ITS

intelligent transportation systems

511
TRAVEL INFO CALL 511

Florida Department of Transportation
Intelligent Transportation Systems Program

Annual Report
Fiscal Year 2006-2007

STATE OF FLORIDA · DEPARTMENT OF TRANSPORTATION

SUNGUIDE™

General Content

ITS Program Highlights

Vision Statement

Provide support and expertise in the application of Traffic Engineering principles and practices to improve safety and mobility.

Mission Statement

Provide leadership and serve as a catalyst in becoming the national leader in mobility.

Florida Department of Transportation

Dear Reader,

On behalf of the Florida Department of Transportation ITS Program, we are pleased to present this Annual Report for fiscal year 2006-2007.

This year marked a productive year—much of the work centered around Florida's 511 Traveler Information Services. Two new regional 511 services, the Northeast and Southwest systems were initiated this year bringing the total to five operational services across the state. The Northeast Florida 511 Service was launched by District 2 in October 2006; and the Southwest Florida 511 Services was launched by District 1 in April 2007. In addition, the Statewide/Central Florida 511 Service was upgraded to include MyFlorida 511 services allowing users to personalize delivery of information.

We are also currently procuring the "next generation" 511 service that will integrate the existing regional traveler information services into a single comprehensive statewide service. The goal is to improve the quality of services offered to our users and the travelling public.

We continue to focus our efforts on ITS performance measures. The ability to measure incident duration, congestion and travel time reliability, and customer satisfaction will allow us to determine the impacts ITS deployment have made.

Work continues on other on-going projects, such as our SunGuide™ Software and our center-to-center communications efforts. Major milestones have been accomplished and many more remain to be reached.

The future holds plans for many new initiatives and accomplishments. Stay tuned, we hope you will be hearing about them soon.

Elizabeth Birriel

Elizabeth Birriel, PE
Deputy State Traffic Operations Engineer
ITS Program Manager

Florida's Transportation Future

Florida's Growth Fast Facts

Over the past several years, transportation demand in Florida has grown at a rapid pace. In order to meet future demands, Florida is focusing on statewide transportation corridors. These are corridors that connect Florida to other states, or that connect two or more economic regions within Florida. The following is a collection of indicators showing the anticipated future growth in Florida.

Population

⊙ Population growth has hovered between 2.0 and 2.6 percent, since the mid 1990's. Over the forecast horizon, population growth will slow – averaging just 1.1percent between 2025 and 2030.

⊙ As of July 2006, Florida's population was over 18 million and was ranked the fourth most populous state. By 2025, Florida is on track to break the 20 million mark and become the third most populous state – surpassing New York.

⊙ Florida's population is projected to increase to more than 26 million by 2030, an increase of over 67 percent from 2000 levels.

Commerce

⊙ Florida has the fastest growing job market in the nation, adding about 212,600 new jobs from December 2005 to December 2006.

⊙ Florida's unemployment rate has been below the national average since 2002.

⊙ Florida is the fourth ranked state in the nation for high-tech workers.

⊙ With $110 billion in 2006 trade, and its multi-cultural population, Florida is a national leader in international commerce.

⊙ Florida hosts some 2,000 firms from other countries, including 300 regional corporate headquarters.

⊙ Exports originating from Florida totaled $44 billion in 2005, a 52 percent increase over 2004.

⊙ Florida's $674 billion Gross State Product is the fourth largest in the nation.

⊙ More than 83 million out-of-state tourists came to Florida in 2005, a 92 percent increase over the past ten years. This number could exceed 145 million by 2030.

Transportation Infrastructure

⊙ Florida land transportation includes four interstate highways, 41,900 lane-miles of state highway, nearly 3,000 miles of rail, and 18 local and regional transit systems.

⊙ The 2005 federal highway bill (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) brings $10.4 billion to Florida through 2011.

⊙ No place in Florida is more than 90 miles from one or more of 14 deep-water seaports.

Overall Vision

To ensure that Florida's transportation system meets future demands, the Florida Department of Transportation (FDOT) is working to achieve the following mission:

FDOT's Mission

Provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of our environment and communities.

To achieve this mission, four primary goals were established— safety, systems management, economic competitiveness, and quality of life.

FDOT's ITS Program Mission

To provide effective Intelligent Transportation Systems for Florida's travelers that enhances the safety and mobility of people and goods, economic competitiveness, and the quality of our environment and communities by serving commuters, tourists, commercial vehicles, and evacuees.

FDOT's Commitment to ITS

FDOT maintains a State Highway System of more than 12,000 centerline miles and 41,473 lane miles. According to the FDOT *Five-Year Work Program*, $8.3 billion was budgeted in this fiscal year to support Florida's transportation needs. As part of its annual program, FDOT made significant investments in ITS and is committed to investing approximately $850 million between 2002 and 2016.
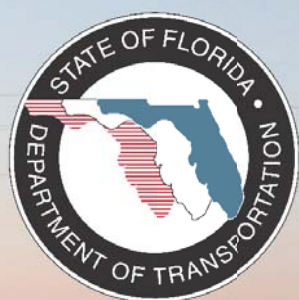
FDOT's ITS Program Areas

FDOT's Traffic Engineering and Operations Office coordinates and promotes the deployment of ITS throughout Florida. The ITS staff is led by Elizabeth Birriel, P.E., Deputy State Traffic Engineer—ITS Program Manager.

Florida's ITS is organized into the following program areas:

- ITS Management/Deployments—*Gene Glotzbach, P.E.*
- ITS Software, Architecture, and Standards—*Trey Tillander, P.E.*
- Telecommunications Program Management—*Randy Pierce*
- Traffic Systems—*Liang Hsia, P.E.*

ITS Management/Deployments

- Promote ITS deployments on Florida's roadways, develop standards, maintain the ITS Strategic Plan, and implement a systems engineering process to support procurement and deployment of ITS
- Deploy advanced traveler information systems and 511
- Provide technical support and assistance to FDOT's District Offices and other partners
- Manage the *Ten-Year ITS Cost Feasible Plan*
- Continue research in the use and deployment of transponders, license plate readers, and other communications devices as probes for real-time traffic data and statistics for planning
- Manage the Federal ITS Discretionary Grant Program
- Support the I-95 Corridor Coalition through the co-chairmanship of the Travel Information Services Program Track

ITS Software, Architecture, and Standards

- Manage the SunGuide™ Software System for freeway and incident management, transportation management center interoperability, and reporting
- Manage the FDOT Ramp Metering Software System for ramp meter control and monitoring
- Manage the *Statewide ITS Architecture* to promote integrated ITS regions, corridors, and projects
- Promote and coordinate the statewide use of robust, non-proprietary ITS standards
- Coordinate ITS training to enhance the quality and quantity of the state's ITS workforce
- Develop and update ITS standards and specifications

Telecommunications Program Management

- Guide deployment of a communications backbone to serve ITS deployments on major corridors

- Implement and manage the Statewide ITS Wide Area Network (WAN) to support ITS deployments

- Manage the operations and maintenance program for the statewide ITS telecommunications network to support ITS deployments, motorist aid call boxes, and various ITS research and development initiatives

- Manage all FDOT Federal Communications Commission radio licenses

- Manage the Wireless General Manager Agreement, a resource sharing public/private partnership which places commercial wireless carriers on FDOT rights-of-way, with Lodestar/American Tower

- Develop operations standards and equipment specifications to support District telecommunications initiatives in their ITS, Maintenance, and Traffic Incident Management programs

Traffic Systems

- Develop, test, maintain, update, and publish minimum standards for traffic control systems and devices; and evaluate and certify these systems and devices for use in Florida

- Develop, implement, and maintain quality assurance and certification programs through the Approved Product List (APL)

- Provide testing and change management for ongoing development and updates of the state's SunGuide™ software with corresponding devices

- Conduct the Traffic Engineering Research Laboratory (TERL) testing and research programs

- Maintain and update traffic operations and ITS device asset inventory for quality assurance and certification record

- Perform traffic operations and ITS and communications testing

FDOT's ITS Program Accomplishments

Florida's ITS Program accomplishments are numerous. The following is a list of the Fiscal Year 2005-2006 major accomplishments.

ITS Management/Deployments

- Updated the *Ten-Year ITS Cost Feasible Plan.*

- Promoted 511 traveler information in Florida with continued support to Districts 1 and 2 for the provision of data to the statewide 511 traveler information system.

- Developed functional requirements and procurement documents for the Next Generation 511 traveler information system.

- Participated in the solicitation and negotiation processes to select a vendor to supply the Next Generation 511 information dissemination component and finalized negotiation with Southwest Research Institute to supply the data fusion component.

- Developed Invitation to Negotiate procurement documents for the Next Generation 511 marketing component.

- Produced *Florida's 511 Progress Report, Next Generation—The Sky's the Limit*, an annual report for 2006.

- Started development of procurement documents for a cellular phone probe data collection effort along I-10 to provide travel times in support of 511.

- Provided support to District Traffic Operations and Work Program staffs to update the Districts' portions of the *Ten-Year ITS Cost Feasible Plan*.

- Provided post-award support to District 1's Traffic Operations with the Interstate 75 ITS deployment project.

- Provided post-award support to District 2's Traffic Operations Office with the Phase IV Interstate 95 North ITS Expansion.

- Provided post-award support to District 2's Traffic Operations Office with the Phase V Interstate 295 projects.

- Provided support to evaluate equipment supplied through the Invitation To Bid for the procurement of ITS field devices and transportation management center equipment to support Districts 2's Phase V Interstate 295 project.

- Completed assisting in development of District 3's design plans for fiber deployment (Phase I) of the Bay County advanced traffic management system (ATMS).

- Developed a draft set of 100 percent plans for District 3's Bay County ATMS deployment (Phase II), which is now under review with attention to utilizing a procurement process that allows bid alternates.

- Provided oversight to District 3 for the installation and testing of dynamic message signs in the Tallahassee area, a Federal Grant project to support the Amber Alert process.

- Provided quality assurance support to the Traffic Engineering Research Lab.

- Provided support to the Traffic Engineering and Research Lab for development of an ITS lab to test the operability of ITS equipment, utilizing the SunGuide software.

- Developed Invitation to Negotiate procurement documents for a license plate reader project in the Tallahassee area. Currently in the process of selecting a vendor to deploy the license plate readers.

- Continue to operate the Change Management Board and process engineering change proposals.

- Continue to produce the *SunGuide™ Disseminator* (FDOT's Traffic Engineering and Operation's monthly newsletter).

- Exhibited at ITS America's 2007 Annual Meeting and Exposition in Palm Springs, California, to showcase FDOT's ITS accomplishments.

- Held the Annual FDOT ITS Working Group Meeting to showcase ITS in the state of Florida, in April 2007.

- Provided support to FDOT's Public Transportation Office for their Resource for Advanced Public Transportation System Program.

- Continued work on developing ITS performance measures by researching ways to collect data to establish a uniform method to determine incident response times and travel time reliability.

ITS Architecture, Software, and Standards

⊙ Conducted SunGuide™ Software Release 2.2 Independent Validation and Verification at the District 4 Broward County regional transportation management center (RTMC).

⊙ Deployed the SunGuide Software in the Districts 5 and 7 RTMCs and the Traffic Engineering Research Lab.

⊙ Provided the SunGuide Software to the University of Central Florida and Florida International University to assist with FDOT-sponsored research projects.

⊙ Enhanced the SunGuide Software by developing additional closed-circuit television, event management, Road Ranger, and performance measures functionality; and deployed these enhancements in the District RTMCs.

