

Lawrence J. Harman

Curriculum Vitae

Home: 13 Beckler Ave., Boston, MA 02127 617-464-3132

Work: GeoGraphics Laboratory, DMG 460, Bridgewater State University, Bridgewater, MA 508-531-6144

lharman@bridgew.edu, larry@geographicslab.org

Summary

- Mr. Harman is currently the Co-Director of the GeoGraphics Laboratory at Bridgewater State University (BSU). He has more than 50 years of experience in research, planning, operation and management of transportation systems, regional and urban planning, and foreign intelligence analysis. For the past twenty years, he has managed leading research applications of geo-spatial analysis, remote sensing data collection systems, and advanced technology applications including small unmanned aircraft systems at BSU.
- Mr. Harman has been active in the National Academies (NASEM)¹ Transportation Research Board (TRB) activities for 40 years. He is currently on TRB's Sub-Committee on Unmanned Aerial Vehicles (UAVs). He served as chair of TRB's Accessible Transportation and Mobility (ATM) Committee and as a member of the Transportation and Land Development Committee and the Rural Public Transportation Committee.
- Mr. Harman has participated in leadership roles with the TRB's Transit Cooperative Research Program (TCRP) since its inception including authorship of the Synthesis Study of Mobile Data Terminals and a chapter for the Synthesis Study on Geographic Information Systems in U.S. transit. He served on the TCRP J-09 e-Transit and the TCRP J-09 Mobility Management Data Exchange committee. He has also served on the National Cooperative Highway Research Program's (NCHRP) Innovations Deserving Exploratory Analysis (IDEA) panel.
- Mr. Harman has extensive teaching and training experience throughout the U.S. His college teaching at Bridgewater State University includes an undergraduate course on the Geography of Transportation, a GPS/GIS module for the Master in Public Administration program and a Technology Module for the Young African Leadership Institute (YALI).
- He has been the principal investigator and principal instructor for professional education courses in every state of the union for the National Highway Institute (NHI) of the Federal Highway Administration (FHWA) the National Transit Institute (NTI) for the Federal Transit Administration (FTA) and for the Community Transportation Association of America (CTAA).
- He is scheduled to teach a course on small unmanned aircraft systems (sUAS) at Holyoke Community College in the spring of 2018 and a Technology Module featuring sUAS for the YALI 2017 summer program at Bridgewater State University.
- The Massachusetts Office of Diversity and Equal Opportunity has certified Mr. Harman as a Vietnam Era Veteran (VEV).

¹ (NASEM) The National Academies of Science, Engineering and Medicine.

Education and Qualifications

Mr. Harman holds a Bachelor's Degree in Education and Earth Science from Bridgewater State University and a Masters in Urban Planning from the University of Washington. Mr. Harman was a teaching assistant in the Department of Earth Sciences in his senior year at Bridgewater State University. His Master's thesis evaluated state and regional planning programs in the U.S. He was a Fellow for Advanced Technology (geographic information systems and intelligent transportation systems) at the National Transit Institute at Rutgers University. He was trained in geographic information systems (GIS) at Bridgewater State University, Rutgers University, Caliper Corporation, and Harvard School of Design.

He completed the Massachusetts senior executive program at Harvard University's Kennedy School. He was a summer intern at the U.S. Department of Housing and Urban Development (HUD) in Washington, DC, where he developed an evaluation methodology for state and regional planning grants for the Assistant Secretary for Metropolitan Development at HUD. After completing his Masters in Urban Planning, he was recruited by HUD into the Urban Intern Program at HUD's San Francisco Regional Office.

A Vietnam-Era veteran, he is a graduate of the U.S. Army Intelligence School's (Ft. Holabird, MD) Imagery Interpretation course. He was trained as an Intelligence analyst at 2nd Army Intelligence School (Ft. George Meade, MD). He received an honorable discharge from the US Army Reserve as a Specialist 5 while attached to the 458th Strategic Intelligence Detachment, 6th Army Headquarters, San Francisco, CA. He completed the Central Intelligence Agency's National Photo Interpretation Center (NPIC) Intelligence Officer/Photo Analyst course (NPIC is now the National Geo-Spatial Intelligence Agency or NGA).

Mr. Harman is certified as a Remote Pilot in Charge (RPIC) to operate small unmanned aircraft systems (sUAS) by the Federal Aviation Administration (FAA). He received a Professional Operator Certificate from DartDrones (Woburn, MA). He is a member of the Academy of Model Aeronautics.

