for GNSS spoofing detection**
  Kuusniemi, H., Blanch, J., Chen, Y., Lo, S., Innac, A., Ferrara, G., Honkala, S., Bhuiyan, M. H., Thombre, S., Soderholm, S., Walter, T., Phelts, R., Enge, et al
  INST NAVIGATION.2017: 2359–70
- **Orbital representations for the next generation of satellite-based augmentation systems** *GPS SOLUTIONS*

Reid, T. G., Walter, T., Enge, P. K., Sakai, T.
2016; 20 (4): 737-750

- **Preliminary availability assessment to support single-frequency SBAS development in the Korean region** *GPS SOLUTIONS*
  Bang, E., Lee, J., Walter, T., Lee, J.
  2016; 20 (3): 299-312
- **GNSS Integrity in The Arctic** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Reid, T., Walter, T., Blanch, J., Enge, P.
  2016; 63 (4): 469-492
- **Leveraging Commercial Broadband LEO Constellations for Navigation**
  Reid, T. G. R., Neish, A. M., Walter, T. F., Enge, P. K., Inst Navigat
  INST NAVIGATION.2016: 2300–2314
- **Demonstrating ARAIM on UAS using Software Defined Radio and Civilian Signal GPS L1/L2C and GLONASS G1/G2**
  Chen, Y., Perkins, A., Lo, S., Akos, D. M., Blanch, J., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2016: 231–38
- **Satellite Selection for Multi-Constellation SBAS**
  Walter, T., Blanch, J., Kropp, V., Inst Navigat
  INST NAVIGATION.2016: 1350–59
- **Mitigation of short duration satellite outages for Advanced RAIM and other integrity systems based on GNSS**
  Blanch, J., Chen, Y., Phelts, R., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2016: 1688–95
- **A Simple Satellite Exclusion Algorithm for Advanced RAIM**
  Blanch, J., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2016: 239–44
- **Leveraging Commercial Broadband LEO Constellations for Navigation**
  Reid, T. G. R., Neish, A. M., Walter, T. F., Enge, P. K., Inst Navigat
  INST NAVIGATION.2016: 2300–2314
- **Demonstrating ARAIM on UAS using Software Defined Radio and Civilian Signal GPS L1/L2C and GLONASS G1/G2**
  Chen, Y., Perkins, A., Lo, S., Akos, D. M., Blanch, J., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2016: 231–38
- **Satellite Selection for Multi-Constellation SBAS**
  Walter, T., Blanch, J., Kropp, V., Inst Navigat
  INST NAVIGATION.2016: 1350–59
- **A Simple Position Estimator That Improves Advanced RAIM Performance** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Blanch, J., Walter, T., Enge, P., Kropp, V.
  2015; 51 (3): 2485-U960
- **GNSS Multipath and Jamming Mitigation Using High-Mask-Angle Antennas and Multiple Constellations** *IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS*
  Heng, L., Walter, T., Enge, P., Gao, G. X.
  2015; 16 (2): 741-750
- **Aviation Benefits from Satellite Navigation** *NEW SPACE*
  Enge, P., Enge, N., Walter, T., Eldredge, L.
  2015; 3 (1): 19–35
- **Baseline Advanced RAIM User Algorithm and Possible Improvements** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Blanch, J., Walker, T., Enge, P., Lee, Y., Pervan, B., Rippl, M., Spletter, A., Kropp, V.
  2015; 51 (1): 713-732

