

Summary of the Regional Hurricane Traffic Operations Workshops (Held January – February 2002)

Three regional workshops were held in the southeastern United States to give representatives from transportation, law enforcement, and emergency response organizations the opportunity to exchange ideas on traffic operations during hurricane evacuations and recovery. A list of attendees is attached.

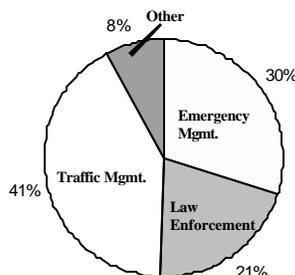
The Federal Highway Administration (FHWA) sponsored the workshops on:

- January 8-9, 2002 Jacksonville, Florida for the states of Alabama, Florida, and Georgia
- January 29-30, 2002 Raleigh, North Carolina for the states of North Carolina, South Carolina, and Virginia
- February 27, 2002 Houston, Texas for the state of Texas

The objectives of the workshops were to:

1. Share updates on transportation plans, ITS deployments, and institutional arrangements associated with transportation operations during hurricanes;
2. Brainstorm and share simple solutions for improving traffic flow across State or jurisdictional boundaries;
3. Work with agency representatives on how to plan and fund improvement projects (institutional, operational, technological) applicable to transportation operations during hurricane evacuations;
4. Develop next steps from the workshops for improving transportation operations during evacuations; and
5. Share information about upcoming activities and conferences supportive of transportation operations (TRB, ITE, NHC, and others).

Approximately 50 individuals attended each of the workshops. Of the 50 participants, approximately 75% were from state or local agencies (emergency management, law enforcement, or transportation). Their primary expectations were to receive information and updates, share ideas, and network. Almost equally important was their desire to learn about hurricane evacuation plans and practices from other state and local agencies. The mix of participants is shown below.



A Balanced Mix Of Agency Participants Provided
A Useful Forum For Idea Exchanges

Summary Observations

In the past several years, Departments of Transportation in the southeastern states have increased their multi-state and multi-agency coordination in response to hurricanes. The effects of these coordination efforts include:

- All southeastern states have used or are prepared to use some form of ITS to support evacuations and recovery operations due to hurricanes. Deployed equipment includes: CCTV, loop detectors, HARs, and data collection and synthesis centers or facilities. Deployed technology is used primarily to collect traffic counts, observe real-time traffic conditions, and provide public information about traffic conditions.
- ITS network coverage is uneven throughout most states, with traffic management information available mainly from the metropolitan areas. For example, most rural southeastern interstates do not have loop detectors or CCTVs between major metropolitan areas. Moreover, ITS investments are focusing more on multi-application uses, rather than single-use needs.
- Integration or sharing of traffic management/traffic volume data within and across agencies is increasing. This information is used to aid decision-making, anticipate resource needs, and enhance emergency response capabilities. Information is exchanged among agencies through a variety of means, including conventional voice communications, interoperable radio systems, and computer networks, including the Internet.
- Planning for evacuations in some areas has complemented other traffic operation needs such as work zone management practices.
- Contraflow plans have been developed in coastal states. Activities have ranged from sketch planning to detailed simulation and selected field tests of ITS devices and traffic management procedures. Information sharing about Contraflow plans and tests has allowed each state to craft policies and procedures appropriate for their jurisdictions and style of traffic management.
- All state agencies expressed a continued need to improve and share real-time traffic count data, congestion predictions, and clearance time estimates.

The summary table below provides an indication of the major transportation-related activities associated with hurricane evacuations and recovery.

