ACADIA NATIONAL PARK ITS FIELD OPERATIONAL TEST

EVALUATION STRATEGIC PLAN

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Prepared for:

U. S. Department of Transportation
ITS Joint Program Office, HOIT-1
400 7th Street, S.W.
Washington, DC 20590

Prepared by:

Battelle
. . . Putting Technology To Work
505 King Avenue
Columbus, Ohio 43201

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Executive Summary

This document provides a strategy for evaluating technologies known as Intelligent Transportation Systems (ITS) that will be implemented in Acadia National Park and Mount Desert Island, Maine. Acadia National Park was selected as a site for an ITS Field Operational Test (FOT) through collaboration of the U.S. Department of Interior and the U.S. Department of Transportation.

Acadia National Park hosted 2.6 million recreation visits in 1999, drawn to the rugged beauty of Mount Desert Island and the many passive and active recreational opportunities it affords. During the summer months the Island’s population nearly triples, the roads become congested, and parking areas are overcrowded. Like Acadia, many National Parks are experiencing severe transportation problems, which frustrates their dual mission of preserving national and cultural resources while providing visitors with a meaningful and pleasant experience.

Through technologies such as electronics, communications, and information processing, Intelligent Transportation Systems can help provide solutions to transportation problems and help maintain a positive experience for visitors. The ITS solutions appropriate to the needs of Acadia National Park and Mount Desert Island were developed through consensus of the key stakeholder organizations. The ITS system architecture includes nine system components in three general areas: transit management, traffic management, and traveler information. A team led by SAIC was selected by U.S. DOT to design and deploy the components as an integrated system. Full implementation of the system will take place prior to the summer of 2001.

An independent evaluation of the ITS FOT is being sponsored by the U.S. DOT as part of the National ITS Evaluation Program. The purpose of the evaluation is to assess the efficacy of the ITS technologies and to document the lessons offered by the FOT so that other National Parks or locations with similar transportation problems can learn from the experience. U.S. DOT selected a team led by Battelle Memorial Institute to conduct the independent evaluation.

The evaluation process consists of several steps, the first of which is the development of the overall strategy that guides the evaluation. The Battelle Team conducted a strategy workshop at Acadia National Park on May 24, 2000 with representatives from the National Park Service, Friends of Acadia, Southwest Harbor, Downeast Acadia Regional Tourism, the U.S. DOT, Maine DOT, and SAIC. Using six standard goal areas from the National ITS Evaluation Program, participants identified the objectives that they wanted the project to achieve and suggested measurements that could be used to assess progress toward objectives. Through a voting process, priorities for focusing the evaluation were recognized, with the highest priorities placed on achieving customer satisfaction and mobility. In addition, workshop participants assisted the evaluation team in identifying potential methods for collecting data.

The evaluation team will use the guidance provided in the strategy document to develop the evaluation plan, which will specify the tests to be conducted, the resources required, the schedule, and roles and responsibilities. Development of individual test plans with detailed protocols will follow. Baseline data will be collected in 2000 so that the effects of ITS can be measured using the test plans in 2001.

ACADIA NATIONAL PARK ITS FIELD OPERATIONAL TEST

STRATEGIC PLAN

1.0 Transportation Problems: The Impetus for ITS at Acadia

1.1 Acadia National Park: The Setting

Acadia National Park is part of the U.S. National Park System, which has as its dual mission the preservation of natural and cultural resources and providing visitors with a meaningful and pleasant experience. Over 260 million American and foreigners come to the National Parks each year to experience their unique features.[1] Acadia, located on the beautiful and rugged coast of Maine, (see Figure 1) preserves the natural beauty of that coastline, little of which remains in public ownership. Acadia's 35,000 acres lie principally on Mount Desert Island, but smaller portions are located on the Isle au Haut and on Schoodic Peninsula. Establishment of the Park dates to 1916, when public and private resources were first joined to create what later became Acadia. Unlike many other National Parks, private lands and Park lands intermingle in much of Acadia National Park. This is especially the case on Mount Desert Island, which has several small towns and villages, where most of the Island's approximately 9600 year-round population live. The largest town on the Island is Bar Harbor. Other towns are Southwest Harbor, Northeast Harbor, and Bass Harbor, plus several other smaller villages.

Tourism dominates the regional economy, and the attraction of Acadia National Park is a major contributor to the tourism industry. During the summer months, the Mount Desert Island population nearly triples with many overnight guests staying at the numerous hotels, bed-and-breakfasts, and campgrounds in the area. In the last several years, large cruise ships such as the QE2 have made Bar Harbor a port-of-call, contributing thousands of additional visitors to the Island.

Acadia National Park hosted 2.6 million recreation visits in 1999[2]. Close to the population centers of the northeastern states, Acadia has become one of the most-visited National Parks in the peak summer months of July and August. Visitors are drawn to Acadia for the active and passive recreation opportunities, such as sightseeing, camping, hiking, rock-climbing, kayaking, and wildlife viewing. Those activities are complemented by the lodging, dining, and shopping amenities of the towns on the Island.

[1] National Park Service web page: www.nps.gov.
[2] National Park Service web page:www2.nature.nps.gov/npstats/

Figure 1. Map of Coastline of Maine Showing Acadia National Park

1.2 Transportation Problems at Acadia National Park

The popularity of Acadia National Park and the growth of tourism on Mount Desert Island are not without problems. On any given year an estimated 90% to 98% of visitors arrive by private vehicle, straining the capacity of the road system and parking areas. During the peak tourist season, roadway congestion is the norm, and parking at trailheads and beaches has become increasingly difficult. Indeed, many National Parks are experiencing similar transportation difficulties with lengthy traffic delays and noise and air pollution becoming increasingly common. These effects, in turn, detract from the visitor experience and threaten the natural and cultural resources that the National Parks were established to protect.