- **GNSS Integrity in The Arctic**
  Reid, T. G. R., Walter, T., Blanch, J., Enge, P. K., Inst Navigat
  INST NAVIGATION.2015: 1726–40
- **Progress on Working Group-C Activities on Advanced RAIM**
  Blanch, J., Walter, T., Enge, P., Burns, J., Alexander, K., Boyero, J., Lee, Y., Pervan, B., Joerger, M., Khanafseh, S., Rippl, M., Martini, I., Perea, et al
  INST NAVIGATION.2015: 629–38
- **Validating Nominal Bias Error Limits Using 4 years of WAAS Signal Quality Monitoring Data**
  Phelts, R., Altshuler, E., Walter, T., Inst Navigat
  INST NAVIGATION.2015: 956–63
- **GPS Multi-Frequency Carrier Phase Characterization During Strong Equatorial Ionospheric Scintillation**
  Xu, D., Morton, Y., Akos, D., Walter, T., Inst Navigat
  INST NAVIGATION.2015: 3787–96
- **A Comparative Study of Triple Frequency GPS Scintillation Signal Amplitude Fading Characteristics at Low Latitudes**
  Jiao, Y., Morton, Y., Akos, D., Walter, T., Inst Navigat
  INST NAVIGATION.2015: 3819–25
- **Fast Multiple Fault Exclusion with a Large Number of Measurements**
  Blanch, J., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2015: 696–701
- **Characterization of GPS Clock and Ephemeris Errors to Support ARAIM**
  Walter, T., Blanch, J., Inst Navigat
  INST NAVIGATION.2015: 920–31
- **Airborne Mitigation Of Constellation Wide Faults**
  Walter, T., Blanch, J., Inst Navigat
  INST NAVIGATION.2015: 676–86
- **Future Dual-Frequency GPS Navigation System for Intelligent Air Transportation Under Strong Ionospheric Scintillation** *IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS*
  Seo, J., Walter, T.
  2014; 15 (5): 2224-2236
- **Effects of solar cycle 24 activity onWAAS navigation** *SPACE WEATHER-THE INTERNATIONAL JOURNAL OF RESEARCH AND APPLICATIONS*
  Datta-Barua, S., Walter, T., Bust, G. S., Wanner, W.
  2014; 12 (1): 46-63
- **Architectures for Advanced RAIM: Offline and Online**
  Blanch, J., Walter, T., Enge, P., Pervan, B., Joerger, M., Khanafseh, S., Burns, J., Alexander, K., Boyero, J., Lee, Y., Kropp, V., Milner, C., Macabiau, et al
  INST NAVIGATION.2014: 787–804
- **Crowdsourcing Arctic Navigation Using Multispectral Ice Classification & GNSS** *PROCEEDINGS OF THE 27TH INTERNATIONAL TECHNICAL MEETING OF THE SATELLITE DIVISION OF THE INSTITUTE OF NAVIGATION (ION GNSS 2014)*
  Reid, T., Walter, T., Enge, P., Fowler, A.
  2014: 707-721
- **Scintillation Characterization for WAAS in the Auroral Region**
  Altshuler, E., Shallberg, K., Potter, B. J., Walter, T., Inst Navigat
  INST NAVIGATION.2014: 1126–37
- **Single Antenna GPS Spoof Detection that is Simple, Static, Instantaneous and Backwards Compatible for Aerial Applications**
  McMilin, E., De Lorenzo, D. S., Walter, T., Lee, T. H., Enge, P., Inst Navigat
  INST NAVIGATION.2014: 2233–42