Chronology of Employment

2001 – Present	Managing Partner, Harman Consulting LLC, Boston, MA
1995-- Present	Co-Director, GeoGraphics Laboratory, Bridgewater State University, MA
1995 – 2001	Independent Consultant, Boston, MA
1993 – 1995	Director of Transportation Research and Planning, EG&G Dynatrend, Inc., Burlington, MA
1989 – 1993	Director of Transportation Consulting, EG&G Dynatrend, Inc. Burlington, MA
1986 - 1989	Assistant Secretary for Public Transportation, MassDOT, Boston, MA
1985	Director of Transit Research and Planning, MassDOT, Boston, MA
1975 – 1985	General Manager and President, Call-A-Ride of Barnstable County, Inc., Hyannis, MA
1973 – 1975	Assistant Director for Regional Planning, South Florida Regional Planning Council, Miami, FL
1970 – 1972	Special Assistant to the President and Assistant Secretary of the University of Massachusetts, Boston, MA
1970	Special Assistant to the Board of Directors, Mass Bay Transportation Authority, Boston, MA
1967 – 1969	Community Planner, U.S. Dept. of Housing and Urban Development, Regional Office, San Francisco, CA
1966	HUD Assistant, U.S. Dept. of Housing and Urban Development, Washington, D.C.
1963 – 1965	Intelligence Officer/Photo Analyst, National Photo Interpretation Center, CIA, Washington, DC.

Related Research and Development Projects

- **Small Business Innovative Research (SBIR) Project, Phase III.** In cooperation with the BSU GeoGraphics Laboratory, Mr. Harman recently updated a US DOT Small Business Innovative Research project that proposed a BSU “Living Lab” to apply remote sensing from small unmanned aircraft systems (sUAS) to transportation infrastructure management in the Bridgewater (MA) Census Designated Place(CDP) that includes a U.S. Small Business Administration’s (SBA) Historically Underutilized Business Zone (HUBZone).
- **MetroWest (MA) Concept Exploration of small Unmanned Aircraft Systems and Remote Sensing for Intermodal Transportation Management.** Mr. Harman drafted a concept exploration document for a technology application project supported by the MetroWest Regional Transit Authority. The context for this research is focused on the development of a suburban intermodal transportation center between the cities of Boston and Worcester in the Commonwealth of Massachusetts (MA). The project uses micro-unmanned aircraft systems² (μUAS) as remote sensing platforms to plan, manage, and evaluate intermodal capital improvements at the commuter rail station in downtown Framingham related to the commuter rail service from Worcester to Boston.
- **Smart Cities Technology in Underserved Communities in Southeastern Massachusetts.** In a collaborative effort, the Institute for Policy Analysis and Regional Engagement (IPARE) and the GeoGraphics Laboratory (GeoLab) joined with the Southeastern Regional Planning and Development District (SRPEDD) to better understand issues of workforce development and transportation as they relate to the underserved population of the Southeastern Massachusetts Gateway Cities. A research project was developed to use geospatial analytical tools and a review of intelligent transportation systems (ITS) regional architecture to provide improved access to jobs, educational attainment and training for these populations. An accelerated project schedule was developed to acquire data, analyze these data, report on preliminary findings and recommend future work in a matter of weeks to accommodate the timeline of the academic calendar and optimize available resources. Mr. Harman was the principal investigator for the project and author of the final report.
- **Consensus Building for Data Standardization in Human Services Transportation Project: FTA Project MA-26-7214.** The Federal Transit Administration (FTA) and Bridgewater State University’s GeoGraphics Laboratory (BSU/GL) entered into a Cooperative Agreement (CA) to build consensus on a common data format for human services transportation (HST) to standardize data for the Mobility Services for All Americans (MSAA) Initiative of the Joint

² In this instance, μUASs are approximately 4.4 lbs (2kg), or less, when fully deployed with sensor and communications systems at take-off.

Program Office for Intelligent Transportation Systems (JPO/ITS). Mr. Harman was the Co-Principal Investigator and Co-Project Manager for the project under contract with the GeoGraphics Laboratory. He made presentations on behalf of the Federal Transit Administration throughout the U.S. and participated in an FTA Webinar on the topic.