To address the transportation problems at Acadia, in 1995 the National Park Service issued a "Statement of Management Planning Implementation Report" calling for Acadia and surrounding towns to develop a regional public transportation system. That approach is consistent with Acadia National Park's General Management Plan, which states:

> "To reduce the perception of crowding in high-density areas, the number of parked cars will be kept to a minimum. Existing parking capacities will be enforced. Alternative means of park access will be developed, with the goal of replacing private automobiles with nonmotorized means and a public transportation system."[3]

[3] National Park Service. 1992. General Management Plan, Acadia National Park. Bar Harbor, ME. 100 p.

With the emphasis on public transportation for relieving traffic congestion, Acadia National Park will be better able to address its mission of protecting the aesthetic and natural resources of park lands, while providing a quality visitor experience.

With support from public and private funding sources, in 1999 the Island Explorer bus service was launched to provide free transportation during the tourist season on Mount Desert Island. From late June through early September of the first season, the buses carried an impressive total of 142,260 passengers over six routes through Mount Desert Island towns and Acadia National Park.[4] The initial success of the service led to a decision to add nine additional buses for the 2000 summer season, thereby increasing service on some routes and providing back-up buses in case of breakdowns.

1.3 ITS as Potential Solution to Transportation Problems

The U.S. Department of Interior (USDOI), the parent organization for the National Park Service, and the U.S. Department of Transportation entered into a memorandum of understanding (MOU) in November of 1997 to work together to address the problems of transportation within the National Parks. The two agencies would collaborate on "joint research efforts to determine how technology can be used to address transportation problems in Nationals Parks; education and training of park service staff on technology applications and programs; and demonstration of new technologies in National Park units."[5] The provision of a demonstration project of transportation technologies would enable the DOT and the DOI to identify opportunities to use a variety of new transportation technologies, including ITS, in the National Parks.

The intent of Intelligent Transportation Systems (ITS) is to integrate advanced technologies, such as information processing, communications, and electronics, to improve transportation systems to save lives, time, and money. In rural areas where many National Parks are located, applications of ITS have been identified for the following aspects of transportation:

- Traveler safety and security
- Emergency services
- Tourism and travel information services
- Public traveler/mobility services
- Infrastructure operating and maintenance
- Fleet operating and maintenance.

As an initial means of focus, U.S. DOT's ITS Joint Program Office and the National Park Service made plans to identify the most suitable site for an ITS Field Operational Test at a National Park. From proposals developed for Acadia, Yosemite, and Zion National Parks, Acadia was chosen for the ITS FOT. SAIC was selected by U.S. DOT to work with the National Park Service and local stakeholders on Mount Desert Island to design and deploy the ITS FOT. U.S. DOT selected Battelle to conduct an independent evaluation of the FOT to assess the

[4] Daigle, John J. and Byung-kyu Lee. "Passenger Characteristics And Experiences With The Island Explorer Bus," Parks, Recreation and Tourism Program, University of Maine. Technical Report, April, 2000.
[5] NPS webpage: http://www.nps.gov/transportation/alt/mou.htm.

benefits from the ITS technologies and identify lessons learned that might be applied to other National Parks.

2.0 Intelligent Transportation Systems at Acadia

2.1 System Concepts

The Intelligent Transportation Systems to de deployed at Acadia integrates nine different components, which support the region's needs for transit management, traffic management, and traveler information. ITS at Acadia will have elements common to systems deployed in other locations but will be uniquely configured to reflect the physical, social, and institutional characteristics of Mount Desert Island.

How Concepts Were Developed

SAIC, as the systems engineers, undertook field studies in the summer and autumn of 1999. These were conducted concurrently with a transportation needs assessment and were followed by a meeting on February 16, 2000 on Mount Desert Island. This meeting, the FOT system concept workshop, was attended by 27 representatives of federal, state, local, and private agencies that were identified as stakeholders: Federal Highway Administration, National Park Service, Maine Department of Transportation, Maine Office of Tourism, Downeast Acadia Regional Tourism, Hancock County Airports, Hancock County Planning Commission, Ellsworth Chamber of Commerce, Town of Bar Harbor, Bar Harbor Chamber of Commerce, University of Maine, Town of Southwest Harbor, Friends of Acadia, Downeast Transportation Incorporated, SAIC, Battelle, and Tom Crikelair Associates. During this meeting, the group reviewed the proposed architecture of the ITS system and discussed priorities and implementation strategies. Decisions were made as to the priority of system components, and on appropriate technologies. These were again reviewed in April, and finally verified in an evaluation workshop in May. The majority of stakeholders were participants in all of these events.

Overall Architecture and Individual Subsystems

The elements of the final system architecture address the specific needs of Acadia National Park and the communities of Mount Desert Island. The system components for the ITS FOT are represented in Figure 2.