⊙ Began development of the SunGuide Software Release 3, consisting of the Event Management, Reporting, 511, and Road Ranger/Automated Vehicle Location subsystems.

⊙ Developed requirements for a future SunGuide Software release to provide probe travel time functionality.

⊙ Developed a Concept of Operations for an interface between SunGuide Software and the Florida Highway Patrol Computer-Aided Dispatch systems.

⊙ Coordinated the provision of SunGuide detector and travel time data to the central data warehouse research project.

⊙ Presented at ITS America's 2007 Annual Meeting and Exposition regarding software procurement and the SunGuide Software.

⊙ Designed and developed the FDOT Ramp Metering Firmware.

⊙ Installed, configured, and tested the FDOT Ramp Metering Firmware and SunGuide Ramp Metering subsystem in District 6.

⊙ Updated the Statewide ITS Architecture to enhance transit operations.

⊙ Coordinated DYNASMART-P Mesoscopic Simulation and Federal Highway Administration Contracting training.

⊙ Developed and provided SunGuide Software Operator initial and follow-up training.

⊙ Continued monitoring use of completed specifications developed for General Requirements for ITS Devices (Section 780), Motorist Information Systems (Section 781), Video Equipment

(Section 782), Fiber Optic Cable and Interconnect (Section 783), Network Devices (Section 784), and Infrastructure (Section 785).

⊙ Performed technical reviews and provided support for project-specific requests related to specification modification.

⊙ Maintained current draft documents for future specification committee review and potential adoption. These drafts serve the FDOT's commitment to continuous improvement by incorporating beneficial modifications and additions based upon user feedback and lessons learned through direct use.

⊙ Completed ITS device specifications for:
   • Vehicle Detection and Data Collection (Section 786),
   • Roadway Weather Information Systems (Section 781), and
   • Field Cabinets and Equipment Shelters (Section 785).

⊙ Updated the design criteria for ITS devices and systems in the *FDOT Plans Preparation Manual* to incorporate the newly developed device specifications.

Telecommunications Program Management

⊙ Awarded a contract for installation of the ITS Wide Area Network (WAN) project connecting the regional transportation management centers (RTMCs) in Districts 4 and 6, Florida's Turnpike Enterprise (south), and the Traffic Engineering Research Lab (TERL).

⊙ Completed the field data collection portion of the fiber management tool project in Districts 4 and 6, and the southern portion of the Florida's Turnpike for development of a statewide facility management system to enable the Districts to manage their overall telecommunications networks, their field system configuration, and its components.

⊙ Awarded a 5-year contract for maintenance of the Statewide Telecommunications Network covering the ITS WAN, Statewide Microwave System, Motorist Aid System fixed site equipment, and related systems.

⊙ Added eight wireless collocations under the Lodestar/American Tower Wireless General Manager Agreement and completed the Lodestar tower new-build structure at Immokalee Road on I-75.

⊙ Completed deployment of the permanent emergency backup power generators, for continuity during power outages, at 12 microwave system locations using revenues from the Lodestar/American Tower Agreement.

- Completed the design of permanent emergency backup power generators, for continuity during power outages, at five additional microwave system locations.

- Completed the design of a replacement telecommunications equipment shelter at an operational microwave system site in District 2.

- Completed construction of the Repeater Deployment for the 47 MHz radio system in Districts 2 and 3.

- Completed the design of the Repeater Deployment for the 47 MHz radio system in District 6.

- Completed a research project by Florida International University on the use of cellular telephones as traffic probes to report travel times for ITS use.

- Completed a research project with University of North Florida on viability of RWIS instrumentation for use in assisting with ATIS data.

- Completed the integration design to add Turnpike network control and surveillance to the Statewide Telecommunications Network management system.

Traffic Systems

- Developed a statewide ITS quality assurance and certification program.

- Setup and update the following laboratories:
    o   Traffic Operations Systems Laboratory
    o   ITS Laboratory
    o   ITS Wide Area Network Operations and Management

- Evaluated ITS products for statewide procurement.

- Performed end-to-end system testing of various SunGuide™ software components and field devices, including the initial independent verification and validation testing of ramp metering firmware, equipment, and software developed for deployment in FDOT District 6.

- Worked to establish partnerships with the American Association of State Highway and Transportation Officials (AASHTO) ITS Standards Testing Program for the evaluation of the National Transportation Communications for ITS Protocol (NTCIP) 1205 Closed-Circuit Television Standard.

- ◉ Participated in the NTCIP 1204 Joint Committee for Environmental Sensor System protocol development, deployment, and refinement.

- ◉ Participated in FDOT Geographic Information System (GIS) Functional Steering Committee regarding ITS and other traffic operations GIS applications.

- ◉ Developed and updated multiple minimum functional specifications for equipment used within FDOT Traffic Operations, including traffic control devices and ITS equipment.

- ◉ Managed the following research projects:
    - o Statewide central data warehouse prototype;
    - o FDOT NTCIP communication requirements for signal controllers, cameras, and center-to-center transportation management center communications;
    - o Quality assurance and review for field devices;
    - o Real-time route diversion system prototype;
    - o Crash pattern prediction using real-time ITS data; and
    - o Impact of detection and communication degradation on traffic management systems operation.

- ◉ Provided central receiving, inspection services, and coordinated corrective action required to successfully purchase and deploy portable incident management field devices for statewide deployment.

- ◉ Managed the TERL operations, including NTCIP standards testing, approved product list, vendor qualification program management, dynamic message sign (DMS) qualification program management, display properties testing for LED traffic signals and DMSs, and travel time and delay software development.

Florida Department of Transportation Launches Two Regional 511 Traveler Information Systems

Better information is now available to residents of Northeast Florida (Jacksonville) and to residents of Southwest Florida, including Sarasota, Ft. Myers, and Naples.

Over the last year, the FDOT has improved the traveler information available to residents of the Northeast Florida (Jacksonville) and Southwest Florida regions—representing approximately 2.5 million people—by developing regional subsystems to its already successful statewide 511 service. Northeast Florida launched in October 2006 and Southwest Florida in April 2007, providing greater detail on more roadways than is available in the Statewide 511 Service, and also providing information on transit alternatives and airports. Residents is southwest and northeast Florida are now able to access information similar to that provided by Florida's other regional 511 services in central and southeast Florida, and the Tampa Bay area.

Filling a Need

One part of the solution to the state's growing congestion problem is providing accurate,

By Gene Glotzbach, FDOT and
Michael Berman, PBS&J

timely information to travelers when and where they need it. FDOT has been making this information available since 2002, with regional services and the more recently launched statewide system. The northeast and southwest Florida regions were identified several years ago as good candidates for regional 511 services, due to ever-increasing population and economic growth. Because the statewide service launched (November 2005) during the planning process for these two services, FDOT decided to build these regional systems as "branches" off of the statewide service, rather than deploying them as separate entities. This decision allowed FDOT to leverage existing resources, saving time and money during the development process.

Building the Northeast Florida 511 Service— Using Existing Projects

The Northeast Florida 511 Service relies heavily on existing assets in FDOT District 2. Because District 2 was already planning a procurement to hire a contractor to operate its traffic management center (TMC), staff simply included 511 operations as a component of that contract, enabling one operations contractor to provide TMC and traveler information functions. The operations contractor is able to use its own data as well as information from District 2's freeway management system for the 511 service. The information is then sent to the statewide 511 interactive voice response system, which was modified to allow for the more detailed information in the

REGIONAL FLORIDA 511 SERVICES
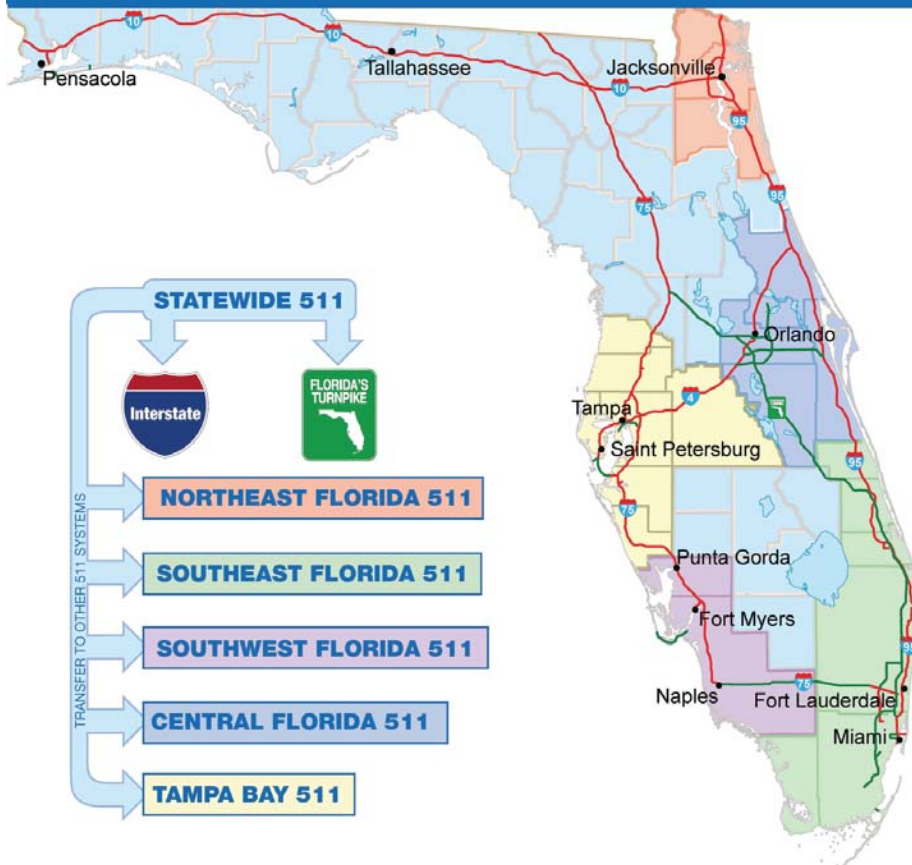
Northeast Florida region, as well as to a northeast Florida-specific 511 Web page (www.jax511.com/), which is also available as a link from the statewide 511 Web page. FDOT launched the Northeast Florida 511 Service on October 26, 2006, in time to provide traffic information for the Florida vs. Georgia football game.

Building the Southwest Florida 511 Service—Starting with a Blank Slate

Typically, 511 and traveler information services take existing transportation data (such as travel speeds, construction information, and information about current conditions), combine it in a database, and provide it to the public over a 511 telephone system and a Web page. Because District 1, which has jurisdiction over the areas covered in the Southwest Florida 511 Service, is just in the process of developing its own freeway management system, and thus has neither real-time traffic data nor a TMC, this service required more creativity. The ultimate solution includes:

- Use of a contractor (Traffic.com) responsible for: (a) entering incident and construction data and (b) providing automated (speed sensor) traffic data on Interstate 75 through Collier, Lee, and Charlotte Counties;

- Use of a conditions reporting and data fusion system (provided by GEWI GmbH, a European company based

in Germany) to consolidate incident, construction, and speed data, and provide the information to travelers via both the 511 phone system and a Web page;

- Modifications to the Statewide 511 Service to support more detailed information on roadways in the southwest Florida region; and

- Development of a new regional 511 Web page (www.southwestflorida511.com/) which is also available as a link from the statewide 511 Web page.

The Southwest Florida 511 Service was successfully launched in April 2007 using operator entered data. The automated speed data collection is scheduled to be added later in the summer of 2007, allowing travel time information along I-75 to be integrated with the incident and construction/event data on the service.