- **Veterans Transportation Community Living Initiative.** For more than two years, Mr. Harman was a consultant to a consortium of non-governmental organizations (NGO's) working under contract to the Federal Transit Administration, the Department of Labor and the Veterans Administration that provided technical assistance to agencies providing "one-call/one-click" centers for veterans seeking access to services. In addition to general management consulting, Mr. Harman provided geo-spatial analytical tools for project management and support for developing open data standards and interoperability for human services and public transportation on a national scale.
- **Cape Cod Geographic Information System Analytics (GIS Analytics) Project, MA-37-X054.** This Cape Cod Commission-sponsored project analyzed the integration of the Cape Cod Regional Transit Authority's (CCRTA) electronic fare system (EFS) that integrated with the global positioning system (GPS) and the computer assisted scheduling and dispatching system (CASD) through the mobile data terminals (MDT) on fixed route and paratransit services. These real-time geographically-referenced data sets allowed for the development of "Big Data" operational analysis that could lead to better customer service at high transit use locations, better real-time transit information enroute through deployment of ITS infrastructure, and better planning and marketing strategies that can address the fast-changing needs of a regional transit economy. Mr. Harman was co-principal investigator and co-project manager for this GeoGraphics Lab project.
- **Smarter Cape Transit Project, MA-57-X028.** The Cape Cod Commission and CCRTA-sponsored Smarter Cape Transit Project researched and demonstrated (R&D) applications of state-of-the-art communications infrastructure to enhance mobility management on Cape Cod and Southeastern Massachusetts. One product of this R&D was a smartphone application for CCRTA fixed route service that included real-time location of CCRTA buses, NextBus© estimated time of arrival (ETA) predictions, and spatial context awareness on the individual's smart phone. The smartphone application included emergency notification features for transit consumers with disabilities. Another product was the automation of data requirements for the Google general transit feed specification (GTFS) that provides transit planning for consumers using smartphones and consumers. Mr. Harman was co-principal investigator and co-project manager for this GeoGraphics Laboratory project.
- **Transportation Demand Management Assessment, Technology Application Project (TAP) Remote Sensing and Transportation (RS&T) Program.** In this first round Technology Application Project for the U.S. Department of Transportation's (US DOT) Research and Special Projects Administration (RSPA), the GeoGraphics Laboratory developed geo-spatial analysis techniques

using high-resolution imagery to assess the effectiveness of transportation demand management (TDM) solutions associated with commuter rail park-and-ride facilities. As a part of this project, the use of model aircraft as remote sensing platforms for high-resolution imagery was introduced to address the problems associated with acquiring high-resolution satellite imagery. Specifications for small unmanned aerial vehicles (sUAVs) were developed and a prototype aircraft was built and tested at the GeoGraphics Laboratory featuring both aerial photography and real-time video downlinks. Mr. Harman was the co-principal investigator and project for the GeoGraphics Laboratory. Dr. Shama was an investigator on this project.

- **Remote sensing systems to improve the safety, security, efficiency and effectiveness of Bus Rapid Transit (SSEE_BRT) using mini-unmanned aerial vehicles (MAVs), SBIR Phase I, FTA 04-FT03.** This project document the rapid progress being made in developing the concept of a sustainable and cost effective approach to applying remote sensing systems and low-cost easy-to-fly MAVs for transportation safety and security in general and for Bus Rapid Transit systems, in particular. While it was not the focus of this study, collateral research of applications of geospatial technology indicate that the return on investment (ROI) of deploying SSEE_BRT Systems technology could be measured in orders of magnitude by providing more *efficient* service (lower unit cost) and more *effective* service (increased ridership), even without the safety and security enhancements. The project was conducted by Harman Consulting LLC. Mr. Harman and Dr. Uma Shama were co-authors of the report. An article on the project was published in *Rail Magazine*.
- **National Geo-Spatial Information Use Survey 2002 and 2003. FTA Transit Research, Demonstration and Innovation Project.** The GeoGraphics Laboratory conducted a web-based survey for the FTA of transit agencies using geographic information systems in 2002 and 2003. Mr. Harman was the principal investigator and project manager on this project. The data was used for a follow on study under TRB's Transit Cooperative Research Program (TCRP) *Synthesis 55: Geographic Information Systems (GIS) Applications*. Mr. Harman wrote Chapter 3, "Survey Findings of Transit Agencies, publishing the results of the FTA national GIS survey.
- **TRB's TCRP Synthesis 70: Mobile Data Terminals – A Synthesis of Transit Practice.** This synthesis reflects state-of-the-practice information from selected transit agencies surveyed across the United States, as well as very specific information on the capability of mobile data computers offered by technology vendors to the industry. The report also contains information about the rapidly changing wireless communications infrastructure that supports mobile data terminal (MDT) deployment in transit. TRB's awarded the project to Harman Consulting LLC. Mr. Harman and Dr. Shama were co-authors of the report.
- **Satellite Sensing and GIS Technology to Measure the Impact of Transit Investment on Land Use, SBIR Phase I, FTA 00-FT4.** This US. DOT SBIR Phase I Project was a landmark effort using imagery analysis and geo-spatial information to measure the impact of heavy rail transit development on land use and land value. The areas of interest were heavy rail extensions in Boston, MA, and Miami, FL. The project was carried out by Mr. Harman as LJH Consulting and

was assisted by Dr. Shama and the GeoGraphics Laboratory. The findings were featured in the April 2004 issue of *Rail* magazine.