- **Mitigation of Nominal Signal Deformations on Dual-Frequency WAAS Position Errors**
  Wong, G., Chen, Y., Phelts, R., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2014: 3129–47
- **VPL Parameter Determination for Improved Performance of Advanced RAIM**
  Lee, J., Kim, D., Lee, J., Walter, T., Inst Navigat
  INST NAVIGATION.2014: 3566–74
- **Experimentally Recorded Amplitude and Phase Scintillation through a Spirent Simulator**
  Jayawardena, T., Ali, A. M., Forte, B., Kinrade, J., Mitchell, C., Smith, S., Walter, T., Inst Navigat
  INST NAVIGATION.2014: 1108–14
- **Evaluation of a covariance-based clock and ephemeris error bounding algorithm for SBAS**
  Blanch, J., Walter, T., Enge, P., Stern, A., Altshuler, E., Inst Navigat
  INST NAVIGATION.2014: 3270–76
- **Exclusion for Advanced RAIM: Requirements and a Baseline Algorithm** *International Technical Meeting of the Institute-of-Navigation*
  Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2014: 99–107
- **Reduced Subset Analysis for Multi-Constellation ARAIM** *International Technical Meeting of the Institute-of-Navigation*
  Walter, T., Blanch, J., Enge, P.
  INST NAVIGATION.2014: 89–98
- **Development of a Real-time GNSS Software Receiver for Evaluating RAIM in Multi-constellation** *International Technical Meeting of the Institute-of-Navigation*
  Chen, Y., Lo, S., Akos, D. M., Choi, M., Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2014: 525–533
- **The Effect of Nominal Signal Deformations on ARAIM Users** *International Technical Meeting of the Institute-of-Navigation*
  Phelts, R. E., Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2014: 56–67
- **DME/TACAN interference mitigation for GNSS: algorithms and flight test results** *GPS SOLUTIONS*
  Gao, G. X., Heng, L., Hornbostel, A., Denks, H., Meurer, M., Walter, T., Enge, P.
  2013; 17 (4): 561-573
- **Critical Elements for a Multi-Constellation Advanced RAIM** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Blanch, J., Walter, T., Enge, P., Wallner, S., Fernandez, F. A., Dellago, R., Ioannides, R., Hernandez, I. F.
  2013; 60 (1): 53-69
- **Incorporating GLONASS into Aviation RAIM Receivers** *International Technical Meeting of the Institute-of-Navigation*
  Walter, T., Blanch, J., Choi, M. J., Reid, T., Enge, P.
  INST NAVIGATION.2013: 239–249
- **Advanced RAIM System Architecture with a Long Latency Integrity Support Message**
  Blanch, J., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2013: 2605–13
- **Constructing Ionospheric Irregularity Threat Model for Korean SBAS**
  Bang, E., Lee, J., Lee, J., Seo, J., Walter, T., ION
  INST NAVIGATION.2013: 296–306
- **Evolution of SBAS: Two Frequencies & Multiple Constellations**
  Walter, T., Inst Navigat
  INST NAVIGATION.2013: 2394–2439
- **Qualifying an L5 SBAS MOPS Ephemeris Message to Support Multiple Orbit Classes**
  Reid, T., Walter, T., Enge, P., Inst Navigat
  INST NAVIGATION.2013: 825–43

- **Dual Frequency SBAS Trial and Preliminary Results for East-Asia Region**
  Sakai, T., Hoshinoo, K., Walter, T., Inst Navigat
  INST NAVIGATION.2013: 912–20
- **The Influence of the Ionosphere on SBAS**
  Walter, T., Inst Navigat
  INST NAVIGATION.2013: 2373–93
- **Overcoming RFI with High Mask Angle Antennas and Multiple GNSS Constellations**
  Heng, L., Walter, T., Enge, P., Gao, G., Inst Navigat
  INST NAVIGATION.2013: 3433–42
- **Implementation of the L5 SBAS MOPS**
  Walter, T., Blanch, J., Enge, P., Inst Navigat
  INST NAVIGATION.2013: 814–24
- **Optimal Positioning for Advanced Raim** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Blanch, J., Walter, T., Enge, P.
  2013; 60 (4): 279-289
- **Near Term Improvements to WAAS Availability** *International Technical Meeting of the Institute-of-Navigation*
  Blanch, J., Walter, T., Phelts, R. E., Enge, P.
  INST NAVIGATION.2013: 71–77
- **L1/L5 SBAS MOPS Ephemeris Message to Support Multiple Orbit Classes** *International Technical Meeting of the Institute-of-Navigation*
  Reid, T., Walter, T., Enge, P.
  INST NAVIGATION.2013: 78–92
- **Signal Deformation Monitoring for Dual-Frequency WAAS** *International Technical Meeting of the Institute-of-Navigation*
  Phelts, R. E., Wong, G., Walter, T., Enge, P.
  INST NAVIGATION.2013: 93–106
- **Results on the Optimal Detection Statistic for Integrity Monitoring** *International Technical Meeting of the Institute-of-Navigation*
  Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2013: 262–273
- **GPS Signal-in-Space Integrity Performance Evolution in the Last Decade** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  2012; 48 (4): 2932-2946
- **Satellite Navigation for Aviation in 2025** *PROCEEDINGS OF THE IEEE*
  Blanch, J., Walter, T., Enge, P.
  2012; 100: 1821-1830
- **Evolving WAAS to Serve L1/L5 Users** *NAVIGATION-JOURNAL OF THE INSTITUTE OF NAVIGATION*
  Walter, T., Blanch, J., Phelts, R. E., Enge, P.
  2012; 59 (4): 317-327
- **The impact the Ionosphere on GNSS Aufmentation**
  Walter, T., ION
  INST NAVIGATION.2012: 1070–78
- **GLONASS Signal-in-Space Anomalies Since 2009** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  INST NAVIGATION.2012: 833–842
- **L1/L5 SBAS MOPS to Support Multiple Constellations** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Walter, T., Blanch, J., Enge, P.
  INST NAVIGATION.2012: 1287–1297