Major Activities (Current or Planned) Associated with Hurricane Evacuations and Preparedness For Southeastern State Departments of Transportation (as of March 2002)

	ITS	Transportation Evacuation and Recovery Operations	Law Enforcement Functions and Coordination	Emergency Management Functions and Coordination
Alabama	Limited ITS applications for hurricanes, but considered as part of state ITS plan			Current availability of 800MHz system for connecting 67 counties with state EOC
Florida	Various ITS devices and networks, which are part of a \$496M overall ITS investment	<ul style="list-style-type: none"> • ITS applications for I-5 contraflow under development • Exploration of improved procedures for shutting down evacuations • Protocol calls for 12 hours of continuous daylight needed for I-5 contraflow operations 	<ul style="list-style-type: none"> • Good regional coordination exists with FDOT 	15-minute traffic counts provided by FDOT to state EOC
Georgia	Limited applications for hurricanes, but considered as part of state ITS plan	Joint work sessions with FDOT to discuss operational management of work zones, rail crossings, and drawbridges on evacuation routes		Coordination discussions underway
North Carolina	<ul style="list-style-type: none"> • Traveler information initiatives through web, kiosk, HAR, DMS, and brochures • Limited applications for hurricanes, but considered as part of state ITS plan 	<ul style="list-style-type: none"> • I-40 contraflow plans done • Decision for contraflow reached through deliberation of four agencies and recommendation to the Governor. Contraflow invoked by the Governor 	Procedures for contraflow operations developed with NCHP	NCDOT incident management teams assist with local agency coordination

Major Activities (Current or Planned) Associated with Hurricane Evacuations and Preparedness For Southeastern State Departments of Transportation (as of March 2002)

	ITS	Transportation Evacuation and Recovery Operations	Law Enforcement Functions and Coordination	Emergency Management Functions and Coordination
South Carolina	<ul style="list-style-type: none"> • ITS deployments from work zones and other projects used to augment hurricane operations, e.g., portable HARs, DMS, etc. • Limited ITS applications for hurricanes, but considered part of state ITS plan 	<ul style="list-style-type: none"> • I-26 contraflow plan in place and field tested • Contraflow decision only from the Governor • Estimated 10 hours savings in clearance times • Including contraflow design needs into new/retrofit construction projects 	Contraflow plans developed and tested with SCHP	SCDOT development (with SCEPD) of hurricane guide
Texas	<ul style="list-style-type: none"> • Limited ITS applications for hurricanes, but considered part of state ITS plan • Contraflow operations monitored, in part, through TMC at San Antonio 	Contraflow used on I-37 from Corpus Christi to San Antonio when Category 3 or higher	Use of a formal traffic management plan as part of Texas Emergency Procedures manual to coordinate among agencies in times of an emergency	
Virginia	<ul style="list-style-type: none"> • Extensive ITS deployment in the Hampton roads area • Additional deployments forthcoming as part of state ITS plan 	Contraflow operations of I-64 in the Hampton roads area to Richmond (I-295) possible if Category 4 or greater and invoked by the Governor	Contraflow plan developed with VDPS/HP	VDOT development of traffic management evacuation plan with VDEM

Highlight of State Presentations on Hurricane Preparedness Activities

Agency representatives presented information on special activities, plans, and programs addressing key aspects of transportation operations during hurricanes. A summary of their key discussion points is provided alphabetically by state:

Alabama

Communication Systems Interoperability

- AEMA discussed operations of the state EOC, which is activated monthly for a variety of reasons. Topics included:
 - The 800 MHz radio system connecting 67 counties to the state EOC
 - The *EM2000* project to interconnect county systems
 - The Statewide public radio system
 - Their preference for sheltering in place.

No further extensive discussion were offered about the traffic management or planning aspects of hurricane evacuation. Interagency coordination was discussed in the context of the state EOC.

Florida

Communication Systems Interoperability

- No direct mention of the needs, issues, or concerns.