What's Next for the Regional Systems?

The northeast and southwest Florida services are achieving their goals of providing more detailed traveler information on more regional roadways to residents of these areas. However, these services were not intended to be long-lasting; they will stay in operation until the launch of the Next Generation 511 Service, currently slated to launch in the late-2008.

Next Generation

—Florida's 511 Service

By Gene Glotzbach, FDOT and
Erik Gaarder, PBS&J

Florida has come a long way since 2000 when the Federal Communications Commission assigned the 511 dialing code for the provision of telephone-based transportation information on a national basis.
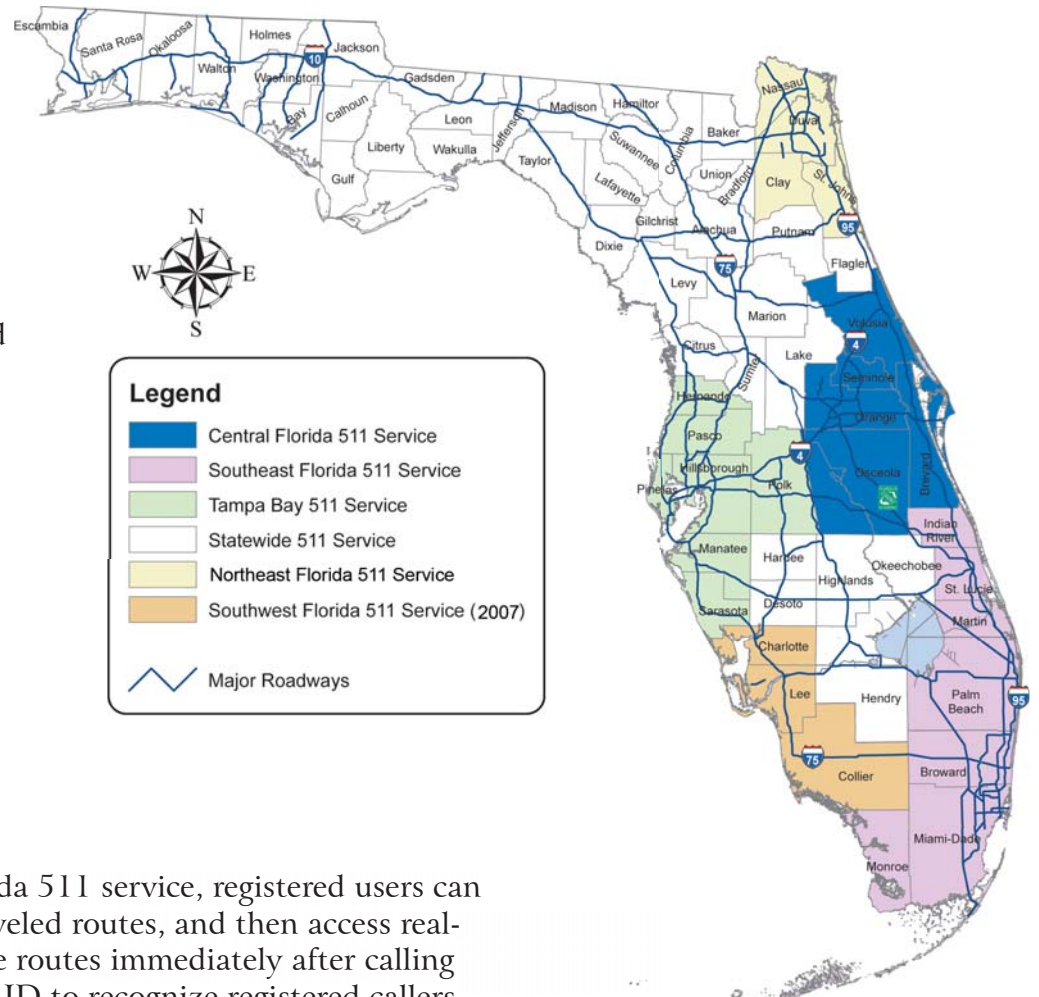
The Sky's the Limit

The year 2006 was highlighted by the launches of the Northeast Florida 511 Service in October and the MyFlorida 511 Service in December. Progress continued into early 2007 when the Southwest Florida 511 Service was added to the Statewide 511 Service. FDOT now offers 511 and other traveler information service to the entire Florida population.

FDOT has achieved high levels of customer satisfaction, but is still seeking to improve the levels of service offered to users through the procurement of a next generation 511 service which will integrate the state's five existing regional traveler information services into a single comprehensive statewide 511 service.

In 2006 Florida's 511 services surpassed a total of 17 million calls since inception of the first two regional systems in 2002. Studies conducted during mid-2006 indicate that the audience for 511 continues to grow, accounting for up to 30 percent of all calls across the nation; and that 511 users have a generally high level of trust in the quality of information provided. In order to continue to increase awareness of 511, FDOT is developing a comprehensive statewide marketing program that includes establishment of relationships with both the media and other public agencies capable of offering promotional assistance for 511 and related services.

Legend

- Central Florida 511 Service
- Southeast Florida 511 Service
- Tampa Bay 511 Service
- Statewide 511 Service
- Northeast Florida 511 Service
- Southwest Florida 511 Service (2007)
- Major Roadways

With the launch of the MyFlorida 511 service, registered users can now pre-program frequently-traveled routes, and then access real-time travel information on those routes immediately after calling 511. MyFlorida 511 uses Caller ID to recognize registered callers who are asked if they want to hear reports on their pre-programmed routes. This service is the first in the country to utilize this technology.

Use of Florida's 511 services has grown steadily since inception of the Central and Southeast Florida services in 2002. Since that time, Florida's 511 services have, on average, accounted for between 20 to 40 percent (depending on the time of year) of the 511 calls from all statewide and regional services in operation nationwide.

Percentage of Nationwide 511 Calls Made in Florida
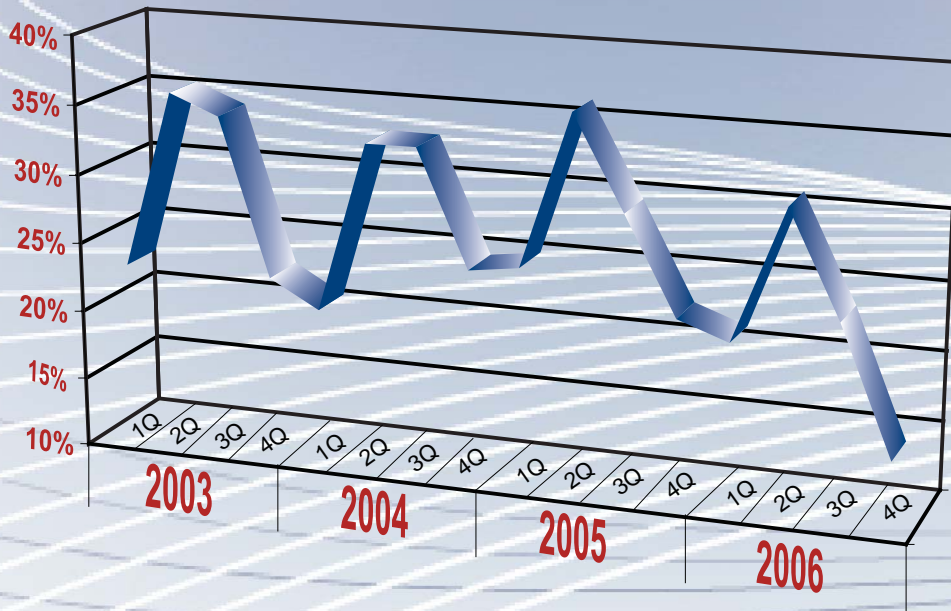
During 2006, call volumes dropped off somewhat from the high of over five million experienced in 2005, which is thought to be the result of an unusually active storm season. It is believed that this drop in calls stemmed from two primary factors:

1. A lack of severe weather during the summer of 2006, and

2. Switching of the Southeast Florida phone service from touch-tone entries to automated speech recognition for the interactive voice response system; which resulted in a brief drop in call volumes while users learned how to use the new service.

The Next Generation

Florida currently uses a regional approach to providing traveler information, allowing each service to act as a stand-alone service that provides its own data collection, data fusion, and data dissemination services. The nature of this service architecture results in 511 callers in most areas being connected directly to one of the regional 511 services or the statewide 511 service based on the physical coverage area from which their call originated. However, for the Northeast and Southwest Florida services, callers are connected first to the statewide service where they may request a transfer for detailed regional information. While these efforts have proven highly effective, opportunities remain to improve service to the traveling public by directly integrating the regional traveler information into a single source for statewide traveler information.

All of the state's existing regional advanced traveler information system (ATIS) projects are scheduled to reach the end of their contractual terms in 2008. This situation provides the FDOT with an opportunity to introduce a new approach to providing traveler

information. To this end, on February 28, 2007, FDOT initiated an Invitation to Negotiate (ITN) procurement process aimed at securing the next generation of ATIS services for the state of Florida. This next generation system will eliminate the regional services and branches of the 511 service so that callers will always have the ability to receive detailed traveler information for any part of the state without the need to transfer between co-existing regional 511 services.

The rationale behind this new approach to 511 is to:

- Avoid redundant spending on multiple regional 511 services

- Eliminate inconsistencies in service delivery across the state

- Eliminate regional call routing issues and call transfer requirements

- Lower operating and maintenance costs

- Enhance FDOT District coordination

- Better meet stakeholder needs

STATEWIDE REPORTING MAP

511

STATEWIDE 511

I-4, I-10, I-75, I-95, I-110, I-175, I-195, I-275, I-295, I-375, I-395, I-595, Florida's Turnpike

CENTRAL FLORIDA 511

TAMPA BAY 511

SOUTHEAST FLORIDA 511

NORTHEAST FLORIDA 511

SOUTHWEST FLORIDA 511
Coming in 2007

A Free Service of FDOT

It is anticipated that the service developed, based on the outcome of the ITN, will begin operation during the latter half of 2008 and include five years of operations and maintenance.

Staying Focused

In 2006 Florida's 511 services attained an exceptional level of success. This level of success continued during early 2007 with the Southeast Florida 511 Service recently surpassing the 10 million caller mark! Although this gives FDOT reason to celebrate, there is a need to stay focused on working together to continue expanding and improving 511 services across the state. Only by doing so can we assure maintaining the upward velocity necessary to give Florida the lift it needs to stay at the forefront of 511 service provision in the nation.

ITS Performance Measures For Florida— *Developing a Performance Measure For Travel Time Reliability*

By Elizabeth Birriel, FDOT and
Kenneth Voorhies, Cambridge Systematics, Inc.

Over the past three years, the FDOT ITS Program has been committed to identifying and developing ITS performance measures that show the effectiveness of deployed ITS. These ITS performance measures will be used to identify areas that need improvement and areas that already meet or exceed the expectations of Florida's travelers.

In the past year, the FDOT ITS Program has worked toward developing a travel time reliability performance measure. Travel time reliability refers to the variation in travel times over a history. That is, travel times on a route or in a network are never the same from one time period to the next. A variety of factors interact to produce unreliable travel times, and most of these relate to events that occur on the highway system in variable fashion, such as incidents, weather, work zones, and special events.