- **Advanced RAIM User Algorithm Description: Integrity Support Message Processing, Fault Detection, Exclusion, and Protection Level Calculation** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Blanch, J., Walter, T., Enge, P., Lee, Y., Pervan, B., Rippl, M., Spletter, A.
  INST NAVIGATION.2012: 2828–2849
- **Measuring Code-Phase Differences due to Inter-Satellite Hardware Differences** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Wong, G., Chen, Y., Phelts, R. E., Walter, T., Enge, P.
  INST NAVIGATION.2012: 2150–2158
- **Impact of Personal Privacy Devices for WAAS Aviation Users** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Gao, G. X., Gunning, K., Walter, T., Enge, P.
  INST NAVIGATION.2012: 235–241
- **Evaluation of Multi-Constellation Advanced RAIM for Vertical Guidance using GPS and GLONASS Signals with Multiple Faults** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Choi, M., Blanch, J., Walter, T., Akos, D., Enge, P.
  INST NAVIGATION.2012: 884–892
- **A Framework for Analyzing Architectures that Support ARAIM** *25th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation*
  Walter, T., Blanch, J., Enge, P.
  INST NAVIGATION.2012: 2850–2857
- **Automated Verification of Potential GPS Signal-In-Space Anomalies Using Ground Observation Data** *IEEE/ION Position Location and Navigation Symposium (PLANS)*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  IEEE.2012: 1111–1118
- **OPTIMAL POSITIONING FOR ADVANCED RAIM** *International Technical Meeting (ITM) of the Institute-of-Navigation (ION)*
  Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2012: 1624–1631
- **Statistical Characterization of GLONASS Broadcast Clock Errors and Signal-In-Space Errors** *International Technical Meeting (ITM) of the Institute-of-Navigation (ION)*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  INST NAVIGATION.2012: 1697–1707
- **Availability Impact on GPS Aviation due to Strong Ionospheric Scintillation** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Seo, J., Walter, T., Enge, P.
  2011; 47 (3): 1963-1973
- **Correlation of GPS signal fades due to ionospheric scintillation for aviation applications** *ADVANCES IN SPACE RESEARCH*
  Seo, J., Walter, T., Enge, P.
  2011; 47 (10): 1777-1788
- **Alternative Characterization of Analog Signal Deformation for GNSS-GPS Satellites** *International Technical Meeting of the Institute of Navigation*
  Wong, G., Phelts, R. E., Walter, T., Enge, P.
  INST NAVIGATION.2011: 497–507
- **First Signal in Space Analysis of GLONASS K-1**
  Thoelert, S., Erker, S., Furthner, J., Meurer, M., Gao, G. X., Heng, L., Walter, T., Enge, P., ION
  INST NAVIGATION.2011: 3076–82
- **Optimization of a Vertical Protection Level Equation for Dual Frequency SBAS** *International Technical Meeting of the Institute of Navigation*
  Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2011: 459–463