Intelligent Transportation Systems

- FDOT discussed their \$496M earmark to deploy ITS on all limited access highways. They are developing corridor master plans including funding and sequencing to meet this goal. Other topics included:
 - The statewide fiber optic network that may link TMCs to EOCs when fully deployed. During hurricane events, 15-minute traffic counts are provided to EOCs.
 - Research into TMC software compatibility issues. A statewide software library is to be developed to enable linking of all TMCs.
 - Testing of unmanned aerial vehicles (UAVs) for surveillance.
 - Incident management program (i.e., Road Rangers) to handle incidents during evacuations.
 - Memorandums of Understanding (MOUs) between FDOT and FHP to share TMCs (i.e., co-located operations)

Interagency Coordination

- FHP contraflow operations require 12 hours of continuous daylight to implement. Specialized ITS treatment is expected for contraflow routes; detailed plans are under development.
- Florida EOC noted the need for:
 - Traffic count data. They currently get hourly volumes and speed from 50 sites around the state. They would also like counters on the barrier islands.
 - Congestion predictions to provide travel time expectations to the public via the statewide radio system.
 - Procedures for shutting down evacuations -- they have not been adequately addressed.
 - Use of archived data on evacuee departure times, routes and destinations to improve planning.
 - CCTV surveillance.
 - Dynamic clearance times (for multiple counties/areas).

Georgia

Communication Systems Interoperability

- GDOT spoke on the need for independent communications systems.

Intelligent Transportation Systems

- No explicit discussion of plans or projects, other than to indicate that ITS for hurricane evacuation is part of the larger state plan.

Interagency Coordination

- Florida and Georgia have held joint sessions to discuss evacuations; special areas requiring further attention include work zones, rail crossings and drawbridges on evacuation routes.

North Carolina

Communication Systems Interoperability

- Improvements are underway to develop greater communications interoperability, especially for the highway incident management program (IMAP).

Intelligent Transportation Systems

Additional sensors and detectors are being installed as part of an on-going state ITS plan, but primarily in the metropolitan areas. I-40, the major contraflow route, does not have

any ITS sensors. A preliminary plan was developed indicating the level of ITS investment needed to facilitate hurricane evacuations.

Interagency Coordination

- NCDOT presented their I-40 lane reversal plan, which was developed after Hurricane Floyd. The decision control group begins to coordinate 48 hours before evacuation is expected. Conference calls, including local agencies, are held every 6 hours (1 hour after forecast update). A “Go/No-Go” decision is made 12 hours before lane reversal might begin.
 - Roughly 90 miles of I40 are reversed between NC Route 132 and NC Route 96 (details are provided in a brochure on the lane reversal plan). Exit and entry are permitted at most interchanges. At the terminus, traffic in westbound lanes must continue on I-40 and cannot exit onto NC 96. Traffic in reversed eastbound lanes must exit and turn either left or right on NC 96.
 - Two parallel US routes are used for eastbound traffic.
 - Due to safety and weight concerns, commercial vehicles are prohibited in reversed lanes. Static signs inform drivers of prohibition.
 - Highway patrol officers and DOT personnel are located at every interchange. DOT personnel also are present at public rest areas. Reversal requires 40 DOT personnel, 100+ SHP officers, 28 DMS, 5 HAR transmitters, 96 Type III barricades, and 400 drums/cones.
 - Incident management assistance patrols (IMAP) travel the route.
 - Traffic surveillance is performed by humans (IMAP, DOT, HP).
 - Lane reversal is terminated 2 hours prior to the arrival of gale force winds.
 - Exit numbers are painted on ramps for aerial viewing by highway patrol. Mile markers are installed on the backside in reversed lanes.
 - In a mobilization exercise, equipment was deployed faster than expected.
 - Traveler information is disseminated via flip-down signs, DMS, HAR, press releases, brochures/posters, local TV & radio (pre-recorded messages), kiosks at welcome centers, and the TIMS website (www.ncsmartlink.org). This site will be the basis of the state’s 511 system. Shelter information dissemination is coordinated with the Red Cross and Salvation Army.
 - Interagency incident management teams are formed for local agency coordination. There are over 20 teams in NC including VA/NC and SC/NC teams.

South Carolina

Communication Systems Interoperability

- No explicit mention of issues, needs, or concerns.

Intelligent Transportation Systems

ITS for hurricane evacuations is part of the overall state ITS plan. However, many of the assets used on other projects, e.g., workzones, special event traffic management, etc., are used by the SCDOT during hurricane evacuations. These assets include portable HARs and DMS.