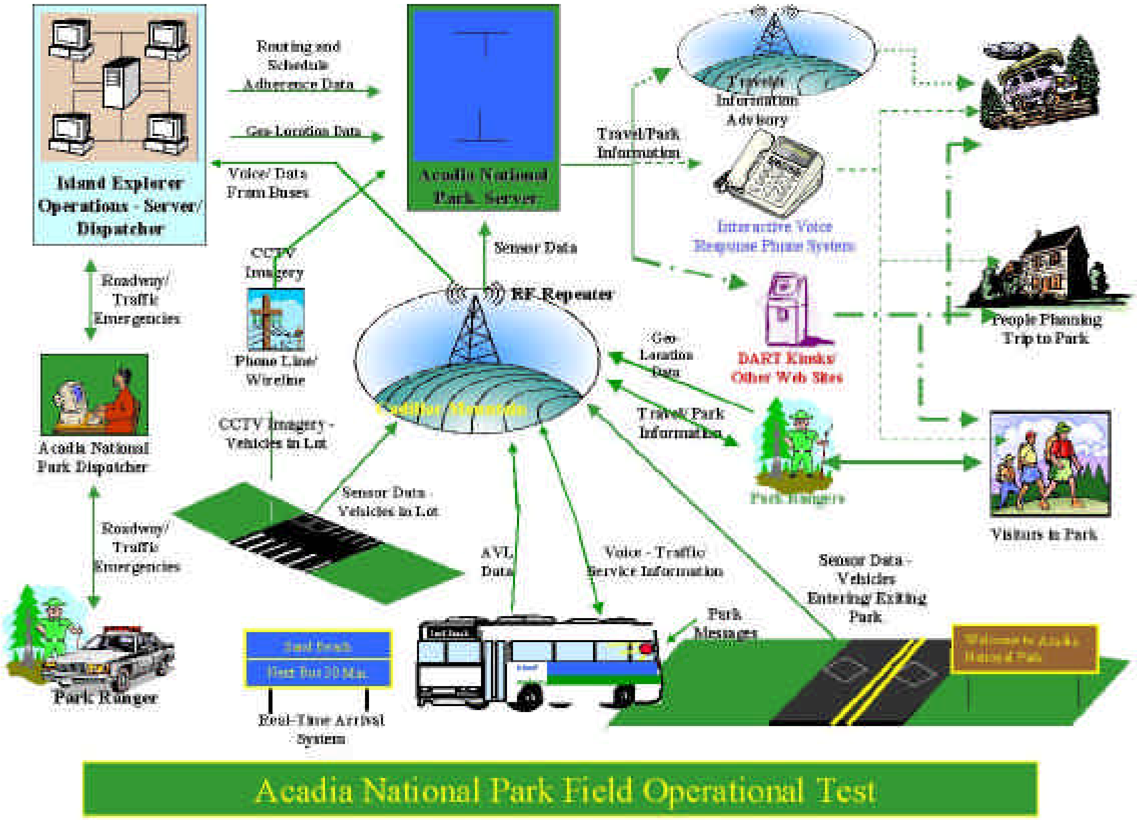

Figure 2. System Architecture for ITS FOT at Acadia National Park

The overall system is comprised of nine interrelated components that represent three general areas of ITS applications:

- Travel and Traffic Management
- Public Transportation Management
- Emergency Management

The clusters of applications are shown in Figure 3.

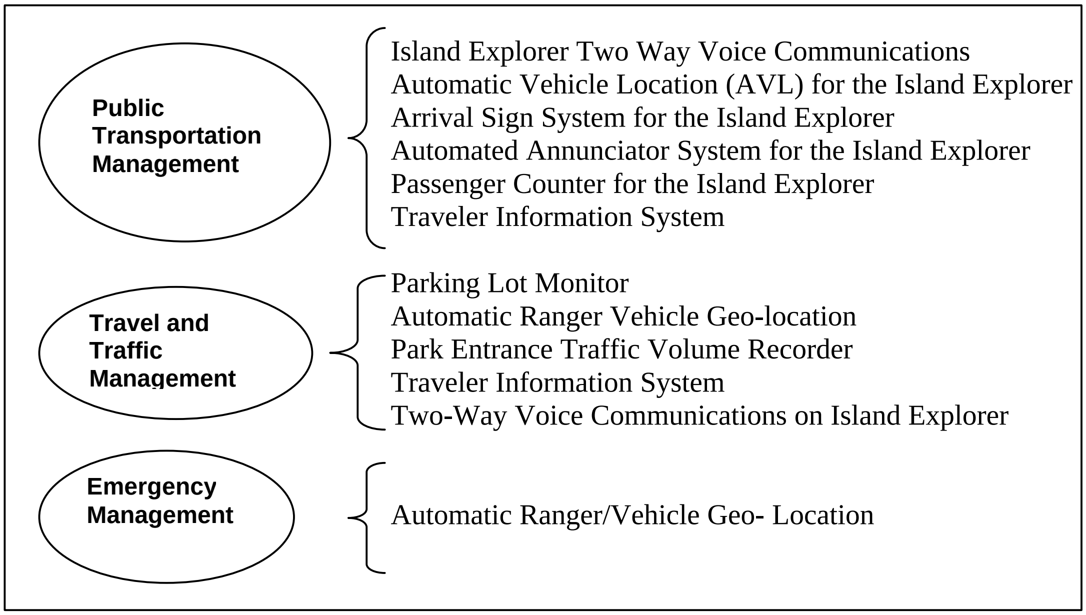

Figure 3. ITS System Components of the Acadia National Park ITS FOT

Further elaboration on the relationship between the individual system components, the functional requirements, the system elements, and the needs the components are intended to address is shown in Table 1.

Table 1. ITS System Components

System Component	Functional Requirements	System Elements	Needs Addressed
Island explorer Two-way Voice Communications	Transmit and receive to/from/between vehicles and dispatch center	Transceivers; vehicle and base station Repeater to amplify signal	Improved efficiency Improved safety Real time traffic information for park staff, reduce crush load conditions, incident detection
AVL for Island Explorer	Compute and transmit vehicle location Integrate vehicle locations with arrival signs, display current vehicle locations, integrated into enunciator	Vehicle transmitter TCP/IP Network Connectivity, GPS Transceiver, GIS Applications, Travel Time Applications	Improved efficiency and performance Decreased use of POV's Improved safety Improved Response Real time updates Increase ridership

Table 1. ITS System Components (Continued)

System Component	Functional Requirements	System Elements	Needs Addressed
Arrival Sign for Island Explorer	Transmit location Compute arrivals Transmit to arrival signs	Display sign Software, Wireless/Wireline Communications	Improved scheduling information Increase ridership
Automated Annunciator for Island Explorer	Determine location Automatically play message	Vehicle annunciator	Improve efficiency Reduce delays Increase safety Improve visitor experience
Passenger Counter for Island Explorer	Auto-count boardings/ dismounts at selected stops, Store information	Sensor to perform counts Data storage	Increase efficiency Improve planning Increase data options Reduce vehicle crush loads
Parking Lot Monitoring	Record number of vehicles entering and exiting, provide slow scan video of parking area, transmit data, display video, store data from vehicle counts	Counting sensor Video camera Display monitor Wireless/wireline communications TCP/IP network connectivity	Decreased use of POV's Provide planning data Information for Rangers Decreased Response times
Automatic Ranger/Vehicle Geo-Location	Determine location +-10 meters, transmit same to server, display locations on map	Transmitting unit GPS Transceiver Repeater for signal GPS/GIS Software	Information for Rangers Exact locations of Rangers Decreased response times Improved visitor safety, security
Entrance Traffic Volume Recorder	Record and transmit number of vehicles entering and exiting, store data	Counting sensor Transmission unit	Count vehicles Provide Planning Data Decrease use of POV's
Traveler Information System	Collect and integrate data, disseminate data to appropriate audience	Interactive telephone messaging system , web pages, vehicle sensors	Increase availability and display options of information, Decrease use of POV's, Improve visitor experience

