

## Paul G. Savage Publications

- “Inertial Sensor Stability Evaluation By Dual Sensor Testing”, SAI WBN-14032, [www.strapdownassociates.com](http://www.strapdownassociates.com), January 23, 2023
- “Why Optical And Mechanical Gyros Measure The Same Angular Rate Relative To Non-Rotating Inertial Space”, SAI WBN-14031, [www.strapdownassociates.com](http://www.strapdownassociates.com), December 21, 2022
- “Blazing Gyros – The Presentation”, SAI WBN-14030, [www.strapdownassociates.com](http://www.strapdownassociates.com), December 14, 2022
- “Simplified Description of Optical Gyros – A Rigorous Analytical Development Without Vector Calculus”, SAI WBN-14027, [www.strapdownassociates.com](http://www.strapdownassociates.com), May 23, 2020.
- “Generating Strapdown Specific-Force/Angular-Rate For Specified Attitude/Position Variation From A Reference Trajectory”, SAI WBN-14026, [www.strapdownassociates.com](http://www.strapdownassociates.com), April 21, 2020.
- “Appendices F, G, And H to Generating Strapdown Specific-Force/Angular-Rate For Specified Attitude/Position Variation From A Reference Trajectory”, SAI WBN-14026a, [www.strapdownassociates.com](http://www.strapdownassociates.com), April 21, 2020.
- “Modern Strapdown Attitude Algorithms And Their Accuracy, Versus Accuracy Requirements For Unaided Strapdown Inertial Navigation”, SAI WBN-14025, [www.strapdownassociates.com](http://www.strapdownassociates.com), February 9, 2020.
- “Analytical Description Of Optical Gyros”, SAI WBN-14024, [www.strapdownassociates.com](http://www.strapdownassociates.com), April 3, 2019 (Updated May 23, 2020).
- “Analytically Deriving How Ring Laser And Fiber Optic Gyros Measure Angular Rotation”, SAI WBN-14023, [www.strapdownassociates.com](http://www.strapdownassociates.com), November 1, 2018 (Updated March 31, 2019).
- “Differential Point-To-Point Relativity In Rotating Coordinates”, SAI WBN-14022, [www.strapdownassociates.com](http://www.strapdownassociates.com), May 28, 2018.
- “Improved Strapdown Inertial Measurement Unit Calibration Procedures”, IEEE/ION Position Location and Navigation Symposium (PLANS), Monterey, California, Apr 23-26, 2018
- “Differential Kinematics Of Point-To-Point Relativity”, SAI WBN-14021, [www.strapdownassociates.com](http://www.strapdownassociates.com), March 11, 2018.
- “Improved Strapdown Inertial System Calibration Procedures, Part 1, Procedures And Accuracy Analysis”, SAI WBN-14020-1, [www.strapdownassociates.com](http://www.strapdownassociates.com), October 20, 2017 (Updated January 11, 2018).