Interagency Coordination

- SCHP and SCDOT discussed hurricane operations in South Carolina:
 - There are several prioritized evacuation routes in the state (details are provided in a public information brochure). Each route has blue route and shelter information signs. Aerial surveillance is used for all routes.
 - I-26 is reversed from I-526 in Charleston to Columbia. There are four loading points for reverse lanes (including Ashley Phosphate Road, US 78, and College Park Road). Loading points are covered by CCTV cameras. Flip-down signs are installed along the route.
 - Exiting is permitted at all locations except loading points. Reentry is not allowed.
 - Lane reversal saves 10 hours of clearance time.
 - At the terminus, traffic in westbound lanes is diverted onto I-77 and traffic in reversed lanes is diverted back on to I-26 westbound lanes.
 - Comfort stations and National Guard wreckers are stationed along route. Roving patrols are also used.
 - Commercial vehicles are restricted to normal lanes.
 - ITS deployments on I-26 include 36 CCTV cameras (134 statewide) with fiber optic and dial-up telephone communication, 41 DMS (47 statewide), 17 HAR, and 2 “smart zones” which are portable combined DMS and CCTV (4 statewide). ATR count data and traffic video are relayed to the State EOC.
 - A reversal contingency plan is enacted based upon established criteria. The plan includes US 278 (Hilton Head), which saves 4 hours in clearance time; US 17 (Georgetown), which saves up to 3 hours; and SC 22 (Conway Bypass).
 - Over 2000 law enforcement personnel are used for traffic control, drawing resources from the western part of the state 24 to 48 hours in advance.
 - Emergency medical response for I-26 is provided via two parallel routes.
 - Parallel US Routes 176 and 78 also lead to Columbia.
 - Contraflow operations were modeled using Synchro and peak volumes during Hurricane Floyd.
 - SCEPD developed a “South Carolina Hurricane Guide” including weather/hazard information, evacuation routes and contraflow info, radio/website info, vulnerability maps, and shelter information.
 - Future needs include permanent DMS and HAR, more CCTV, wireline telephone access, design considerations for new construction/retrofitting, and permanent barriers (e.g., gates) at interchanges to reduce personnel needs.

Texas

Communication Systems Interoperability

- No explicit mention of needs, issues, or concerns.

Intelligent Transportation Systems

- The ITS capabilities at the San Antonio terminus of the contraflow on I-35 have provided opportunities to assist with mobility management and contraflow termination in the San Antonio area. I-35 does not have extensive ITS detection outside the greater San Antonio area. Future ITS deployments are part of the overall state ITS plan.

Interagency Coordination

- TXDPS/HP and TXDOT presented information on their Traffic Management Plans for hurricane operations.
 - Primary purpose of the Traffic Management Plan was to formally establish a coordinated plan for the direction and control of evacuating traffic during times of emergencies.
 - Plan allows for separation of routes from the at-risk coastal counties of Nueces, San Patricio, Kleberg, Kenedy, Aransas and Calhoun. The primary northerly and westerly routes away from the Coastal bend are I-37 and US-181 & 77.
 - Contraflow is used on I-37 by converting the southbound lanes to northbound traffic from the Coastal Bend Corpus Christi area.
 - In addition to expected storm track times, other criteria for reverse lane plan are: size and or intensity of storm; anticipated path; storm surge; number of citizens affected; and preparation for mobilization.
 - Contraflow plans are not considered for small storms such as Tropical storms and Category 1 or 2 hurricanes. This is not to indicate that any other size category storm will automatically cause initiation of the reverse lane plan.
- Hosts at Houston's TranStar provided a tour of the integrated emergency management functions at the facility. Proposed improvements for better integration of fire and law enforcement functions were also discussed.

Virginia

Communication Systems Interoperability

- No explicit mention of needs, issues, or concerns.

Intelligent Transportation Systems

- The ITS capabilities in the Hampton Roads area are extensive with a Smart Travel Center and approximately 55 CCTV and several hundred loop detectors installed and operating. An extensive incident management team has also been operating for several years. ITS investments call for increased detectors (about 300 additional CCTVs) within the next two years. The ITS capabilities have been installed primarily for general mobility management, but have the ability to assist during hurricane evacuations, e.g., contraflow operations in the Newport News area of I-64.