2.2 Potential Impact of ITS

Based on the collective feedback of the stakeholders, the overriding impact of the ITS technologies should be to reduce vehicle congestion and improve the general visitor experience in Acadia National Park. Reduced congestion will have the added benefits of increased mobility of visitors and residents, aesthetic and environmental benefits of fewer vehicles parked on roads, and safety benefits of less traffic and better emergency response. These factors will combine to provide a more positive visitor experience.

Another potential impact on the entire Mount Desert community is the economic impact that a successful ITS and Island Explorer deployment would have. As in other areas of the country, tourism has a tremendous impact on the local economy. It is anticipated that ITS can significantly contribute to the regional economy of Acadia and Mount Desert Island by:

- Maintaining visitor access to Acadia National Park by relieving overcrowding of the roadways and parking areas
- Attracting new segments of tourists who arrive without automobiles
- Increasing local trade and commerce by removing reliance on downtown parking
- Enabling local businesses to expand with transit as an alternative to providing parking spaces.

This FOT is also significant in a larger context, as lessons learned at Acadia National Park and Mount Desert Island will help other rural locales plan ITS deployments.

3.0 Evaluation of ITS: An Overview

3.1 Purpose of Evaluation

U.S. DOT is sponsoring an independent evaluation of the ITS FOT at Acadia National Park. Evaluation of any system or program is good management practice. As a general management tool, evaluations should be undertaken to determine if a system performed as expected. Were the impacts positive or negative, or as large or small as intended? Did the individuals or organizations receive the intended benefits from the program? Were improvements in operations achieved? Was the natural environment affected in any way? A well-planned evaluation can address such questions. Objectivity, or absence of bias, is an important feature of a well-planned evaluation, for it ensures that assessment of positive and negative effects will be made without any conflict of interest on the part of the evaluators. For that reason, U.S. DOT has appointed an evaluation team not involved in the design, deployment, or operation of the Acadia National Park ITS Field Operational Test.

With respect to ITS, U.S. DOT is seeking to learn how the technologies performed in delivering their anticipated benefits as well as any other benefits to travelers. The evaluation will document what is learned and help to determine what ITS technologies work and under what conditions. ITS is an evolving area of the transportation profession, and much is still to be learned about what works and doesn't work. For the National Park Service and others in the parks and recreation industry, the evaluation will help planners, designers, and managers make good choices from among alternative approaches to dealing with transportation problems.

3.2 National ITS Evaluation Program of U.S. DOT

The ITS Joint Program Office of the U.S. DOT has established a National ITS Evaluation Program to conduct evaluations of ITS, document their results, and disseminate the information to a wide audience that can utilize the information.[6] In the course of conducting a large number

[6]For more information about the program, the reader can consult the following U.S. DOT webpage: http://www.its.dot.gov/eval/eval.htm.

of ITS evaluations to date, several lessons have been learned that contribute to a successful evaluation. These include:

- Achieving an early on-site presence of the evaluator
- Involvement of all stakeholders in planning the evaluation
- Establishing priorities for the evaluation
- Understanding how data will be used to achieve evaluation goals
- Collecting baseline data before the ITS technologies are implemented
- Identifying a few key measures of success in system performance.

The process for evaluating ITS deployments has taken the form of five basic steps as depicted in Figure 4.