- **FTA/NPS Cape Cod Transportation Partners Technology Project.** The GeoGraphics Lab was awarded a project by the FTA and the National Park Service (NPS) to design, test, and deploy an intermodal low-cost automatic vehicle location system on inter-city passenger ferries, intercity passenger buses, and local fixed route and paratransit shuttles serving the Cape Cod National Seashore and the Lower Cape Region. The project deployed the prototype intermodal AVL system in time for the summer season of 2007. Real-time web mapping was tested using Google Maps, Google Earth and Microsoft Virtual Earth. An estimated time of arrival (ETA) algorithm and intermodal messaging for passenger transfer was tested in the fall of 2007. Mr. Harman was the project manager. Mr. Harman and Dr. Shama were co-principal investigators.
- **NHTSA Remote Sensing and Spatial Information Technology Project.** This project was mandated by Congress as an earmark in the 2006 Transportation Appropriations Act. The resulting Cooperative Agreement between the National Highway Traffic Safety Administration and the GeoGraphics Laboratory focused on research and technology development that will assist the Federal and state agencies in evaluating programs to ticket aggressive cars and trucks (TACT). This project deployed low-cost cell-phones with assisted GPS to track trucks and buses with location, bearing, and speed at very high refresh rates over the wireless cellular network. These data were stored on very large databases and analyzed using SQL Server queries and geographic information systems for analysis of driver reaction to reckless driving, monitoring speed, deceleration, and evasive maneuvers. This project is also experimented with filming the driver view with mini-DV camcorders and internet cameras with spatial and time stamping. The project was completed in the summer of 2007. Mr. Harman and Dr. Shama were co-principal investigators for this project. Mr. Harman was the project manager
- ***Demonstration of Military Aerial Recon for Bus Operations.*** *In 1972, the University of Massachusetts' (UMass) Institute for Governmental Services (IGS) and the Massachusetts Bay Transportation Authority's (MBTA) Operations Directorate planned a demonstration of applying tactical intelligence analysis to solving the problems of bus operations on city arterials. The principal investigator at UMass/IGS was Lawrence J. Harman, Special Assistant to the President at UMass and former Special Assistant to the Chairman of the MBTA. An RF 101 reconnaissance jet aircraft was acquired from the Kentucky Air National Guard to fly a mission during an evening rush hour and early the next morning over downtown Boston, Massachusetts. The reconnaissance target was the MBTA's number one bus route from Dudley Square in Roxbury to Harvard Square in Cambridge. The Kentucky Air Force National Guard (KY AF NG) recon jet aircraft was equipped with a forward oblique camera in the nose and a vertical camera in the belly with a 6" focal length. The KY AF NG unit processed the imagery for the University and provided negative film imagery and paper positive aerial photography products. UMass IGS and the MBTA conducted imagery interpretation and analysis of the imagery using U.S. Army Intelligence methods and presentation techniques for MBTA policy makers. The project documented identified operational issues for providing high quality transit service in traffic congested downtown Boston including, failure to tow fifty (50) illegally parked vehicles twenty-six of which were in a tow zone, lack of enforcement of gridlock causing*

incidents (a twelve block long gridlock trapped eight MBTA busses along Massachusetts Avenue, and inadequate policing around construction sites. The inability to acquire no-cost military recon aircraft and imagery processing precluded the replication of these techniques until the availability of MAVs for monitoring transit infrastructure and operations. This seminal study led to the eventual deployment of sUAS for remote sensing of transit infrastructure thirty years later.

Recent Presentations and Publications

L. Harman and U. Shama, "Applying Remote Sensing from small-Unmanned Aircraft Systems (sUAS) to Transportation Infrastructure Management as a Small Business Innovative Research (SBIR) Service," A unpublished paper for the Office of Transit Innovation, Federal Transportation Administration, U.S. Department of Transportation, May 2017.

U. Shama and L. Harman, "Using Open Data on Health Care Services and Data Standards for Transit and Inter-City Bus Trip Planning for Statewide Rides to Wellness Geographic Information Systems," A presentation at the Annual Meeting of the Transportation Research Board (TRB)/National Academies of Sciences, Engineering, and Medicine (NASSEM), Washington, DC, January 2017.