- **Statistical Characterization of GPS Signal-In-Space Errors** *International Technical Meeting of the Institute of Navigation*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  INST NAVIGATION.2011: 312–319
- **Demonstrations of Multi-Constellation Advanced RAIM for Vertical Guidance using GPS and GLONASS Signals** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Choi, M., Blanch, J., Akos, D., Heng, L., Gao, G., Walter, T., Enge, P.
  INST NAVIGATION.2011: 3227–3234
- **SBAS and GBAS Integrity for Non-Aviation Users: Moving Away from "Specific Risk"** *International Technical Meeting of the Institute of Navigation*
  Pullen, S., Walter, T., Enge, P.
  INST NAVIGATION.2011: 533–545
- **Statistical Characterization of GLONASS Broadcast Ephemeris Errors** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  INST NAVIGATION.2011: 3109–3117
- **Breaking the Ice: Navigation in the Arctic** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Gao, G. X., Heng, L., Walter, T., Enge, P.
  INST NAVIGATION.2011: 3767–3772
- **A Proposal for Multi-Constellation Advanced RAIM for Vertical Guidance** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Blanch, J., Walter, T., Enge, P., Wallner, S., Fernandez, F. A., Dellago, R., Ioannides, R., Pervan, B., Hernandez, I. F.
  INST NAVIGATION.2011: 2665–2680
- **Evolving WAAS to Serve L1/L5 Users** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Walter, T., Blanch, J., Phelts, R. E., Enge, P.
  INST NAVIGATION.2011: 2495–2504
- **Advanced RAIM Demonstration using Four Months of Ground Data** *International Technical Meeting of the Institute of Navigation*
  Choi, M., Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2011: 279–284
- **A Clock and Ephemeris Algorithm for Dual Frequency SBAS** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2011: 2513–2519
- **Bounding Errors Caused by Nominal GNSS Signal Deformations** *24th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS)*
  Wong, G., Phelts, R. E., Walter, T., Enge, P.
  INST NAVIGATION.2011: 2657–2664
- **Reversion from L1-L5 Dual to L5 Single Frequency WAAS in the Presence of RF Interference** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Jan, S., Walter, T., Enge, P.
  2010; 46 (3): 1110-1126
- **RAIM with Optimal Integrity and Continuity Allocations Under Multiple Failures** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Blanch, J., Walter, T., Enge, P.
  2010; 46 (3): 1235-1247
- **Unaugmented GPS-Based Flight Inspection System** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Kim, E., Walter, T., Powell, J. D.
  2010; 46 (2): 717-724
- **Coverage Improvement for Dual Frequency SBAS** *2010 International Technical Meeting of the Institute-of-Navigation*

Walter, T., Blanch, J., Enge, P.
INST NAVIGATION.2010: 344–353

- **GPS in Mid-life with an International Team of Doctors Analyzing IIF-1 Satellite Performance and Backward-Compatibility** *23rd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-2010)*
  Gao, G. X., Heng, L., Wong, G., Phelts, E., Blanch, J., Walter, T., Enge, P., Erker, S., Thoelert, S., Meurer, M.
  INST NAVIGATION.2010: 1597–1604
- **Prototyping Advanced RAIM for Vertical Guidance** *23rd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-2010)*
  Blanch, J., Choi, M. J., Walter, T., Enge, P.
  INST NAVIGATION.2010: 285–291
- **Vertical Protection Level Equations for Dual Frequency SBAS** *23rd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-2010)*
  Walter, T., Blanch, J., Enge, P.
  INST NAVIGATION.2010: 2031–2041
- **GPS Signal-in-Space Anomalies in the Last Decade Data Mining of 400,000,000 GPS Navigation Messages** *23rd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-2010)*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  INST NAVIGATION.2010: 3115–3122
- **Characterization of Signal Deformations for GPS and WAAS Satellites** *23rd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-2010)*
  Wong, G., Phelts, R. E., Walter, T., Enge, P.
  INST NAVIGATION.2010: 3143–3151
- **GPS Ephemeris Error Screening and Results for 2006-2009** *2010 International Technical Meeting of the Institute-of-Navigation*
  Heng, L., Gao, G. X., Walter, T., Enge, P.
  INST NAVIGATION.2010: 1014–1022
- **MATLAB Algorithm Availability Simulation Tool** *GPS SOLUTIONS*
  Jan, S., Chan, W., Walter, T.
  2009; 13 (4): 327-332
- **Compass-M1 Broadcast Codes in E2, E5b, and E6 Frequency Bands** *IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING*
  Gao, G. X., Chen, A., Lo, S., De Lorenzo, D., Walter, T., Enge, P.
  2009; 3 (4): 599-612
- **Characteristics of deep GPS signal fading due to ionospheric scintillation for aviation receiver design** *RADIO SCIENCE*
  Seo, J., Walter, T., Chiou, T., Enge, P.
  2009; 44
- **Evaluation of Signal in Space Error Bounds to Support Aviation Integrity** *22nd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-09)*
  Walter, T., Blanch, J., Enge, P.
  INST NAVIGATION.2009: 1317–1329
- **Characterizing Nominal Analog Signal Deformation on GNSS Signals** *22nd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-09)*
  Phelts, R. E., Walter, T., Enge, P.
  INST NAVIGATION.2009: 1343–1350
- **Availability Benefit of Future Dual Frequency GPS Avionics under Strong Ionospheric Scintillation** *22nd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-09)*
  Seo, J., Walter, T., Enge, P.
  INST NAVIGATION.2009: 1216–1224
- **Hysteresis in RAIM** *22nd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-09)*
  Blanch, J., Mayer, C., Lo, S., Walter, T., Enge, P.