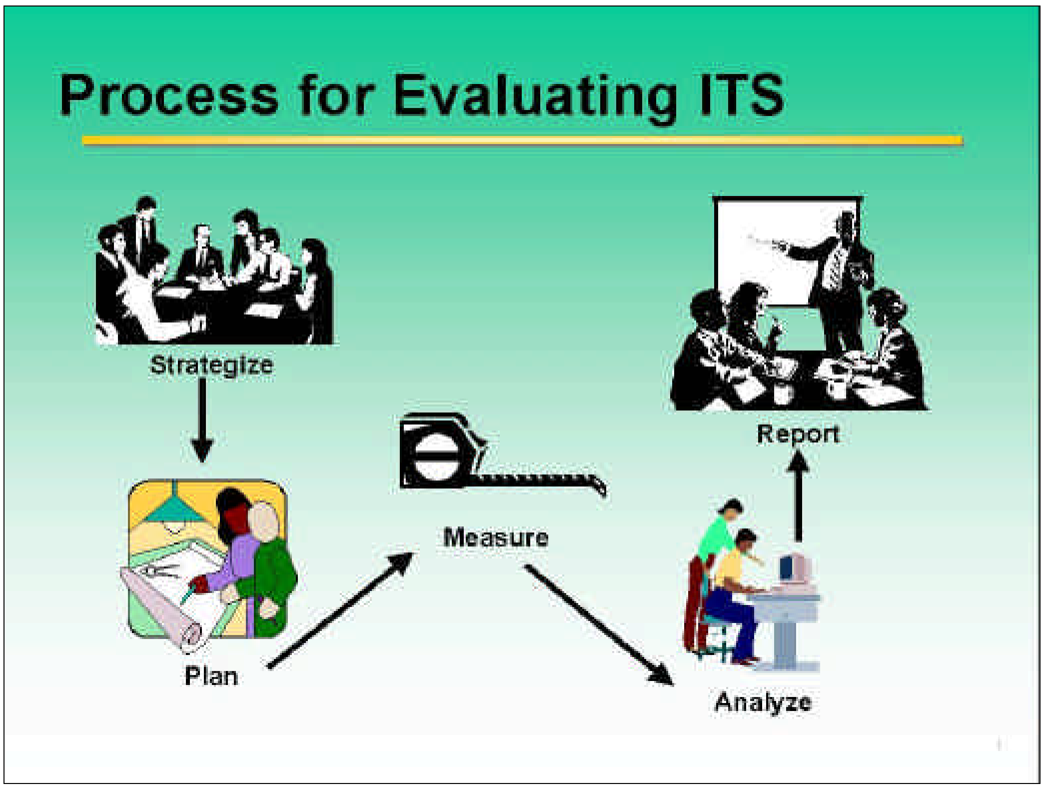

Figure 4. The Evaluation Process

First, an evaluation strategy is developed. In this step, the evaluator works with the project stakeholders to arrive at a shared vision of the project objectives and their relative importance for the evaluation. This stage can also be used to identify the target customers for the project and the evaluation and to ascertain what constitutes success in the impacts that will be measured. A workshop with stakeholders conducted by the evaluation team is an effective tool for developing the evaluation strategy.

In the second step, two types of evaluation plans are prepared. Based on the strategy that has developed with stakeholder input, an overall evaluation plan lays out what aspect of the ITS project will be assessed, when, and the method used for collecting data. For each evaluation test to be conducted, a detailed test plan is developed. The specific protocols are prepared, and responsibilities and resources detailed. All the planning is done with the concurrence of the project stakeholders.

At the measurement stage, data are collected that can be used to measure the effects of the ITS deployment. As specified in the evaluation plan, the evaluation team will use the most appropriate method, including surveys and interviews with users, direct observation, and system-recorded or historical data. Baseline data or "before" data measuring conditions before ITS technologies are in place should be collected, so that the effects can be discerned in the "after" data.

Analysis of the data in step four using quantitative and qualitative techniques is performed to compare before and after data. The results will indicate if the goals of the ITS deployment were achieved.

In the final stage, an evaluation report is prepared. The report can be disseminated in a wide variety of ways, including U.S. DOT publications, websites, and in presentations to appropriate audiences.

4.0 Evaluation Planning Workshop

On May 24, 2000, an evaluation workshop was conducted as part of the evaluation planning process. The purposes of the evaluation workshop were to:

1) Map a strategy for evaluating the benefits of the ITS technologies that will be used;
2) Identify goals of the various stakeholders involved in the FOT;
3) Determine how progress toward achieving the goals can be measured;
4) Identify what level of success is expected over the next two years; and
5) Develop a consensus view of evaluation goal areas

The workshop was held with members of local and regional stakeholder organizations, including members of the implementation team. A list of participants is presented in Table 2.

Table 2. Evaluation Workshop Participants

Organization	Names
National Park Service (NPS)	Len Bobinchock Shirley Beccue
Friends of Acadia (FOA)	Ken Olsen Stephanie Clement
Southwest Harbor (SWH)	Jean Marshall
Downeast Acadia Regional Tourism (DART)	Risteen Masters
United States Department of Transportation (USDOT)	James Pol Jeff Van Ness John Dewar
Tom Crikelair Associates	Tom Crikelair
Downeast Transportation Incorporated (DTI)	Glenn Gordon Don Cooper
Maine Department of Transportation (MeDOT)	Russ Charette Susan Moreau Dale Peabody
Science Applications International Corporation (SAIC)	Moe Zarean David Register
Battelle Evaluation Team	Carol Zimmerman Tom Coleman John Daigle

After presenting an overview of the process for evaluating the Acadia National Park ITS Field Operational Test and reviewing the ITS technologies for Acadia, the workshop focused on the following objectives:

1) Identify the anticipated impacts associated with the ITS technologies for Acadia;
2) Identify key objectives associated with the six general goal areas for ITS evaluations that are relevant to Acadia; and
3) Prioritize the goal areas and key objectives to be evaluated and identify relevant data collection methods.

In identifying anticipated impacts associated with the ITS technologies for Acadia, workshop participants were divided into 2 breakout groups of about 6 stakeholders, a facilitator and a recorder. More than one person representing an organization or agency was asked to work together in the same breakout group. This enabled a consensus decision to be made at a later stage when an organization represented one voting block in the process of determining the importance of each evaluation goal area. The first task for members of each breakout group was to think broadly of both positive and negative outcomes of ITS technologies at Acadia. A number of items were listed under broad themes such as ecological, psychological, economic, sociological, and safety outcomes. The breakout groups then shared their lists of anticipated impacts of ITS technologies.

Next, the participants were given a brief presentation about the goal areas for rural ITS evaluations. A brief description was given for each goal area involving safety, mobility, efficiency, productivity, energy and environment, and customer satisfaction as well as examples of key evaluation measures for each goal. Participants were then asked to remain in the same group but trade facilitator and recorder. A number of measures of interest were identified and sorted into the evaluation goal areas. Each organization or agency was given 100 total points to distribute and to vote on the relative importance of each evaluation goal area. Again, if more than one person represented an organization or agency these individuals needed to work together to determine the distribution of the 100 points. The two breakout groups were then assembled to share results and to form a consensus view on the priority of evaluation goal areas. Table 3 presents the results of the voting by stakeholder organization and the total for the entire group.

Table 3. Evaluation Workshop Voting

Goal Area	Organization							Grand Total
	NPS	FOA	SWH	DART	USDOT	DTI	MeDOT	
Customer Satisfaction	20	40	30	30	5	40	30	195
Mobility	15	0	50	20	20	5	30	140
Energy and Environment	25	30	0	10	20	10	4	99
Productivity/ Economic Vitality	5	10	20	15	15	20	8	93
Safety	20	10	0	10	25	5	20	90
Efficiency	15	10	0	15	15	20	8	83

A brief introduction was given on data collection methods such as surveys, individual interviews, focus groups, system data, and direct observation with an emphasis on using before and after data for evaluating the goal areas. Participants identified data collection methods that would be appropriate for measures of interest for each goal area. In addition, participants identified appropriate sources of information and points of contact to assist with measures of interest and data collection.