- “Improved Strapdown Inertial System Calibration Procedures, Part 2, Analytical Derivations”, SAI WBN-14020-2, [www.strapdownassociates.com](http://www.strapdownassociates.com), October 20, 2017 (Updated January 11, 2018).
- “Improved Strapdown Inertial System Calibration Procedures, Part 3, Numerical Examples”, SAI WBN-14020-3, [www.strapdownassociates.com](http://www.strapdownassociates.com), November 10, 2017, (Updated January 11, 2018).
- “Down-Summing Rotation Vectors For Strapdown Attitude Updating”, SAI WBN-14019, [www.strapdownassociates.com](http://www.strapdownassociates.com), July 16, 2017.
- “Digital Integration Algorithm Error For Band-Limited Random Process Inputs”, SAI WBN-14018, [www.strapdownassociates.com](http://www.strapdownassociates.com), June 26, 2017.
- “Skewed Sensor Failure Detection Using Parallel Navigation Solutions”, SAI WBN-14017, [www.strapdownassociates.com](http://www.strapdownassociates.com), June 16, 2016.
- “Blazing Gyros - The Movie”, SAI WBN-14016, [www.strapdownassociates.com](http://www.strapdownassociates.com), May 16, 2016.
- “Introduction To The Kinematics Of Point-To-Point Relativity”, SAI WBN-14015, [www.strapdownassociates.com](http://www.strapdownassociates.com), April 17, 2016 (Updated May 3, 2018).
- “Geordie’s Quaternion Decision”, SAI WBN-14014, [www.strapdownassociates.com](http://www.strapdownassociates.com), February 17, 2016.
- “Program Management”, SAI WBN-14013, [www.strapdownassociates.com](http://www.strapdownassociates.com), January 18, 2016.
- “Designing An Extended Kalman Filter For A Stellar Aided Strapdown Inertial Navigation System”, SAI WBN-14012, [www.strapdownassociates.com](http://www.strapdownassociates.com), January 16, 2016.
- “Performance Analysis Of Strapdown Systems”, SAI WBN-14011, [www.strapdownassociates.com](http://www.strapdownassociates.com), June 2, 2016.
- “Computational Elements For Strapdown Systems”, SAI WBN-14010, [www.strapdownassociates.com](http://www.strapdownassociates.com), May 31, 2015.
- “Blazing Gyros - The Evolution Of Strapdown Inertial Navigation Technology For Aircraft - Web Version”, SAI WBN-14009, [www.strapdownassociates.com](http://www.strapdownassociates.com), May 29, 2015.
- “Lever Arm Corrections During INS Transfer Alignment With Wide Angle Initial Heading Error”, SAI WBN-14008, [www.strapdownassociates.com](http://www.strapdownassociates.com), April 17, 2015.
- “Coarse Leveling Of INS Attitude Under Dynamic Trajectory Conditions”, SAI WBN-14007, [www.strapdownassociates.com](http://www.strapdownassociates.com), January 28, 2014.
- “Moving Base Alignment With Large Initial Heading Error”, SAI WBN-14006, [www.strapdownassociates.com](http://www.strapdownassociates.com), October 3, 2014.

“Modifying The Kalman Filter Measurement To Mitigate Second Order Error Amplification In INS Velocity Matching Alignment Applications”, SAI WBN-14005, www.strapdownassociates.com, July, 15, 2014.

“Fixed Gain Digital Filter Design For Specified Phase Versus Frequency Response”, SAI WBN-14004, www.strapdownassociates.com, June 29, 2014.

“Schuler Oscillations”, SAI WBN-14003, www.strapdownassociates.com, June 27, 2014.

“Redefining Gravity And Newtonian Natural Motion”, SAI WBN-14002, www.strapdownassociates.com, May 21, 2014.

“Mitigating Second Order Error Effects In Linear Kalman Filters Using Adaptive Process And Measurement Noise”, SAI WBN-14001, www.strapdownassociates.com, May 16, 2014.

*Introduction To Strapdown Inertial Navigation Systems*, Previously provided as part of Paul G. Savage's Introductory Strapdown Inertial Navigation course, Now Available For Purchase From Strapdown Associates, Inc.

*Strapdown Inertial Navigation Lecture Notes*, Previously provided as part of Paul G. Savage's Introductory Strapdown Inertial Navigation Course, Now Available For Purchase From Strapdown Associates, Inc.

“Blazing Gyros: The Evolution of Strapdown Inertial Navigation Technology for Aircraft”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 36, No. 3, May - Jun 2013, pp. 637-655.

“Strapdown Sculling Algorithm Design for Sensor Dynamic Amplitude and Phase-Shift Error”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 35, No. 6, Nov - Dec 2012, pp. 1718-1729.

“Explicit Frequency Shaped Coning Algorithms for Pseudoconing Environments”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 34, No. 3, May-Jun 2011, pp. 1123-1132.