INST NAVIGATION.2009: 2818–2823

- **Methodology and Case Studies of Signal-in-Space Error Calculation Top-down Meets Bottom-up** *22nd International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GNSS-09)*
  Gao, G. X., Tang, H., Blanch, J., Lee, J., Walter, T., Enge, P.
  INST NAVIGATION.2009: 2824–2831

- **Bounding higher-order ionosphere errors for the dual-frequency GPS user** *RADIO SCIENCE*
  Datta-Barua, S., Walter, T., Blanch, J., Enge, P.
  2008; 43 (5)

- **Altitudinal variation of midlatitude localized TEC enhancement from ground- and space-based measurements** *SPACE WEATHER-THE INTERNATIONAL JOURNAL OF RESEARCH AND APPLICATIONS*
  Datta-Barua, S., Mannucci, A. J., Walter, T., Enge, P.
  2008; 6 (10)

- **Position Error Bound Calculation for GNSS using Measurement Residuals** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Blanch, J., Walter, T., Enge, P.
  2008; 44 (3): 977-984

- **Wide area augmentation system-based might inspection system** *JOURNAL OF AIRCRAFT*
  Kim, E., Walter, T., Powell, J. D.
  2008; 45 (2): 614-621

- **Improving GPS-based landing system performance using an empirical barometric altimeter confidence bound** *IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS*
  Jan, S., Gebre-Egziabher, D., Walter, T., Enge, P.
  2008; 44 (1): 127-146

- **Understanding the GIOVE-B Broadcast Codes of the Galileo System** *42nd Asilomar Conference on Signals, Systems and Computers*
  Gao, G. X., Akos, D., Walter, T., Enge, P.
  IEEE.2008: 2086–2090

- **Compass-M1 Broadcast Codes and Their Application to Acquisition and Tracking** *2008 National Technical Meeting of the Institute-of-Navigation*
  Gao, G. X., Chen, A., Lo, S., De Lorenzo, D., Walter, T., Enge, P.
  INST NAVIGATION.2008: 133–141

- **Understanding the GIOVE-B Broadcast Codes of the Galileo System** *42nd Asilomar Conference on Signals, Systems and Computers*
  Gao, G. X., Akos, D., Walter, T., Enge, P.
  IEEE.2008: 2086–2090

- **Understanding PHMI for Safety of Life Applications in GNSS** *2007 National Technical Meeting of the Institute-of-Navigation*
  Blanch, J., Walter, T., Enge, P.
  INST NAVIGATION.2007: 305–310

- **Adaptive Carrier Smoothing Using Code and Carrier Divergence** *2007 National Technical Meeting of the Institute-of-Navigation*
  Kim, E., Walter, T., Powell, J. D.
  INST NAVIGATION.2007: 141–152