5.0 Evaluation Strategy for Acadia ITS FOT

Five evaluation goal areas have been identified for rural ITS applications: safety, mobility, efficiency, productivity and economic vitality, energy and environment, and customer satisfaction.[7] One of the outcomes of the Acadia ITS FOT evaluation workshop was identifying which goal areas have priority in the project. The voting process revealed that there was

[7] For example, "Evaluation of the FORETELL Consortium Operational Test, Evaluation Strategy," July 1, 1998, available at http://www.its.dot.gov/eval/rural.

considerable agreement among the workshop participants that customer satisfaction and mobility were higher in priority than other goal areas. However, all evaluation goal areas including energy and environment, productivity, safety, and efficiency appear to have some level of importance among organizations. Whereas it may be possible to collect evaluation data for each of the goal areas, collecting all possible information can be both expensive and time consuming, and as such counterproductive. Thus, the evaluation priorities defined during the workshop can be used to narrow the evaluation focus where necessary.

Whereas the purpose of the evaluation is to measure the effects of ITS technologies at Acadia National Park, it is through the users of the technologies and their decisions and actions that the effects are realized. Figure 5 illustrates the links in the relationship between ITS components and some of the types of benefits that are expected within the context of Acadia National Park and Mount Desert Island.

5.1 Mapping of Goals, Measurements, and Methods

To improve the focus of the evaluation, a few good measures in each of the five goal areas have been identified. Table 4 maps the evaluation goal areas to specific measures and methods of data collection. In cases where the effect of interest is too difficult to measure directly, surrogates can be used. For example, air quality measurements might prove to be prohibitively expensive or difficult to detect in the FOT. Possible surrogates include number of vehicles or vehicle miles of travel.

ITS Components

- Two-Way Voice Communications for Island Explorer
- Automatic Vehicle Location for Island Explorer
- Real-Time Arrival Sign for Island Explorer
- Automated Enunciator for Island Explorer
- Automatic Passenger Counter for Island Explorer
- Parking Lot Monitor
- Automatic Ranger/Vehicle Geo-location
- Park Entrance Volume Recording
- Traveler Information System

Users

- Island Explorer Operations
- National Park Service Staff
- Tourists
- Mount Desert Island Residents
- Mount Desert Island and Regional Businesses
- Office of Tourism
- Emergency Services

Decision/Action

- Frequent Use Of Island Explorer
- Island Explorer Drivers Call For Help
- Tell Customers About Island Explorer
- Tell Customers About Parking Conditions
- Deploy Emergency Services
- Access To Information
- Planning Of Bus Routes And Schedules
- Tell Customers About Numbers Of Vehicles Entering Acadia National Park

Effect/Benefit

- Less Stress for Tourists and Residents
- Reduced Impact On Park Ecosystems
- More Time For Recreation
- Less Traffic Congestion
- Faster Response To Emergencies
- More Tourist Business
- More Diverse Recreation Opportunities
- Improved Safety
- Decreased Use Of Pov's
- Improved Scheduling
- Customers More Attuned To Environmental Practices
- Improved Scheduling
- Provides Data For Planning

Figure 5. Relationship of ITS Components to Examples of Anticipated User Behavior and Evaluation Outcomes

Table 4. Map of Evaluation Goals, Measures and Potential Methods

Goal Area	**Evaluation Measures and Surrogate Measures**		**Method**: Survey	System Data	Historical Data/ Government Records & Models	Interviews	Focus Groups	Direct Observation
Customer Satisfaction	***End user:***							
	Awareness and use	How became aware of Acadia traveler information services	M/O/I			S	S	
		Expectations of product benefits	M/O/I			S	S	
		Ability to find needed information	M/O/I			S	S	
		Ease of use	M/O/I			S	S	
		Number and type of services used	M/O/I			S	S	
		Occasion of use	M/O/I			S	S	
	Effect on decision-making or behavior	Mode choice	M/O/I			S	S	
		Change in destination or time of travel				S	S	
	Realization of benefits	Ability to visit desired destinations	M/O/I			S	S	
		Fulfillment/unmet needs	M/O/I			S	S	
	Assessment of value	Enhancement of visitor experience	M/O/I			S	S	
		Value to trip-planning	M/O/I			S	S	
		Park pass sales	M/O/I			S	S	
		Comparison to last visit	M/O/I			S	S	
		Comparison of IE to POV	M/O/I			S	S	
	Transportation Provider:							
	Effect on IE driver job					P		
	Effect on IE operations					P		
	Effect on interagency relationships					P		
Mobility	Types of users of IE	Characteristics of IE users	M/O/I			S		
		Purpose of use of IE	M/O/I			S		
	Ability to reach destinations/activities	Destinations of IE vs. non-IE users	M/O/I			S		
		Activities of IE vs. non-IE users	M/O/I			S		
	Ability to use IE	Proximity of IE stops	M/O/I			S		
		Service refusals	M/O/I			S		
	Volume of travelers accommodated	Number of IE vs. non-IE users	M/O/I			S		
		Number of vehicles by type	M/O/I	S		S		
		Number of car-less visitors	M/O/I			S		
	Congestion of roadways	Perceived congestion	M/O/I			S		
Energy and Environment	Reduction in emissions	Non-attainment days			P			
		Number of bicycles carried on the IE				P		S
		CO, NOx, and HC levels			P			
		Vehicle counts			P			
	Enhanced natural aesthetics and values	Pounds of trash collected				P		S
		Number of illegally parked cars				P		S
		Understanding of ANP's mission and values	M			S		
	Reduction in fuel consumption	Fuel use: total and per vehicle	M/O/I					
		Vehicle counts			P			

Table 4. Map of Evaluation Goals, Measures and Methods (Continued)