In fall 2006, a list of reliability performance measures that would be collected and reported statewide was defined by the ITS Program. It was determined that the primary reported measures would be the buffer time index and Florida on-time arrival measure. Both of these measures, along with several other reliability measures, such as the travel time index and delay, all use the same base data (either speed that is converted to travel time or directly measured travel time). Since the travel time data will be collected, it was decided that these secondary measures could also be calculated and reported. In December 2006, FDOT staff and their consultants began to review reliability definitions and SunGuide™ Software Version 3.0 functional requirement statements. The SunGuide Software Version

3.0 release will include data collection and travel time reliability reporting along with other speed-related measures when it becomes fully operational in fall 2007.

In order to continue the progress of the reliability measurement efforts, a Travel Time Reliability Workshop was developed and held in the FDOT Central Office on May 29-30, 2007. Workshop attendees included FDOT staff from the ITS Program, the Planning Office, FDOT management, and several consultants assisting the FDOT in projects relating to travel time data collection and analysis. This workshop provided background information on:

- The need for reporting travel time reliability and issues with collecting and reporting reliability,

- The status of reporting reliability in other states,

- The obstacles to reporting reliability in Florida, and

- Recommendations for FDOT to move forward in reporting reliability as a performance measure.

The workshops findings are summarized in the following paragraphs.

Status of Reliability Reporting in Florida

Through the ITS Performance Measures project, FDOT has identified reliability metrics. The primary metrics are buffer time index for operations and on-time arrival for planning. Secondary measures will include travel time index and delay. All reliability measures are based on travel time distribution data.

Data needs for reporting reliability have been identified. The data will be either speed data from roadside detectors that communicate in real time to transportation management centers (TMCs) or probe data from various sources that report travel time directly.

The FDOT ITS Performance Measures project is making progress on data collection at the District level. The project team has been in contact with Districts 2, 4, 5, 6, 7, and the Florida Turnpike Enterprise concerning obtaining detector speed data. These Districts expect to be able to provide speed data in 2008. Districts 1 and 3 have indicated that data will be provided when it is available.

The prototype central data warehouse (CDW) is under development by the University of Florida, under the direction of Dr. Ken Courage. The prototype is expected to be completed in fall 2007. Implementation of the CDW is expected to begin in 2008. The SunGuide software for TMCs is being configured to feed reliability and incident data into the CDW.

The FDOT Planning Office is investigating models for estimating statewide reliability. A project to develop a model for estimating reliability is being conducted by the University of Florida, under the direction of Dr. Lily Elefteriadou. This model development is also waiting for quality speed data to be available from FDOT Districts.

Reliability Issues

Many states are beginning to try reliability reporting, but none have succeeded to date. Several over arching issues have been identified in previous work on reliability. Reliability is a significant factor

affecting customers and needs to be measured and addressed. Commuters, tourists, and freight interests all face highly variable conditions and all are interested in obtaining information on that variability. Reliability is a way to measure the influence of nonrecurring events that cause great disruption, such as incidents, weather, work zones, and special events. Because these nonrecurring events have a large effect on the transportation system, reliability measures indicate the effectiveness of system operations.

The sources of delay need to be tracked so that causes and solutions can be identified. Recent national studies estimate the causes of delay are as shown in the following congestion graph.

The average of travel time doesn't tell the full story; historically, traffic conditions are reported as an average. However, travelers experience and remember the variability in travel time for their trip. Travelers don't think in terms of the average travel time, but the longest travel time.

Obstacles to Implementing Reliability Measurement in Florida

Two major obstacles to implementing reliability measurement were identified in the workshop: FDOT management expectations and data limitations. The issues with management expectations are addressed by stating several questions that must be answered:

- When is reliability reporting needed?

- How should reliability be presented?

- How should reliability measurement activities within the FDOT be coordinated? Operations, Strategic Intermodal System (SIS), Planning?

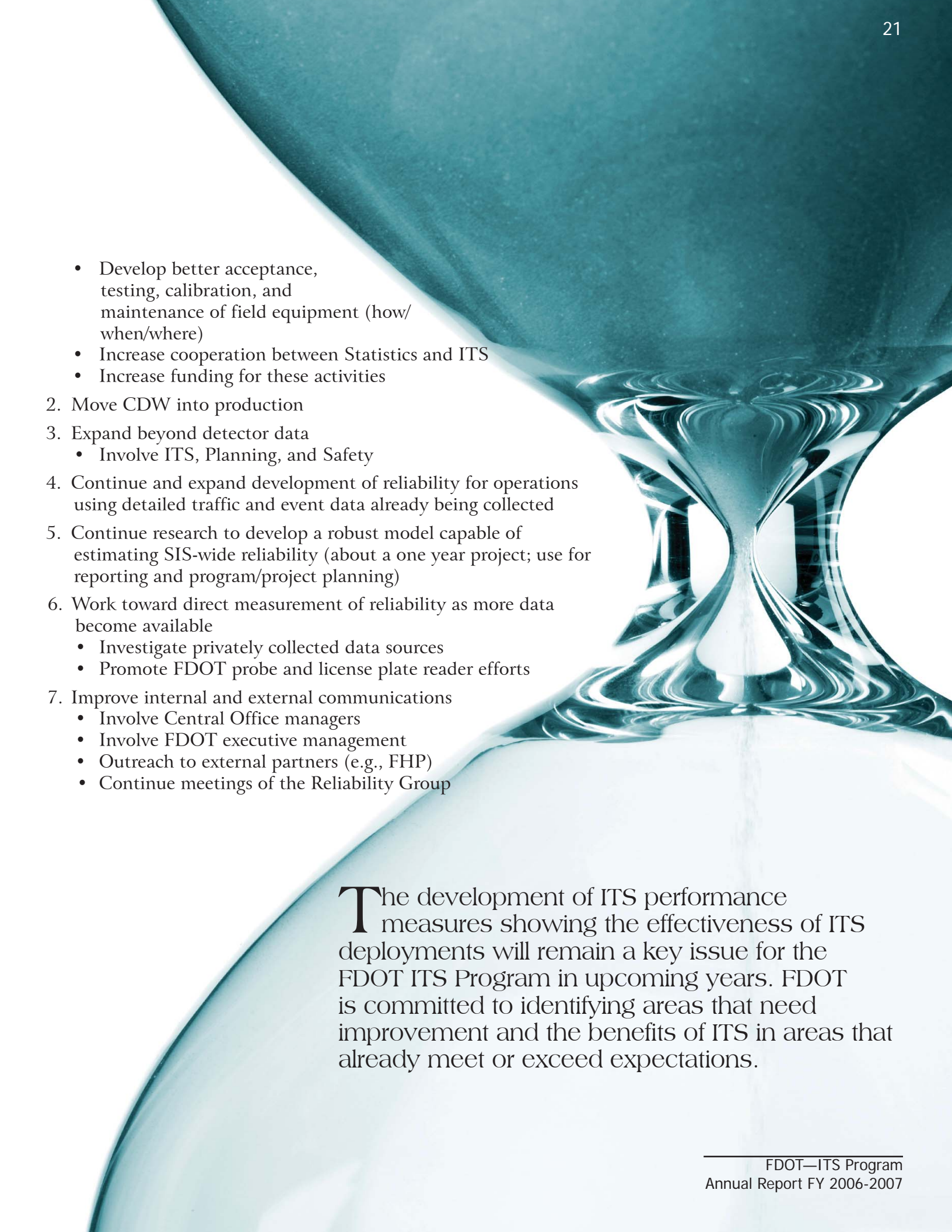- How will reliability be used? What data needs to be shared among FDOT divisions?

These questions need to be addressed in the context of how reliability measurement fits in the program activities of FDOT Planning, e.g. SIS and Systems planning, and Transportation Data Statistics; and the Traffic Engineering Operations Office.

Data limitations issues are data availability, data quality, and the use of collected data as opposed to modeling reliability. Speed data is not currently available in Florida; however, some freeways with ITS deployments will have data available in 2008. The issue is that these freeway sections are only a small portion of the SIS network. FDOT must develop a method to estimate reliability on segments without ITS deployments. Data quality is also a major issue. FDOT must develop methods to assure quality data are provided by the detectors. This will require the development of data quality processes and a high level of maintenance of the detectors and the communications system.

Recommendations from the Workshop

The following recommendations were proposed by the workshop participants:

1. Prepare a Data Quality Plan to improve FDOT data efforts
   - Identify data problems (quality control) and do something about it (quality assurance)

- Develop better acceptance, testing, calibration, and maintenance of field equipment (how/when/where)
- Increase cooperation between Statistics and ITS
- Increase funding for these activities

2. Move CDW into production

3. Expand beyond detector data
   - Involve ITS, Planning, and Safety

4. Continue and expand development of reliability for operations using detailed traffic and event data already being collected

5. Continue research to develop a robust model capable of estimating SIS-wide reliability (about a one year project; use for reporting and program/project planning)

6. Work toward direct measurement of reliability as more data become available
   - Investigate privately collected data sources
   - Promote FDOT probe and license plate reader efforts

7. Improve internal and external communications
   - Involve Central Office managers
   - Involve FDOT executive management
   - Outreach to external partners (e.g., FHP)
   - Continue meetings of the Reliability Group

The development of ITS performance measures showing the effectiveness of ITS deployments will remain a key issue for the FDOT ITS Program in upcoming years. FDOT is committed to identifying areas that need improvement and the benefits of ITS in areas that already meet or exceed expectations.

A Data Management Solution

By Liang Hsia, FDOT and
Ken Courage, University of Florida

The Florida Statewide Intelligent Transportation System Architecture contains a feature for an archived data management subsystem that serves as a central data warehouse. The Statewide Transportation Engineering Warehouse for Archived Regional Data (STEWARD) will implement that feature. STEWARD will eventually archive data from a variety of sources to support the generation of reports and queries.

STEWARD will eventually archive data from a variety of sources to support the generation of reports and queries. A prototype of STEWARD is under development as a proof of concept for a fully operational version to be deployed in the future.

A prototype of STEWARD is under development as a proof of concept for a fully operational version to be deployed in the future. The STEWARD prototype is being developed by the University of Florida (UF) Transportation Research Center with support from the FDOT Research Office. The prototype is currently located on the UF campus in Gainesville, but will be moved to the FDOT Traffic Engineering Research Lab in Tallahassee for continued operation.

STEWARD will provide transportation management center (TMC) managers, District ITS program managers, traffic operation engineers, and management with the following useful functions:

♦ Identify detector malfunctions

♦ Provide calibration guidance for detectors

♦ Perform quality assessment data reliability tests

♦ Provide daily performance measures for system and statewide performance measures

- Facilitate periodic reporting requirements
- Provide data for research and special studies

At this point, the effort is concentrating on the SunGuide™ traffic sensor subsystem (TSS) and the travel time subsystem (TVT). The SunGuide-generated archive data from Interstate 95 in District 2 is being used as a model for this development. Other SunGuide TMCs will be added as archive data becomes available. The District 2 system is configured with approximately 450 detectors at 120 remote traffic microwave sensor detection stations, covering a 25 mile section of the freeway. Other systems in Districts 4, 5, 6, and 7 are also being configured for STEWARD.