- **Model Analysis on the Performance for an Inertial Aided FLL-Assisted-PLL Carrier-Tracking Loop in the Presence of Ionospheric Scintillation** *2007 National Technical Meeting of the Institute-of-Navigation*
  Chiou, T., Gebre-Egziabher, D., Walter, T., Enge, P.
  INST NAVIGATION.2007: 1276–1295

- **Galileo GIOVE-A Broadcast E5 Codes and their Application to Acquisition and Tracking** *2007 National Technical Meeting of the Institute-of-Navigation*
  Gao, G. X., De Lorenzo, D. S., Chen, A., Lo, S. C., Akos, D. M., Walter, T., Enge, P.
  INST NAVIGATION.2007: 936–946

- **A Reference Point-based Precise Relative Positioning Method Using a Single Frequency Receiver** *2006 National Technical Meeting of the Institute-of-Navigation*
  Kim, E., Walter, T., Powell, J. D.
  INST NAVIGATION.2006: 283–292
- **Optimizing WAAS Accuracy/Stability For a Single Frequency Receiver**
  Kim, E., Walter, T., Powell, J., NAVSTAR
  INST NAVIGATION.2006: 962–70
- **Bounding Higher Order Ionosphere Errors for the Dual Frequency GPS User** *19th International Technical Meeting of the Satellite Division of the Institute-of-Navigation*
  Datta-Barua, S., Walter, T., Blanch, J., Enge, P.
  INST NAVIGATION.2006: 1377–1392
- **Code Generation Scheme and Property Analysis of Broadcast Galileo L1 and E6 Signals** *19th International Technical Meeting of the Satellite Division of the Institute-of-Navigation*
  Gao, G. X., Spilker, J., Walter, T., Enge, P., Pratt, A. R.
  INST NAVIGATION.2006: 1526–1534
- **WAAS-based threat monitoring for a Local Airport Monitor (LAM) that supports Category I Precision Approach** *IEEE/ION Position, Location, and Navigation Symposium*
  Rife, J., Pullen, S., Walter, T., Phelts, E., Pervan, B., Enge, P.
  IEEE.2006: 468–482
- **Galileo-GPS RAIM for Vertical Guidance** *2006 National Technical Meeting of the Institute-of-Navigation*
  Ene, A., Blanch, J., Walter, T.
  INST NAVIGATION.2006: 432–440
- **A development of WAAS-aided Flight Inspection Truth System** *2006 IEEE/ION POSITION, LOCATION AND NAVIGATION SYMPOSIUM, VOLS 1-3*
  Kim, E., Peled, U., Walter, T., Powell, J. D.
  2006: 61-70
- **Field Data Analysis for a Range-Based Local Airport Monitor for WAAS** *2006 National Technical Meeting of the Institute-of-Navigation*
  Seo, J., Rife, J., Pullen, S., Walter, T., Enge, P.
  INST NAVIGATION.2006: 748–758
- **Comparison of master station and user algorithms for wide-area augmentation system** *JOURNAL OF GUIDANCE CONTROL AND DYNAMICS*
  Kee, C., Walter, T., Chao, Y. C., Tsai, Y. J., Enge, P., Parkinson, B. W.
  1997; 20 (1): 170-176
- **High integrity multipath mitigation techniques for ground reference stations** *10th International Technical Meeting of the Satellite Division of the Institute-of-Navigation*
  Dai, D. H., Walter, T., Comp, C. J., Tsai, Y. J., Ko, P. Y., Enge, P., Powell, J. D.
  INST NAVIGATION.1997: 593–604
- **Ionospheric estimation and integrity threat detection** *ION National Meeting on Navigation and Positioning in the Information Age*
  Hansen, A. J., Chao, Y. C., Walter, T., Enge, P.
  INST NAVIGATION.1997: 883–889
- **Improving WAAS integrity and availability: UDRE and GIVE time updates** *10th International Technical Meeting of the Satellite Division of the Institute-of-Navigation*
  COMP, C., Gazit, R., Walter, T., Enge, P.
  INST NAVIGATION.1997: 1315–1324
- **Ionospheric correction using tomography** *10th International Technical Meeting of the Satellite Division of the Institute-of-Navigation*
  Hansen, A. J., Walter, T., Enge, P.
  INST NAVIGATION.1997: 249–257
- **A proposed integrity equation for WAAS MOPS** *10th International Technical Meeting of the Satellite Division of the Institute-of-Navigation*