Goal Area	Evaluation Measures and Surrogate Measures		Survey	System Data	Historical data/ Government Records & Models	Interviews	Focus Groups	Direct Observation
Productivity	Operational Improvements	IE staff overtime		P				
		IE cost per passenger mile/trip/mile/ service hour		P				
		Missed runs		P				
		On-time performance		P				
		Missed connections		P				
		O&M costs		P				
	Economic Benefit	Visitor expenditures			S	P		
		Duration of visitor stay	M		S		P	
		Sales tax receipts			P			
		Donations collected			P			
		Park entrance fees collected			P			
Safety	Improved Emergency Response Time:	Roadway		P		S	S	
		Back Country		P		S	S	
		Reporting time for emergencies/incidents		P		S	S	
	Reduced incidents	Incidents by location		P		S	S	
		Incidents by mode: Vehicle/bicycle/pedestrian		P		S	S	
	Reduction in hazardous conditions	Number of illegally parked cars		S			S	P
		Crush loads on buses		P		S	S	
Efficiency	Increase in Throughput	Efficient incident management (ranger location)		P			S	
		Efficient planning (number of buses on routes)		P		S	S	
		Crush loads on buses			P		S	S
		Number of stops at visitor centers		P				
		Dispatcher efficiency				P		
	Increase in Capacity	Decrease parking lot closures		P		S	S	S
		Standing riders (no seats available)	O/M	P				
		Denied riders (no room on bus)	O/M	P				
		Overall car count (both MDI and ANP)		P		S	S	
		Number of illegally parked cars			S			S
	Quality of Visitor Experience	Arrival/departure times (schedule adherence)		P		S	S	
		Analysis of web usage	M/I	P				
		Reduction in stops at visitor center for information		P		S	S	

Methods: P = primary source, S = secondary source, M = mail survey, O = on-board survey, I = intercept survey

5.2 Baseline Data

Detection of an effect of ITS technologies rests on measures taken from baseline conditions prior to ITS deployment. Where it is feasible, existing baseline data will be used. Still, not all of the desired measures can be supported by existing baseline data. Table 5 presents the Evaluation Team's current knowledge of possible sources of baseline data identified from discussion with stakeholder organizations. A more thorough investigation of these sources will be conducted as part of the evaluation plan and detailed test plans.

Table 5. Potential Sources of Baseline Data for Acadia National Park ITS FOT

	Data Source													
	1998 Visitor Study[8]	1999 IE Passenger Survey[9]	1999 Visitor Survey[10]	2000 IE Passenger Survey[11]	NPS Visitor Logs	NPS Ranger Logs	NPS Financial Reports	Maine DOR	Maine DOE	Maine DOT	Local Police	Maine Office of Tourism	DTI Records[12]	ITS System
Economic														
• Sales Tax Revenues								*						
• Overnight Tourists							*					*		
• Gate Fees							*							
• Donations							*							
• Park Attendance	*	*	*		*									
Traffic														
• Vehicle Counts										*				
• RV Count	*	*	*											
• Vehicles in Park														
Safety														
• Accidents						*				*	*			
• Incidents						*				*	*			
• Emergency Response						*					*			
Environmental														
• Emissions									*					
• Roadside Parking						*								
Operational														
• O&M Costs													*	
• Passengers Carried	*	*	*	*									*	
• Number of Routes		*		*									*	
• Missed Runs													*	
• Transit Measures													*	
Visitor Experience														
• Activities, Sites Visited	*	*	*	*										
• Benefits and Satisfaction	*	*	*	*										
• Visitor Characteristics	*	*	*	*										

[8] Littlejohn, M. 1999. Acadia National Park Visitor Study: Summer 1998. Report 108 Visitor Services Project. Cooperative Park Studies Unit, University of Idaho.
[9] Crikelair, T. 1999. Onboard passenger survey of the Island Explorer Bus. Report prepared for Acadia National Park. Daigle, J. and B. Lee. 2000. Passenger Characteristics and Experiences with the Island Explorer Bus. Technical report prepared for Acadia National Park.
[10] David-Peterson Associates. 1999. Visitors to Acadia National Park/Mount Desert Island: Look at Information System. Visitor Survey for Science Application International Corporation. Incorporated into the Transportation Needs Assessment report for the Federal Highway Administration and Acadia National Park.
[11] Planned for the visitor season of 2000 are two surveys, an onboard passenger survey of the Island Explorer, and an onsite visitor survey for carriage roads.
[12] Downeast Transportation will be collecting more detailed data on bus operations beginning in 2000. This information will include more detail on vehicle operations (enhanced dispatch and operating indicators), and should provide a firmer baseline to measure future operational efficiency.

5.3 Organization and Responsibilities of Evaluation Team

Battelle Memorial Institute under contract to U.S. DOT's ITS Joint Program Office leads the evaluation of the Acadia National Park ITS FOT. Dr. Carol Zimmerman of Battelle is the evaluation team leader and is assisted Mr. Thomas Coleman of Battelle's Cambridge, Massachusetts office. Battelle is supported in this effort by the University of Maine (Prof. John Daigle and his students), which is under subcontract to Battelle. Together, this team provides extensive experience in evaluations, ITS deployments, and familiarity with the issues of Acadia National Park. Figure 6 presents the organizational structure of the evaluation team.

Dr. Zimmerman will work closely with the FOT deployment team and local stakeholders to ensure that evaluation activities are coordinated with FOT activities. She will report to Mr. James Pol, the U.S. DOT Contract Officer for the evaluation. As evaluation leader, Dr. Zimmerman will have overall responsibility for the evaluation program and will assign responsibilities to evaluation team members. Prof. Daigle and his students will be primarily responsible for planning, executing, and analyzing the customer satisfaction surveys. From September, 2000 through December 2001, a graduate student under Prof. Daigle's direction will serve as the on-site evaluator and that student will be assisted by undergraduate students in data collection activities as needed. Mr. Coleman's principal duties include planning and executing traffic and transit management data collection and analysis, and he will be assisted in this effort by other Battelle staff as necessary. Zimmerman, Coleman, and Daigle will share responsibilities for planning and reporting.

Table 6 indicates the hours allocated for personnel assigned to the evaluation.