Interagency Coordination

- VDOT presented a briefing on Virginia Coastal Hurricane Evacuation Planning.
 - A vulnerability study for Hampton Roads area found that 650,000 people are at risk. (The total population is 1.5 million.) 300,000 vehicles evacuate in the 27-hour clearance time. Considering traffic from NC, traffic demand exceeds capacity.
 - Complacency is an issue in Virginia since it's been many years since a hurricane has directly impacted the state.
 - They plan to use ramp metering to prevent route over-saturation.
 - The HurrEvac decision arc arrives when storms are near central Florida. This is too far out for local jurisdictions to make evacuation decisions.
 - Contraflow will be used as a last resort for a Cat 4 storm and must be directed by the Governor. There is a plan to reverse roughly 80 miles of I-64 from the Hampton Roads Bridge Tunnel to Richmond. No entry or exit is permitted due to peninsular geography. There are high-speed crossovers on both ends of the bridge tunnel, which was designed for use in both directions.
 - At the I-295/I-64 interchange terminus, traffic in reversed lanes transition back to westbound lanes via a high-speed crossover, and traffic in westbound lanes must exit to the collector-distributor road or I-295.
 - Due to preparation and shutdown time, clearance time is 27 hours with or without contraflow. Preparation time is 6 hours. Throughput of 10,000 vehicles per hour is expected.

FHWA Grant Concept

Representatives from FHWA presented preliminary ideas on a grant program to provide state assistance with transportation operations during hurricanes. The program is initially scoped at about \$500K and could be made available to individual states or group of states, especially those addressing multi-state or cross-state evacuation issues. Workshop participants offered a variety of suggestions on the criteria for grant qualifications, timing of the grant, and applicable categories/uses of the funds. FHWA will provide final guidelines in April 2002 on the grant procedures with the goal of releasing the funds prior to or near the beginning of the 2002 hurricane season.