Sun Guide Detectors on I-95 in District 2

RTMS 95N020

RTMS 95S0x7

RTMS 95S033
RTMS 95S037
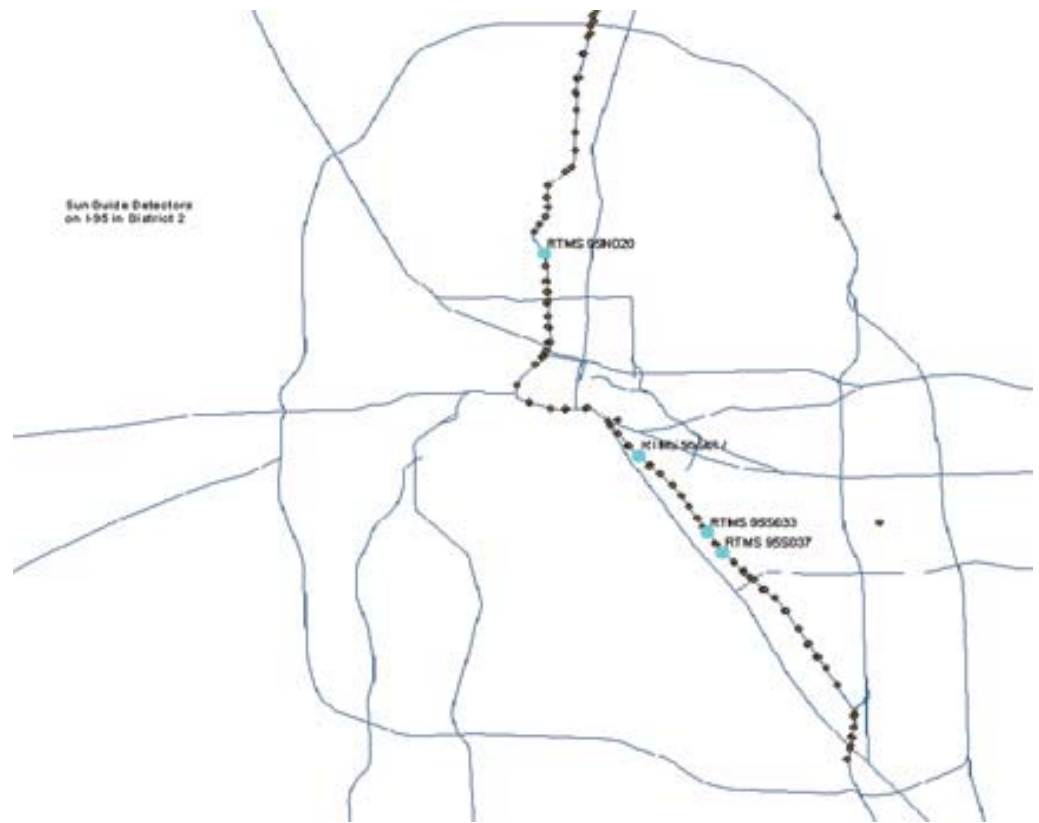
Configuring the STEWARD Facility Data

The archived data are stored in comma-delimited flat files, with each file representing a 24-hour day. Zipped versions of these files are posted periodically by the District staff. Adapting the data for use in the STEWARD database involves adding several data items to relate the individual detectors to the system in which they are located. In addition, the STEWARD database includes the results of some analyses that aggregate certain measures over periods ranging from 15 to 60 minutes.

As a part of the proof of concept, STEWARD supplies data to support FDOT efforts to develop a framework for reporting travel time reliability on arterial roadways. It is anticipated that STEWARD will continue to supply travel time reliability data for long-term monitoring and reporting.

The current threshold of delay for purposes of travel time reliability analysis is established at 10 mph under the speed limit. Reporting of delay under this definition requires knowledge of the speed limit for each travel time link. This requirement is complicated by the fact that multiple speed limits may apply over a given travel time link.

The following information must be collected and maintained in a database for each travel time link in the TVT archive data:

- A description of the origin and destination
- Direction

♦ Distance weighted average speed limit (required to compute the travel time variability measures)

♦ Link Length

The STEWARD Traffic Sensor Subsystem Database

The STEWARD database will contain the TSS data from all days at all stations from all TMCs. The SunGuide raw data archive contains one record for each lane for each 20-second polling interval. The STEWARD database content differs from the raw data in the following ways:

♦ To streamline the processing and retrieval, the STEWARD database contains one record per station representing all of the lanes at that station. Individual lane data are not archived, but lane balance measures, based on the ratio of the highest lane value to the lowest lane value, are recorded for both volume and speed.

♦ The values contained in the STEWARD database represent the 20-second archived data values accumulated over periods of 5, 15, and 60 minutes.

♦ A quality assessment process is applied to identify bad or suspicious data.

The STEWARD TVT Database

District 2 has established approximately 30 travel time links. The one minute travel times for each link are accumulated and grouped into 5, 15, and 60 minute intervals. Other Districts are configuring their systems now

In addition to the estimated travel times, three performance measures derived from the travel times are contained in the database:

♦ **Congestion delay**—based on a travel time index of 1.5. The travel time index is defined as the ratio of the actual travel time to the travel time at the free flow speed. The speed limit will be used to represent the free flow speed. The unit of measurement is "accumulated minutes of delay."

♦ **On-time delay**—referenced to a travel speed of 10 mph below the speed limit. This threshold has been specified for purposes of travel time reliability reporting in Florida. The unit of measurement is also "accumulated minutes of delay."

♦ **Percent of on-time trips**—defined as the percent of trips that were made at a speed no less than 10 mph below the speed limit.

In addition to the estimated travel times, three performance measures derived from the travel times are contained in the database.

A TVT-generated summary report includes average travel time and delay as well as maximum travel times and delays, along with their time of occurrence. A recently added field reports the percentage of on-time trips. This information is presented for each link and time interval. A summary report may be requested for a specific link, for all origins to a specific destination or for all destinations from a specific origin.

Traffic Count Generation

Given accurate traffic counts from SunGuide, the STEWARD data could provide a very useful supplement to the FDOT telemetered traffic counts. With this in mind, a feature has been built into STEWARD to provide count files in the same format as the telemetered count stations. This capability will be tested on selected stations in District 2 and eventually expanded to other Districts.

There are two telemetered traffic monitoring stations within the District 2 system. Comparison of the counts provided by the FDOT Statistics Office with the SunGuide archived counts from nearby stations has indicated excellent agreement:

The ability to provide the Central Office with supplemental traffic counts should be a useful STEWARD feature. However, a potentially more useful feature would be created by the ability to provide the District planning offices with supplemental counts for their portable stations. Because the District stations have no permanent counters or telemetering, obtaining the required periodic counts is much more labor intensive.

Internet Access for STEWARD

The capability to access the STEWARD TSS and TVT databases by internet is under development and a prototype Web site has been created. Users who access STEWARD via the internet will be able to query the database by location and time and generate a variety of reports.

Future Development

Additional SunGuide TMCs will be brought on board as their archive data subsystems become active. Data from other sources, such as the FDOT Roadway Character Index, crash records, and Statistics Office traffic counts will be examined to investigate correlations with the SunGuide data. It is hoped that the prototype will demonstrate the useful work that can be done by STEWARD and recommendations will be made for expansion of functionality and implementation of a full statewide central data warehouse.

By Trey Tillander, FDOT and
David Chang, PBS&J

SunGuide™ Software continues to evolve and keep pace with new technologies and high user expectations. FDOT realizes the benefits of this investment as the use and capabilities of SunGuide Software increases.

SunGuide Software reaches additional deployment milestones with three new deployments during Fiscal Year 2007. The new deployments of SunGuide Software include:

◆ District 5's Orlando Regional Transportation Management Center (RTMC),

◆ District 7's Tampa Bay SunGuide RTMC, and

◆ FDOT's Traffic Engineering Research Lab (TERL).

SunGuide Software Release 2.2 was deployed in October 2006, and included additional functionality in the areas of event management, Road Ranger tracking and monitoring, and performance measures. SunGuide Release 2.2 was developed by a third party and integrated through the SunGuide Software contract. SunGuide Software is an open architecture and highly documented system. A primary goal is for multiple software developers to develop and interface to SunGuide Software. SunGuide Release 2.2 is a significant milestone in achieving this goal while providing much needed functionality to the users.

SUNGUIDE™ Software—

Returning the Investment

To enhance the service to SunGuide Software users, the FDOT ITS Program launched in-depth, user-customized SunGuide Software operator training. In addition to SunGuide Software operator training after major releases, additional training is provided on a follow-up, as needed basis at locations preferred by the users. The training is focused on transportation management center (TMC) operators and each District's specific needs. The pilot training session was provided to District 5 in DeLand. The next session was provided to District 7 in Tampa in July 2007.

The FDOT ITS Program embarked on a major enhancement to the SunGuide Software in Fiscal Year 2007. In accordance with the systems engineering process, SunGuide Software Release 3 was planned and requirements were defined and analyzed over a period of several months. The requirements in SunGuide Software Release 3 are needs-driven and incorporate needs from virtually every FDOT District. This release includes the development of seven new subsystems and six new software interfaces. In addition, Release 3 enhances nine existing subsystems as well as the database and the graphical user interface (GUI). The systems engineering process was continued through two major design reviews at Districts 5 and 6 and during two follow-up design review video conferences to finalize the software design.

SunGuide Software Release 3 builds on Release 2.2 by further integrating and enhancing the Event Management and Reporting subsystems and adding the Responder Audit subsystem. The Event Management subsystem provides the TMC operator with greater flexibility by adding a tabular input mechanism for event information in addition to the existing graphical map-based process of inputting incidents. The enhanced Event Management subsystem gives TMC operators and supervisors the necessary tools to track and manage incidents and distribute traveler information in an efficient and timely fashion. The Event Management subsystem collects additional detailed data, such as Road Ranger data, for use during incident management activities. Other enhanced data collection consists of the incident data necessary to produce the incident duration timestamps required for performance measures.

The Reporting subsystem allows reports to be generated directly from the SunGuide Software user interface. The Reporting subsystem also enables sorting and filtering of data prior to generating and printing a report. The Responder Audit subsystem allows TMC and ITS management staff with appropriate permissions to audit data collected through the Event Management subsystem. The Responder Audit subsystem becomes a crucial quality assurance tool for the FDOT to ensure the quality of the data and resulting reports. The integrated Event Management, Reporting, and Responder Audit subsystems satisfy key user needs by enabling more accurate and efficient performance measures reporting and providing on-demand operational feedback.

Integrated with the Event Management subsystem are two new Road Ranger and automated vehicle location (AVL) interfaces. These new interfaces give the TMC operator the ability to track and monitor Road Rangers in a dispatch environment. This software functionality improves Road Ranger response times and incident coordination. The multiple interfaces give FDOT Districts the flexibility to procure a tablet PC device or mobile data terminal.

Other significant enhancements in SunGuide Software Release 3 include integrating an Event Viewer subsystem and a Video Incident Detection interface. Both of these enhancements meet user needs by reducing demands and time on TMC Operators. The Event Viewer subsystem allows a TMC partner to view real-time SunGuide event information remotely over a web-based application. This application reduces the need for continuous communication between the TMC and its partners by automating the process. The Video Incident Detection interface improves efficiency by including functionality for an incident to be automatically detected through video and sending an alert to the SunGuide Operator GUI.

The FDOT ITS Program is partnering with District 5 to add software functionality demonstrated in the iFlorida Surface Transportation Security and Reliability Information System Model Deployment to SunGuide Software Release 3. The new SunGuide functionality provides District 5 with further efficiencies gained from system integration and standardization. In addition, integrating the functionality demonstrated by the iFlorida program into SunGuide provides the other FDOT districts and their customers the new functionality.

There are 22 Variable Speed Limit (VSL) signs along I-4 in the Orlando area. These devices are controlled in SunGuide Software similar to other DMSs using the National Transportation Communications for Intelligent Transportation Systems Protocol. SunGuide Software Release 3 recommends speed limits for the VSL signs based on occupancy thresholds.