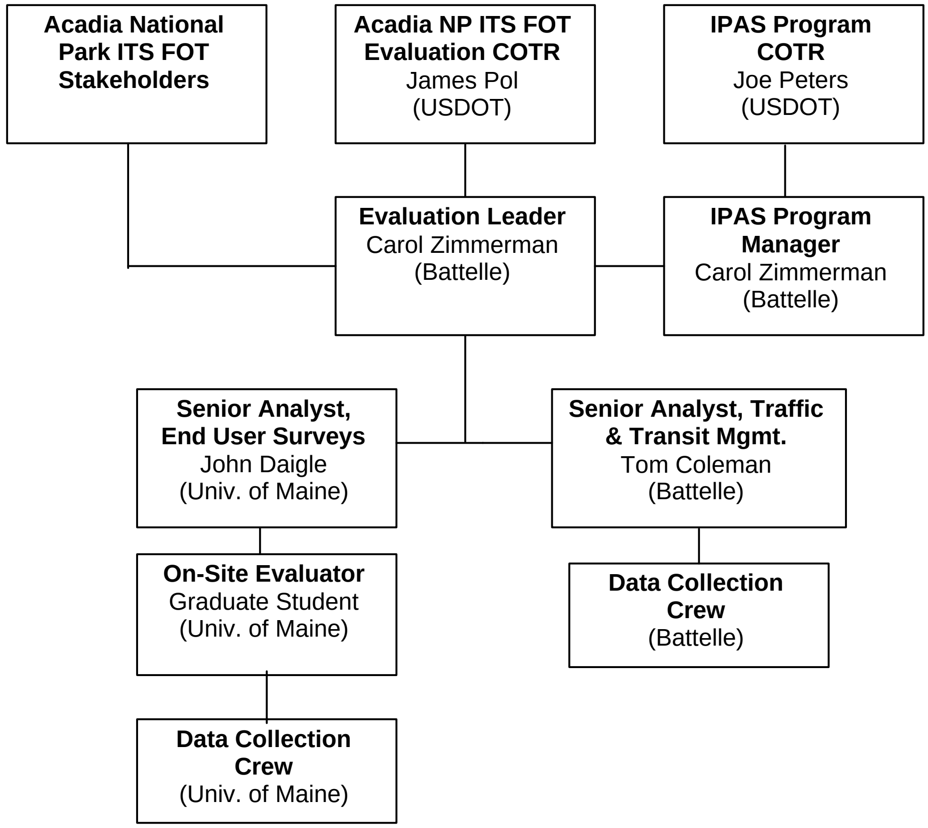

Figure 6. Evaluation Team for Acadia National Park ITS Field Operational Test

Table 6. Allocation of Team Member Hours to Evaluation Task

	Team Member	Role	Strategy Formulation	Evaluation Plan Hours	Test Plan	Baseline Data Collection	After Implementation Data Collection	Final Report	Archive Data	Total Hours
Battelle	Carol Zimmerman	Evaluation Leader	64	80	36	40	72	80		372
	Tom Coleman	Senior Analyst	80	104	120	100	140	210	40	794
	Engineering Staff	Data Collection Crew		64	80	180			40	364
	Battelle Support Staff	Administrative Support	48	48	30			120		246
Univ. of Maine	John Daigle	Senior Analyst	32	56	40		80	60		268
	Graduate Student	On-Site Evaluator			230		400	230		860
	Undergraduate Students	Data Collection Crew					200			200

5.4 Schedule

The evaluation of the Acadia National Park ITS FOT started in May, 2000 and is scheduled to be completed in December, 2001. Evaluation milestones and deliverables during that timeframe are shown in Table 7. By necessity, evaluation activities are tied closely to the seasonal cycle of tourism on Mount Desert Island. While much of the data collection will be focused during the summer months, the rest of the calendar will be used for other evaluation activities such as planning and analysis.

Data collection is scheduled for the summers of 2000 and 2001 and is dependent to a large extent on the limited operating season of the Island Explorer, which runs from late June through early September. Data collected will also reflect conditions external to Island Explorer operations, such as poor weather and gasoline prices. These factors could influence the number of visitors to Mount Desert Island and Acadia National Park.

Table 7. Schedule of Milestones and Deliverables

TASK	2000								2001											
	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Evaluation Strategy		?																		
Evaluation Plan			?																	
Detailed Test Plans				?																
Baseline Data Collected						?														
Report on Baseline Conditions									?											
Updated Evaluation Plan (if needed)													?							
Updated Detailed Test Plan (if needed)														?						
Post-Deployment Data Collected																	?			
Draft Evaluation Report																		?		
Final Evaluation Report																				?
Archived Data																				?

6.0 Next Steps

Pursuant to the approval of the evaluation strategy by the U.S. DOT and other stakeholders, the Battelle Evaluation Team will undertake the following tasks over the next four months:

- Development of Evaluation Plan
- Development of Detailed Test Plans
- Baseline Data Collection.

The strategy defined in this document provides the foundation for development of the evaluation plan. The evaluation plan will define the measurements that will be made, the approach that will be used for each measurement, the techniques to be used in analysis of the data. The evaluation plan will also identify the individual test plans that need to be developed as well as the resources required and schedule for implementation. For example, the evaluation plan is likely to propose one or more types of visitor surveys and collection of information on Island Explorer operations to assess the effect of the ITS technologies.

Several detailed test plans will be developed as specified in the evaluation plan. The test plans are the protocols that will guide the actual data collection and analysis. With respect to a visitor survey, the individual test plan would include the questionnaire to be used, the sample design, tabulation scheme for the data, individuals or organizations responsible for conducting the test, and other details needed to implement the survey.

During the summer of 2000, baseline data will be collected. This activity will rely on reuse of existing data where feasible. Investigation of some of those sources of data (see section 5.2 of this document) has already begun. Where no data currently exists for a measurement that is needed, baseline data will be collected. For example, it is anticipated that information related to Island Explorer operations will need to be collected in the summer of 2000.