Walter, T., Enge, P., Hansen, A.
INST NAVIGATION.1997: 475–484

- **Integration of wide area DGPS with local area kinematic DGPS** *IEEE 1996 Position Location and Navigation Symposium (PLANS 96)*
  LAWRENCE, D., Evans, J., Chao, Y. C., Tsai, Y. J., Cohen, C., Walter, T., Enge, P., Powell, J. D., Parkinson, B.
  I E E E.1996: 523–529
- **Quality control algorithms on Wide-area Reference Station for WAAS** *52nd Annual Meeting of the Institute-of-Navigation on Navigational Technology for the 3rd Millenium*
  Kee, C., Walter, T., Enge, P., Parkinson, B.
  INST NAVIGATION.1996: 487–495
- **Generation of ionospheric correction and confidence estimates for WAAS** *52nd Annual Meeting of the Institute-of-Navigation on Navigational Technology for the 3rd Millenium*
  Chao, Y. C., Tsai, Y. J., Evans, J., Kee, C., Walter, T., ENGE, P. K., Powell, J. D., Parkinson, B. W.
  INST NAVIGATION.1996: 139–146
- **An algorithm for inter-frequency bias calibration and application to WAAS ionosphere modeling** *8th International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GPS-95)*
  Chao, Y. C., Tsai, Y. J., Walter, T., Kee, C. D., Enge, P., Parkinson, B.
  INST NAVIGATION.1995: 639–646
- **Observed GPS signal continuity interruptions** *8th International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GPS-95)*
  COBB, H. S., LAWRENCE, D., Christie, J., Walter, T., Chao, Y. C., Powell, J. D., Parkinson, B.
  INST NAVIGATION.1995: 793–795
- **A low temperature gyroscope clock for gravitational redshift experiments** *XXXth Rencontres de Moriond on Dark Matter in Cosmology, Clocks and Tests of Fundamental Laws*
  Buchman, S., Turneaure, J. P., Walter, T., Everitt, C. W.
  EDITIONS FRONTIERES.1995: 429–436
- **Validation or the RTCA message format for WAAS** *8th International Technical Meeting of the Satellite Division of the Institute-of-Navigation (ION GPS-95)*
  Tsai, Y. J., Enge, P., Chao, Y. C., Walter, T., Kee, C. D., Evans, J.
  INST NAVIGATION.1995: 661–670
- **CHARACTERIZING FREQUENCY STABILITY - A CONTINUOUS POWER-LAW MODEL WITH DISCRETE SAMPLING** *IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT*
  WALTER, T.
  1994; 43 (1): 69–79
- **FLIGHT TRIALS OF THE WIDE AREA AUGMENTATION SYSTEM (WAAS)** *7th International Technical Meeting of the Satellite-Division of the Institute-of-Navigation (ION GPS-94)*
  Walter, T., Kee, C., Chao, Y. C., Tsai, Y. J., PELED, U., Ceva, J., Barrows, A., Abbot, E., Powell, J. D., Enge, P., Parkinson, B.
  INST NAVIGATION.1994: 1537–1546
- **AUTONOMOUS INTEGRITY MONITORING AND WIDE AREA DGPS** *1994 National Technical Meeting on Navigating the Earth and Beyond*
  Walter, T., Pervan, B., Enge, P., HERENDEEN, J., Levin, P. L.
  INST NAVIGATION.1994: 155–163
- **DISCRETE SIMULATION OF POWER-LAW NOISE**
  KASDIN, N. J., WALTER, T., IEEE
  I E E E.1992: 274–83
- **AN ULTRA HIGH-VACUUM LOW-TEMPERATURE GYROSCOPE CLOCK** *19TH INTERNATIONAL CONF ON LOW TEMPERATURE PHYSICS (LT-19)*
  Walter, T., Turneaure, J. P., Buchman, S., Everitt, C. W., Keiser, G. M.
  ELSEVIER SCIENCE BV.1990: 155–156