FDOT District 5 has operated the Central Florida 511 system since June 2002 and the Statewide 511 system since November 2005. SunGuide
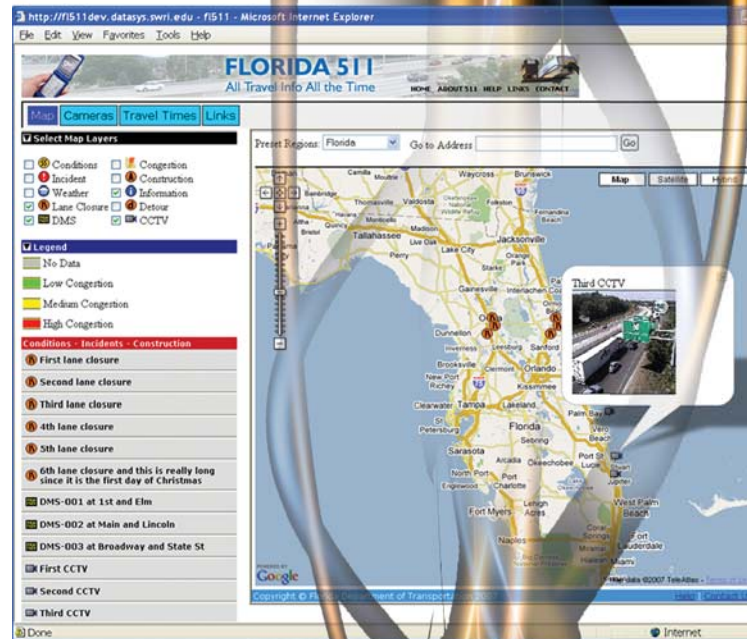
Software Release 3 manages pre-recorded audio files in accordance with the existing District 5 rules. In addition, the SunGuide Operator manually records incident reports and floodgate messages. These audio files are placed on the existing 511 telephonic system via a new SunGuide interface. The SunGuide Software GUI is enhanced in Release 3 to display 511 reporting segments on the operator map and display alerts for new or updated incidents on 511 reporting segments.

SunGuide Software Release 3 enhances the existing SunGuide web server to provide additional functionality required by the www.fl511. com web site. The new web site provides an enhanced "look and feel" that includes a more user-friendly map. Congestion is graphically shown by segment and camera snapshots are displayed by leveraging the existing SunGuide capability.

The design and development of SunGuide Software Release 3 is approximately a 6 month-effort with deployment to the District RTMC's anticipated in September and October 2007. SunGuide Release 3 users benefit from the new and enhanced functionality. Leveraging the iFlorida demonstration projects into SunGuide provides the traveling public with increased service throughout the State of Florida. With this next generation of SunGuide Software, FDOT will have an even more powerful tool to manage the increasing traffic on Florida highways.

The FDOT is not stopping with SunGuide Release 3. During Fiscal Year 2007, additional planning and requirements development was accomplished for future releases. As a primary information source, SunGuide Software will support the Florida Statewide Advanced Traveler Information System (FLATIS), which includes the statewide 511 system and statewide traveler information web site. SunGuide Software will be the data fusion engine serving as the data collection, entry, and aggregation point for the FLATIS. SunGuide Software will also be enhanced to provide travel time information from probe data sources. The SunGuide probe data collection subsystem interfaces with toll tag readers and license plate readers. This new functionality is scheduled to be deployed in Spring 2008 and will provide better and more frequent information to Florida's motorists.

As a testimony to Florida's successful SunGuide Software deployments, several other DOT's have visited or talked with FDOT to gather information on Florida's experiences. As FDOT continues to use and reuse the SunGuide Software System, the State of Florida receives benefits that far exceed the investment. The SunGuide era continues – FDOT looks forward to providing more efficient traffic management and a greater level of service to our customers, the traveling public.

Ramp Metering Software—

A Tool to Reduce Congestion

FDOT uses a tool new to Florida to battle increasing congestion. Ramp metering software enables additional intelligence to improve safety and freeway throughput.

By Trey Tillander, FDOT

Ramp metering reduces congestion (increases travel speed and volume) on freeways by restricting the total flow entering the freeway and breaking up platoons of vehicles to allow more efficient merging. Intelligent software is required to effectively manage, control, and monitor a ramp metering system. The FDOT has developed central management software through its SunGuide™ Software System and local control software that is housed on the field controller at the ramp meter site.

The FDOT ramp metering software is based on algorithms developed and used by the Washington DOT. These algorithms use data from upstream and downstream mainline and ramp detectors to generate a vehicle per minute metering rate. The software makes automatic adjustments to the metering rate based on ramp queue, red signal violations, and high occupancy lane bypass traffic. To maximize support of the ramp meter software, the code is developed using the latest software technologies; the source code is owned by the FDOT; and the documentation is at a very high level.

Independent validation and verification of the ramp metering software was completed at the Traffic Engineering Research Lab in June 2007. The initial field testing of the software was also completed in June 2007 in Miami. Operational testing and tweaking is scheduled to take place for the remainder of 2007. The ramp metering software is scheduled to be fully operational along Interstate 95 in Miami by early 2008.

The FDOT continues to strive for new technologies and strategies to mitigate congestion and improve safety along Florida's highways. The FDOT ramp metering software enables one more ITS tool to provide better service to FDOT's customers—the traveling public.

FDOT's ITS Mainstreaming Effort—

Encouraging a Statewide Team Effort

The FDOT ITS Program maintains a robust effort at providing information in an effort to support ITS deployment.

This mainstreaming effort marks a significant achievement for the ITS Program to educate not only the FDOT District Offices, Florida's Turnpike Enterprise, and the Central Office staffs, but also other public agencies and the ITS consulting, contracting, and academic communities, along with the general public.

FDOT feels a commitment to share the successes and lessons-learned of its ITS Program. To this end, FDOT prepares and disseminates materials to support the mainstreaming of ITS within FDOT and with its transportation partners. These materials include:

⊙ The SunGuide Disseminator. This monthly newsletter is published on the Internet in hypertext markup language (HTML) and, three times a year, as a print edition. The FDOT Districts also provide project status updates that are included as a supplement to the Disseminator.

⊙ FDOT's ITS Program Annual Report. At the end of each fiscal year, the FDOT ITS Program produces an annual report, highlighting work on initiatives and listing program accomplishments. This report is produced as a high-end magazine and is distributed nationwide.

⊙ Florida's 511 Progress Report. The FDOT ITS Program produces this annual progress report in order to highlight 511 achievements in Florida. This report is also a high-end magazine which is distributed by the National 511 Deployment Coalition as well as FDOT.
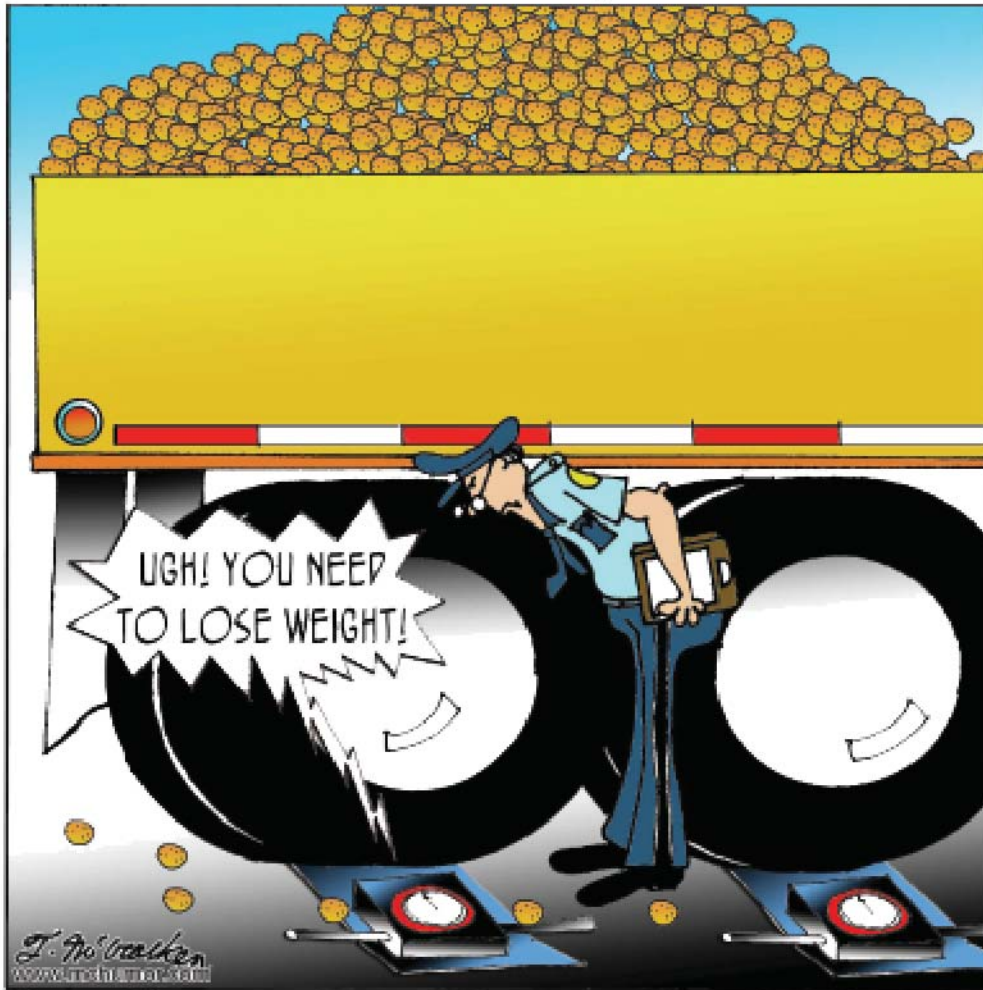
Past articles have been written by FDOT Secretaries, Assistant Secretary, State Traffic Engineers, FDOT District personnel, ITS Florida chapter members, university professors, and various Florida

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expressway authorities. Additionally articles have been contributed from agencies outside of Florida, such as ITS America, the I-95 Corridor Coalition, and the Federal Highway Administration.

This entire package of mainstreaming materials provides a solid archive of ITS information for the benefit of all ITS professionals. The ITS Program will sustain this endeavor for years to come.

FDOT's ITS Program has acted to consolidate District and Central Office project information and accomplishments into these three documents, which are produced either monthly or annually, for easy access. Past documents are also archived on the FDOT's Web site to provide an historical perspective of the FDOT's ITS Program. By providing this information, FDOT's management and the contractor community, as well as the interested public, benefit from a better understanding of ITS deployments in Florida.

Awareness of the ITS Program accomplishments by the FDOT management is vital in keeping the program moving forward.

Contractor awareness of the FDOT's ITS Program allows the consultant/contractor community to better plan their activities to address Florida's ITS deployment needs. Better awareness of the ITS Program's accomplishments and successes results in a savings to the FDOT due to increased confidence in their ability to deploy ITS.

Public involvement is also very important. Involvement by the public results in valuable input as to how well the ITS Program is received, and provides good feedback to make improvements to the ITS Program. Public confidence in the FDOT's ITS Program is necessary, and provides the support needed to continue expansion of the program.

Moment of Humor!

UGH! YOU NEED TO LOSE WEIGHT!

If a scale could speak...

FDOT's ITS Program publications are widely produced and read by a diverse audience. These publications are emailed/mailed to addresses through out the United States, with the distribution list growing every month by request from interested parties.