“Coning Algorithm Design By Explicit Frequency Shaping”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 33, No. 4, Jul-Aug 2010, pp. 774-782.

“Computational Elements For Strapdown Systems”, NATO/RTO SET-116, Oct 2008.

“Performance Analysis of Strapdown Systems”, NATO/RTO SET-116, Oct 2008.

*Strapdown Analytics*, Strapdown Associates, Inc., Second Edition, 2007.

“A Unified Mathematical Framework for Strapdown Algorithm Design”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 29, No. 2, Mar - Apr 2006, pp. 237-249.

- “Strapdown Inertial Navigation Computational Elements”, NATO/RTO SET-064, Oct 2003.
- “Strapdown System Performance Analysis”, NATO/RTO SET-064, Oct 2003.
- “Analytical Modeling of Sensor Quantization in Strapdown Inertial Navigation Error Equations”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 25, No. 5, Sep - Oct 2002, pp. 833-842.
- Strapdown Analytics*, Strapdown Associates, Inc., First Edition, 2000.
- “Strapdown Inertial Navigation System Integration Algorithm Design Part 2 - Velocity & Position Algorithms”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 21, No. 2, Mar - Apr 1998, pp. 208-221.
- “Strapdown Inertial Navigation System Integration Algorithm Design Part 1 - Attitude Algorithms”, *AIAA Journal Of Guidance, Control, And Dynamics*, Vol. 21, No. 1, Jan - Feb 1998, pp. 19-28.
- “Advances In Strapdown Sensors”, NATO/AGARD LS-133, May 1984.
- “Strapdown System Algorithms”, NATO/AGARD LS-133, May 1984.
- “The Evolution of Honeywell Laser Gyro Inertial Navigation Technology” presented to Los Angeles Chapter of the ION, El Segundo, California, Nov 14, 1979.
- “Strapdown Sensors”, NATO/AGARD LS-95, Jun 1978.
- “Calibration Procedures For Laser Gyro Strapdown Inertial Navigation Systems”, 9th Annual Electro-Optics/Laser Conference and Exhibition, Anaheim, California, Oct 25-27, 1977.
- “Honeywell Laser Gyros”, Advanced Missiles Systems Committee Convention, Albuquerque, New Mexico, Mar 23-25, 1977.
- “Laser Gyros in Strapdown Inertial Navigation Systems”, IEEE Position Location and Navigation Symposium (PLANS), San Diego, California, Nov 1-3, 1976.
- “Honeywell Laser Inertial Navigation System (LINS) Test Results”, Ninth Data Exchange For Inertial Systems, Clearwater, Florida, Nov 1975.
- “The Honeywell Laser Inertial Navigation System (LINS)”, ION NAECON, Dayton, Ohio, Jun 1975.
- “Recent Trends In Strapdown Navigation Technology”, AIAA Guidance and Control Conference, Key Biscayne, Florida, Aug 1973.
- “Optimum Aiding Of Inertial Navigation Systems Using Air Data”, AIAA Guidance and Control Conference, Stanford, California, Aug 1972.

“Midcourse Guidance Shipboard System Support”, Symposium on Marine Inertial Navigation Systems (MINS), John Hopkins University Applied Physics Laboratory, Silver Springs, Maryland, Jun 1970.

“A Strapdown Phased Array Radar Tracker Loop Concept For a Radar Homing Missile”, AIAA Guidance, Control, and Flight Mechanics Conference, Aug 1969.

“A New Second Order Solution For Strapped-Down Attitude Computation”, AIAA/JACC Guidance and Control Conference, Aug 1966.

“Terminal Prediction Guidance”, AIAA/ION Guidance and Control Conference, Aug 1965.

“Theoretical Optimum Design of a Low frequency, Small Size, Band-Pass Electronic Filter”, *Infrared Physics*, 1963, Vol. 3, pp. 49-68, Pergamon Press Ltd., Printed in Great Britain.