L. Harman, "Exploring the Concept of Applying micro-Unmanned Aircraft Systems (mUAS) and Remote Sensing Technology (RST) to Interagency/Intermodal Transportation Management (ITM)" A Project Report for the MetroWest Regional Transit Authority, Framingham, MA, January 2017.

L. Harman and U. Shama, "Open Geographic Data for Transportation and Health Care – A GIS Club Sandwich for Rides to Wellness," A presentation at the NAS/TRB Conference on Rural Public and Intercity Bus Transportation, Asheville, NC, October 2016.

L. Harman, "Smart Mobility in Smart Places," A presentation at the NAS/TRB Conference on Rural Public and Intercity Bus Transportation, Asheville, NC, October 2016.

L. Harman, "Creating Web-based Videos for Small Urban and Rural Transit," A presentation at the NAS/TRB Conference on Rural Public and Intercity Bus Transportation, Asheville, NC, October 2016.

L. Harman, "Smart Mobility in a Smart Place," A presentation for the Young African Leadership Institute (YALI) Smart Cities/Smart Places Technology Module, Bridgewater, MA, summer 2016.

L. Harman, "Summary report of the Consensus Building for Data Standardization in Human Services Transportation," FTA Project MA-26-7214, for the Office of Transit Research and Innovation, Federal Transit Administration, August 2016.

U. Shama and L. Harman, "Demonstrating Real-Time Web-based Mapping of Inter-regional Intermodal Passenger Transportation," A presentation for GeoSmart India 2016/Geo Intelligence Asia 2016, Greater Noida, India, March 2016.

L. Harman, "Summary Report -- Integrated Cape Cod Mobility Management Technology Project – 2013 to 2015". MA-57-X028 (Mobility Management Technology Project) and MA-37-X154 (Geographic

Information System Decision Support Environment), for the Cape Cod Commission and the Cape Cod Regional Transit Authority, March 2016

L. Harman, "Perspectives on Standardizing Data Interfaces to Enhance Human Services/Demand Responsive Transportation," A Presentation at the ITS Passenger Transportation Systems and Services Conference, Washington, DC, January 2016.

L. Harman and U. Shama, "Precision Transit on Cape Cod 2015 – Providing Ladders of Opportunity," A plenary session presentation at the 16th Biennial Federal Transit Administration State Programs Meeting and State Public Transportation Partnership Conference, Washington, D.C., August 2015.

L. Harman, "From Veterans Transportation to Mobility on Demand", A Pecha Kucha Slam Presentation, Community Transportation EXPO, Tampa, FL, June 3, 2015.

L. Harman, "How We Can Use Digital Mapping and Big Data to Plan and Evaluate our Transit Services," An Interactive Presentations at the Conference on Implementing Technology, Community Transportation Association of America, Tampa, FL, June 2, 2015.

L. Harman, "Data Standardization – A Case of Program Serendipity – Where Theory Meets Reality," A presentation at the FTA Community Mobility Programs Session, NAS/TRB International Paratransit Conference, Conference Monterrey, CA, October 2014

L. Harman, U. Shama, C. Van Zandt, D. Walsh, "Connecting Inter-City Bus and Regional Transit Using GTFS Real-Time Concepts for Web AVL Mapping," A Presentation at the NAS/TRB National Conference on Rural Public and Intercity Bus Transportation, Monterrey, CA, October 2014.

L. Harman, U. Shama, D. Walsh, "Inter-regional and Intermodal GTFS Database Development," NAS/TRB National Conference on Rural Public and Intercity Bus Transportation, Monterrey, CA, October 2014.

L. Harman, "The Veteran's Transportation and Community Living Initiative – Inter-regional, intermodal, interoperability in Massachusetts and New England." A presentation at the Annual Conference of the Massachusetts Regional Transit Authorities (MARTA), Lennox, MA, Sept 2014.

L. Harman, "Challenges in Interagency Transit Services Coordination," A Presentation at the 2014 National Rural ITS Conference, Branson, MO, August 2014.

S. Parker, L. Harman, and N. Srinivasan, "The Future of Transit is Here: Rides on Demand Can Be Better Than (and Almost as Fast as) Driving Yourself," A Presentation at the Intelligent Transportation Systems World Congress, Tokyo, January 2013.

L. Harman and U. Shama, "Cape Cod Transit is Smart Transit and About to Get Smarter," A Presentation as a part of the Federal Transit Administration's Webinar on Customer Information Systems," Washington, D.C., June 13, 2013.

L. Harman, "The Cape Cod e-Transit Village Project," A Presentation at the Mobility on Demand and Remotely Operated Vehicles Session, TransITech Conference, American Public Transit Association, Phoenix, March 2013.