The SunGuide Disseminator has even poked fun at the "humorous" side of ITS with its Moment of Humor and Word Challenge sections. One section is a cartoon and the other is a puzzle with an accompanying cartoon. These cartoons are built from concepts developed by FDOT and illustrated by a cartoonist in Waldport, Oregon. These portions of FDOT's mainstreaming have elicited a chuckle from many ITS professionals.

At times, information contained in the articles has sparked much discussion about the ITS projects being deployed by FDOT. These discussions have indicated to FDOT the value of disseminating information in a timely manner.

FDOT's ITS Program mainstreaming effort has proven to be beneficial to the state of Florida. The most important factor in development of these documents has been obtaining consensus from all of the participants, including: the seven FDOT Districts and the Florida's Turnpike Enterprise, ITS Florida chapter members, university professors, and various Florida expressway authorities, all of whom participate in providing articles. As a monthly effort, much production work goes into the newsletter, from planning stages up to projecting the future direction and timeliness of articles.

The annual reports are high-end productions that require research into state and national statistics, thus, providing evidence for Florida's need for ITS, They also require consensus building from across Florida.

The FDOT's ITS Program mainstreaming publications have been a tremendous success in raising ITS awareness in Florida. The SunGuide Disseminator, the ITS Program Annual Report and Florida's 511 Progress Report have been excellent tools for providing information about Florida's ITS Program. These publications are widely distributed through out the state, and beyond, and are a significant enhancement to the ITS Program's overall efforts to raise the awareness of the benefits of ITS, and to expound on the success Florida has had in deploying ITS. These publications are passed out at the various events where FDOT's ITS Program has provided an exhibit, including ITS America's Annual Meeting.

If you have an interest in the FDOT's ITS Program, sooner or later, one of these publications will provide answers to your questions.

FDOT's ITS Program mainstreaming effort provides a positive image of ITS in Florida, and has been a tremendous benefit when approaching management for support of new initiatives. The funds used on development of these publications have been money well spent.

THE FIRST PHASE OF FDOT'S ITS WAN—

The South Florida Deployment

By Randy Pierce, FDOT and
John Hogan, RCC Consultants, Inc.

This article updates the progress FDOT has made in implementing the ITS wide area network since last year's ITS Program Annual Report.
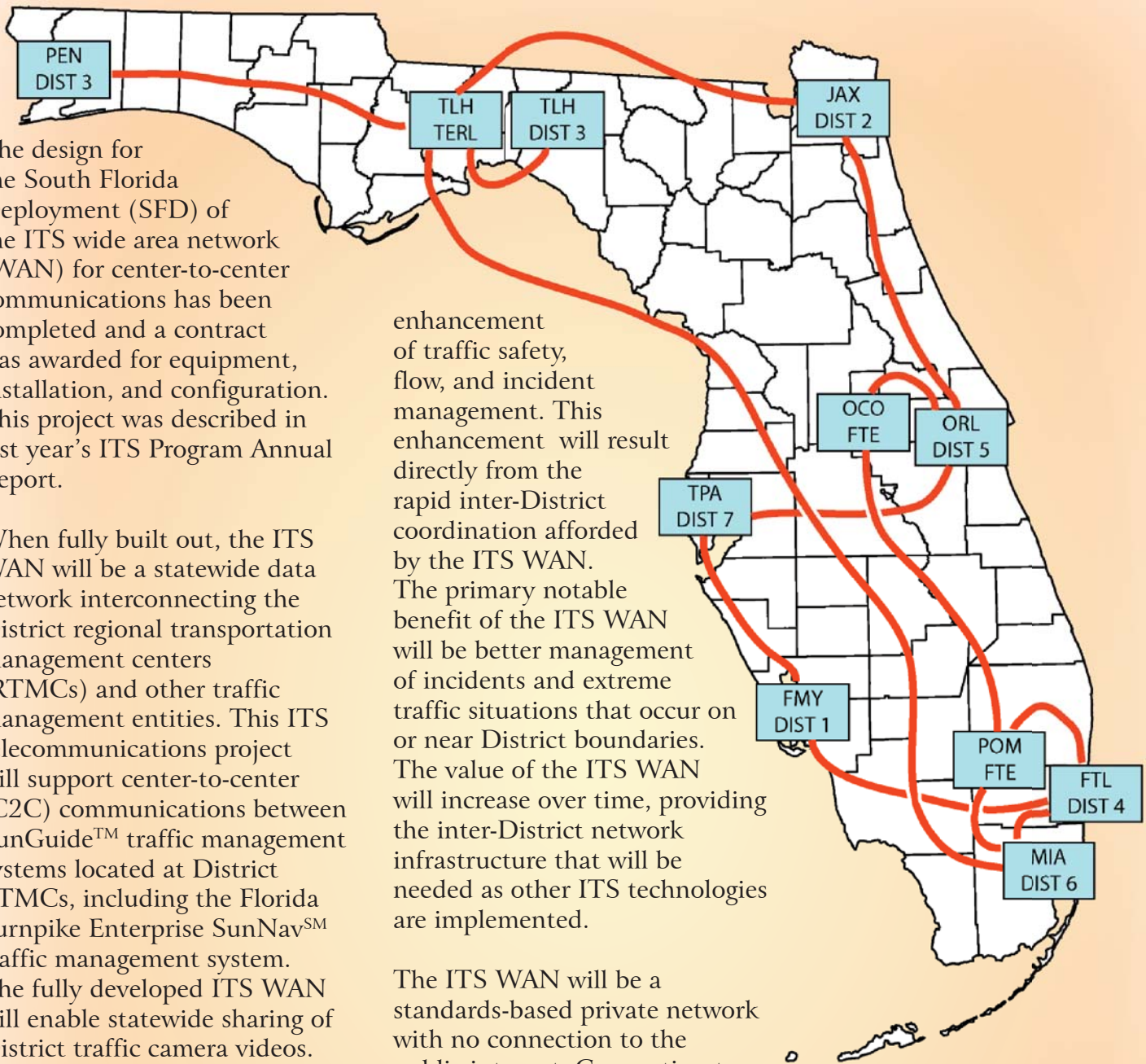
The design for the South Florida Deployment (SFD) of the ITS wide area network (WAN) for center-to-center communications has been completed and a contract was awarded for equipment, installation, and configuration. This project was described in last year's ITS Program Annual Report.

When fully built out, the ITS WAN will be a statewide data network interconnecting the District regional transportation management centers (RTMCs) and other traffic management entities. This ITS telecommunications project will support center-to-center (C2C) communications between SunGuide™ traffic management systems located at District RTMCs, including the Florida Turnpike Enterprise SunNav℠ traffic management system. The fully developed ITS WAN will enable statewide sharing of District traffic camera videos. The ITS WAN will also support other ITS traffic management communications. Functioning as a wide area inter-District "backbone," it will provide ITS network services while preserving District network autonomy.

The high-speed, real-time ITS communications service provided by the ITS WAN will play an important role in the enhancement of traffic safety, flow, and incident management. This enhancement will result directly from the rapid inter-District coordination afforded by the ITS WAN. The primary notable benefit of the ITS WAN will be better management of incidents and extreme traffic situations that occur on or near District boundaries. The value of the ITS WAN will increase over time, providing the inter-District network infrastructure that will be needed as other ITS technologies are implemented.

The ITS WAN will be a standards-based private network with no connection to the public internet. Connection to the ITS WAN will be restricted to District RTMCs and other Florida traffic management entities approved by FDOT. A primary design criterion is the use, where available, of fiber-optic facilities operating at gigabit speeds. Wide area circuits will employ District-supplied fiber-optic cable interconnected to provide inter-District connectivity. Where District

FDOT ITS WAN Anticipated Statewide Fiber Optic Backbone Infrastructure at Full Build-out

fiber is unavailable, the FDOT Statewide Microwave System (SMS) will be utilized for an interim period. Additional fiber-optic facilities from selected telecommunications service providers will be sought to provide the bandwidth needed.

The SFD is both a proof-of-concept pilot project for the ITS WAN and the first phase of ITS WAN implementation. The SFD will interconnect the RTMCs in District 6 (Miami), District 4 (Fort Lauderdale), and Florida's Turnpike (Pompano Beach) by means of fiber, and also the McArthur/Sunrise SMS site in Plantation. A microwave circuit extending from Plantation to the Tallahassee Florida Highway Patrol (FHP) SMS site will connect South Florida and Tallahassee. An EMBARQ metropolitan area network (MAN) circuit from the Tallahassee FHP SMS site to the test-bed transportation management center at the FDOT Traffic Engineering Research Laboratory (TERL) will complete the SFD backbone. This ITS telecommunications project will provide real-time traffic data and video from South Florida to the TERL through the use of several types of communications media.

The SFD project was awarded to Ronco Communications and Electronics, Incorporated. Ronco is a certified Nortel reseller, possessing the Nortel Elite Advantage Partner certification. Ronco's corporate headquarters is in Tonawanda, New York, with Florida offices in Tallahassee, Jacksonville, Tampa, and Deerfield Beach. Pending contract finalization, installations at SFD sites are expected to begin in July 2007. The SFD ITS WAN is expected to be complete and operational by the end of calendar year 2007.

Three planned follow-on ITS WAN implementation phases will, upon full build-out, achieve the goal of providing statewide ITS telecommunications. These phases are as follows:

Phase Name	Completion Date	Site
Central Florida Deployment	By end of 2008	District 7 RTMC, Tampa District 5 RTMC, Orlando Turnpike Turkey Lake TMC, Ocoee District 2 RTMC, Jacksonville
Southwest Florida Deployment	Dependent on RTMC construction progress	District 1 RTMC, Ft. Myers
Northwest Florida Deployment	Dependent on RTMC construction progress	District 3 RTMC, Tallahassee District 3 RTMC, Pensacola

Providing a statewide data network interconnection for the District RTMCs and other traffic management agencies remains a high priority in the FDOT's ITS Program. The fully developed ITS WAN will enable this statewide data network interconnection along with supporting other ITS traffic management communications.

Providing a statewide data network interconnection for the District RTMCs and other traffic management agencies remains a high priority in the FDOT's ITS Program

FDOT's Private Radio System Infrastructure

FDOT is unique in many ways. Among other characteristics, FDOT considers itself an integral part of the public safety community and it actively participates within Florida's public safety communications community.

By Randy Pierce, FDOT and
Roger Madden, Telvent Farradyne

FDOT's Motor Carrier Compliance Office has a cadre of more than 100 sworn officers who enforce Florida statutes as well as Federal laws and regulations concerning commercial vehicle operation. Additionally, immediately before, during, and after a major event, such as a hurricane (not unknown to occur in Florida), FDOT is responsible for maintenance of traffic; clearing and restoring operation of the interstate, federal, and state highways; and verifying that bridges are safe to travel, a de facto "first" first responder role. Most of FDOT's seven Districts and Florida's Turnpike Enterprise have implemented motorist assistance patrols on Florida's Turnpike and interstate highways in urban areas. These patrols, known as Road Rangers, assist the Florida Highway Patrol (FHP) at traffic incidents, provide motorist assistance, reduce secondary crashes,— and improve traffic flow by quickly moving disabled vehicles off the roadway.

FDOT's radio communications systems have proven to be a vital element in achieving effective and efficient delivery of services to the motoring public; and it has six major radio systems in service. FDOT's radio systems include 2,200 miles of private microwave (two systems); two motorist aid call box systems with two call boxes per interstate mile in rural areas, or approximately 3,000 call boxes; a low band mobile radio system consisting of approximately 60 base stations and 3,000 mobile radios; and a UHF radio system consisting of two dozen repeaters, 20 base stations, and 250 mobiles.

History

Past

FDOT's first radio system was a low VHF band radio system which FDOT began installing in their highway maintenance trucks in the mid-1950s. This system was centered around low-height antenna base stations at each highway maintenance facility and dispatched locally. Typically, these stations were installed with 60-foot towers and had a service range of about 10 to 12 miles.

FDOT's motorist aid system was constructed over a period of years, beginning on Florida's Turnpike in the late 1970s. The system consists of radio call boxes along Florida's Turnpike Mainline; I-75 from western Broward County to the Georgia state line; I-10 from the Alabama state line to the Jacksonville area; I-95 from the Georgia state line to Palm Beach County, with the exception of the Jacksonville area; and I-4 from the Orlando area to Daytona. This system has fixed stations to receive call box transmissions and a microwave backbone to carry the call box messages back to the FHP. This system remains much as it was initially designed.

Today

FDOT recently upgraded its Interstate and Turnpike private microwave systems to increase the capacity. The analog microwave stations were retrofitted to provide fully digital, IP-based operation so that the microwave system could not only transmit the call box signals, but could also provide capacity for other services as well. The FDOT microwave system links are designed for 99.999 percent reliability at 10-6 bit error rate. Reliability was also improved by linking the Florida's Turnpike microwave system to the Interstate microwave.

FDOT is also modernizing its land mobile radio system. When completed, the low VHF band simplex system with local service to each maintenance yard will be transformed into a system that provides District-wide mobile-to-mobile communications. The transformed system will also provide portable operation with vehicular repeaters for employees who need portable operation to perform their duties.

The Microwave System

Because of Florida's geographical location in an area with tendencies for both hurricanes and lightning storms, all of FDOT's radio systems have been designed with survivability in mind.

Towers

FDOT's microwave towers are typically self-supported. Most are located on interstate or toll road right-of-ways, land directly controlled by FDOT. No matter what communications equipment is installed on the
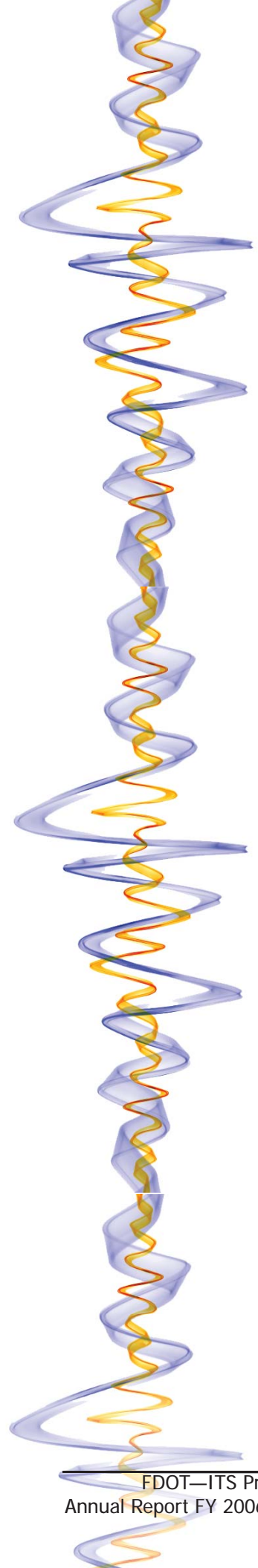
tower or in the shelter(s), if your communications tower falls down during a storm, your radio system is off the air. Recognition of this fact caused FDOT to ensure that their towers would withstand wind speeds, antenna loading, and forces of nature significantly greater than typical required standards. This ensures that as the standards increased and additional uses were found for the towers, the towers would still be within specification and capable of surviving hurricane force winds.

All towers are designed with "future loads" well beyond those anticipated for FDOT's near term use. Self supporting towers are favored over guyed towers, and towers constructed since 1995 have been required to be solid leg or lattice-style construction to significantly reduce corrosion issues typical in hollow leg and hollow cross-member towers. The wisdom of this choice is that to date the FDOT has not lost or sustained significant damage to any tower structure built in the last 20 years. Most of the hurricane damage has been limited to antennas being blown out of alignment or antennas struck by windborne debris.

But hurricanes are not the only problem faced in Florida.

Lightning Protection

As the lightning capital of the United States, Florida experiences more than 100 days per year on average of lightning. Most of FDOT's towers are in rural areas, extend well above the surrounding tree line, and are prime targets for lightning. FDOT specifies a low resistance ground system for each tower site deploying ground radial systems and ground mats ground systems. Each FDOT facility has achieved a resistance to ground of 5 ohms or less and many facilities achieve resistances near 1 ohm.

Backup Power

During the one-two punch of Hurricanes Charley and Frances in 2004, electrical power was simultaneously lost by many of the microwave sites; and FDOT did not have enough mobile generators to provide backup power. The maintenance technicians scrambled to restore power, moving generators from site to site to charge batteries. Some technicians brought their personal generators that they had for their homes to provide what electrical power they could to restore power to the site. But even then, they had to share a generator among several sites and, with the limited quantity of generators and limited availability of fuel, power could not be maintained across the affected portions of the network. For a few days, some sites were off the air and the decision as to which sites to power down was based upon which site would have the least effect on the motorist aid call box system. With meteorologists warning of even more active hurricane seasons to come, FDOT began planning for the installation of permanent generators at all sites, standardizing on a 2000 gallon buried liquid propane tank at each microwave site, a fuel reservoir capable of sustaining operation for approximately two weeks.

People Matter

No matter how well a system is built, events will occur that affect its operation. For most organizations, communications is not their primary business. Police, fire, and emergency medical services may depend on a communications system, but their motto is "to serve and protect." FDOT's mission is to provide a safe transportation system. In public safety organizations, management must recognize the importance of a communications system and make sure that it is designed and maintained so that it is there when needed. The best way to accomplish this is by having the system managed and maintained by dedicated people—people who recognize the importance of the system.

Looking Forward

Although the 2006 hurricane season was relatively uneventful, a leading hurricane forecaster is predicting the future seasons to return to being active. If FDOT is to rely upon the microwave communications system for its mission critical functions, emergency power system upgrades are required. The FDOT is currently in the construction phase on a significant portion of the affected sites. With the quality of the original construction and the additional upgrades already implemented and being implemented, FDOT's statewide microwave communications system will meet the requirements for its critical role in disaster evacuation and management.

FDOT's Highway Maintenance Radio System

FDOT is constructing a new statewide low VHF band radio system that will provide District-wide communications for each of its seven Districts. The new system consists of repeaters linked by the statewide microwave system with multicasting (i.e., transmitting the same information on different frequencies) transmitters and receiver voting.

This radio system is designed for mobile coverage. All mobiles have the same frequency template installed, so vehicles can be moved between Districts and still have communications no matter where they travel within the state. Usually, the mobiles are tuned to the frequency transmitted by the repeater closest to their area of operation. Alternately, they scan the repeater transmit frequencies in the District in which they are operating. Vehicular repeaters and high VHF band portables provide mobility for those persons who are out of their vehicles at work sites.

Conclusion

FDOT, like most state government agencies charged with public safety responsibilities, operates a large private radio system composed of smaller radio systems linked in a manner that serves the unified purpose. FDOT, again like most state government agencies, also uses commercial wireless services when they are more convenient and efficient, although not for life critical applications.

Currently, FDOT is not aware of any commercial wireless service that offers the same level of performance in difficult scenarios that its private systems offer. Because Florida endures several weather-related, widespread disruptions of services annually, FDOT's private system is constructed to survive most storms and utility service outages so that FDOT can conduct its mission irrespective of the availability of commercial services.

What's Happening at the TERL—

Testing and Applying New Technologies

By Liang Hsia, FDOT and
Jeffrey Morgan, FDOT

The purpose of the TERL is to test and apply new technologies and standards to devices in the areas of ITS, traffic operations systems, incident management, and communications products based on latest national and FDOT standards and specifications. This satisfies the statutory requirement (as listed in Florida Statute 316.0745 - Uniform Signals & Devices) that the FDOT shall evaluate and certify all official traffic control signals and official traffic control devices before their purchase and installation in the state of Florida.

The TERL's efforts have helped the FDOT ensure that all products deployed on Florida's streets and highways, meet national uniformity requirements, and Florida-specific requirements which include minimum acceptable levels of quality and performance. The transportation devices evaluated and approved are then listed on the FDOT Approved Products List (APL). This listing simplifies the procurement processes by identifying equipment that is known to meet national and state requirements.

With all the rapping hammers and buzzing saws now put away, the expansion of the Traffic Engineering Research Lab (TERL) is being put to good use.

Work performed at the TERL includes:

1. Quality control, quality assurance, and quality assurance review
2. Certification for the APL
3. SunGuide™ Software independent verification and validation
4. Device change management and testing
5. Hardware, software, and communications system testing
6. Specification testing, development, and upgrades
7. TERL research projects
8. Statewide central data warehouse for performance measures and data reliability quality control.

This work is completed at the TERL in one of the specialized areas, including:

- Traffic Operations Systems laboratory, which tests:
    o Traffic signal controller systems
    o Traffic signal devices
    o Pedestrian signal and count down devices
    o Traffic controller cabinet
    o Ramp metering controller and cabinet
    o All other traffic control device on the APL

- ITS laboratory, a fully functional transportation management center with the statewide SunGuide Software, which tests:
    o Video walls
    o Dynamic message signs
    o Closed-circuit television cameras
    o Transportation sensor systems
    o Incident management systems
    o All other ITS products on the APL and Invitation to Bid lists

- Communications Systems laboratory, which tests:
    o Statewide microwave communications systems
    o ITS wide area network system
    o Statewide call box system

During this fiscal year, the TERL performed work on the following major projects:

- ITS invitation to bid (ITB) on product evaluation for statewide procurement – evaluation and testing of 50 ITS devices for the District 2 ITB and statewide ITS device procurement.

- National Transportation Communications for ITS Protocol (NTCIP) standards and Florida management information base (MIB) – testing of ITS products to ensure better system integration.

- Field evaluation and testing of ITS devices, including transportation sensor systems and dynamic message signs.

- Ramp metering firmware development and SunGuide Software for the ramp metering independent verification and validation subsystem.

- American Association of State Highway and Transportation Officials State DOT ITS Standards Testing Program Partner – participation for NTCIP 1205 CCTV Standards test.

- NTCIP Joint Committee, NTCIP 1204 Environment Sensor System Committee participation.

- FDOT Geographic Information System (GIS) Functional Steering Committee – participation in the steering committee for incident management, Road Ranger, video wall, ITS device GIS mapping and database applications.

- ITS wide area network (WAN) – development to provide statewide ITS center-to-center communications with backbone infrastructure.

- ITS specifications update and development

- Research projects, including:

  o Statewide Central Data Warehouse
  o NTCIP closed-circuit television camera, actuated signal control controller, and center-to-center communications
  o Real-time route diversion
  o Crash pattern prediction using real-time ITS data
  o Quality assurance
  o Advanced transportation management system detector and communication degradation

- Incident management field device storage, inventory, and evaluation. The devices include portable dynamic message signs, portable highway advisory radio, and CB Wizard Alert System.

- TERL research network, SunGuide network, ITS WAN, and Office of Information Systems (OIS) network setup and maintenance to provide entire system integration evaluation and test for software, hardware, and network.

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