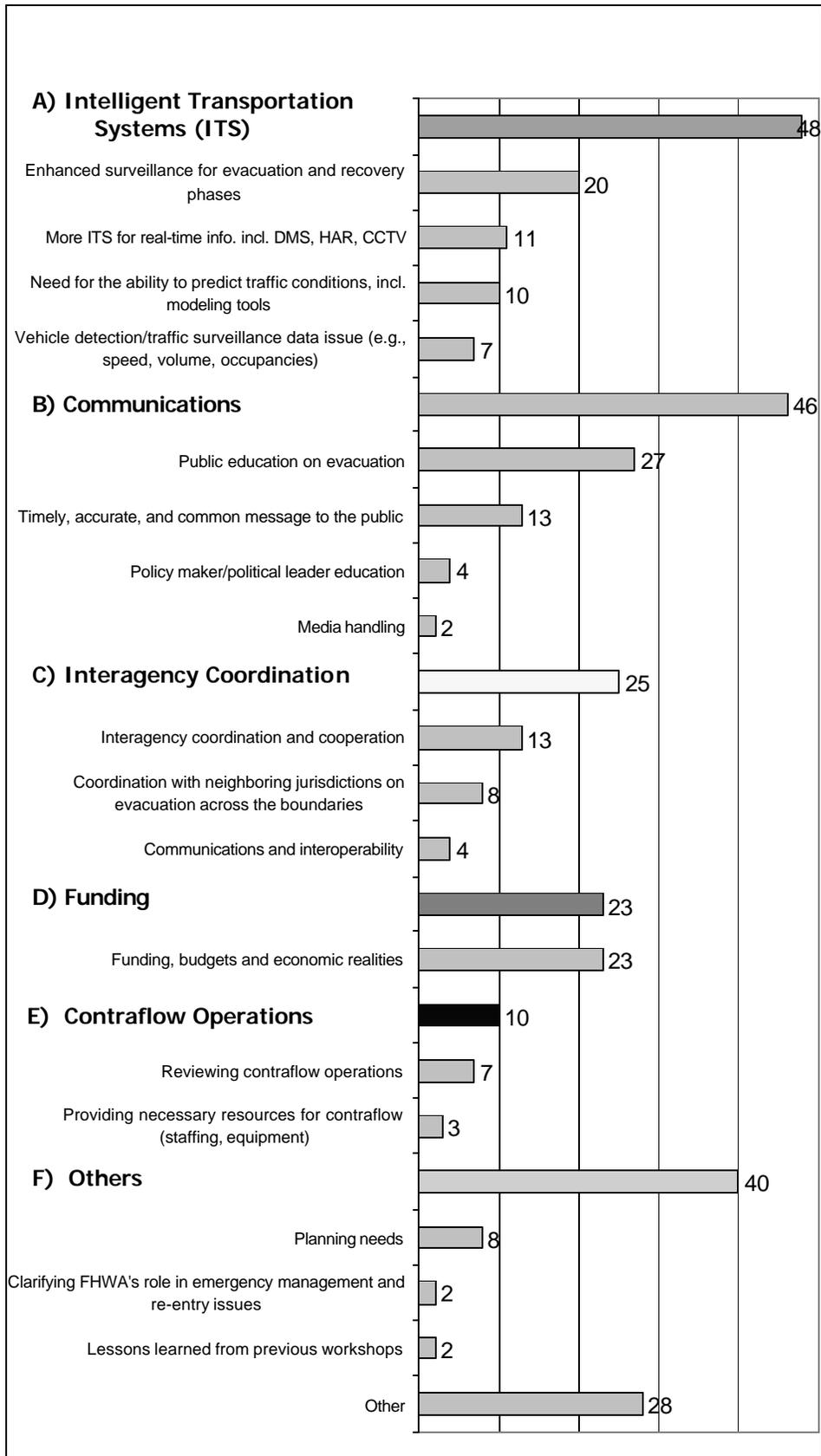
Key Issues and Concerns for Further Study and Activity

Another portion of the agenda was devoted to small group discussions among agency representatives. During this period and other parts of the workshop, participants had an opportunity to brainstorm key issues and concerns and suggest action steps. The following chart summarizes the key needs, grouped into six categories:

- ITS, including issues of network coverage and real-time information collection and traffic prediction
- Communication with the public
- Interagency Coordination
- Funding
- Contraflow Operations, including testing and sharing lessons learned from applications
- Others – Interoperability of communications equipment, etc.

These categories reflect some of the topics presented by the states during the depiction of their hurricane evacuation plans and programs. For example, many states believe ITS technologies can be useful in monitoring and managing the evacuation and recovery phases of evacuations, especially in more rural or remote parts of the state. However, ITS investments require multiple uses and benefits other than just hurricane evacuations to be selected.

Numerical scores collected from all workshops are depicted in the chart, indicating the relative number of times an issue was raised. FHWA is working with all agencies to follow-up.



Six Categories of Key Needs From All Workshops Were Identified

Workshop Evaluations

At the conclusion of each workshop, participants were asked to complete an evaluation form. In addition to the usual comments and recommendations for improved logistics and timing, the following summary results (counts or percentages shown in parentheses) topics were especially useful:

- **What were your expectations for this workshop?**

- Information update, sharing ideas, and networking (39)
- Learning about hurricane evacuation plans/practices and ITS deployments of other states and agencies (33)
- Gaining information on how ITS is being planned/used for hurricane awareness and evacuations (5)
- Gaining information on funding, and learning of FHWA work on evacuation plans and issues (3)

- **Were your expectations met? Why or Why not?**

- | | |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yes (84%) | Learned from other agencies/states plans and practices; learned new concepts; gained grant information and networking opportunity; obtained regional perspective. |
| Somewhat (6%) | Certain states were underrepresented; not much discussion on ITS aspects of hurricane evacuation. |
| No (6%) | The workshop attempted to develop new ideas; program is better suited for regional level; focus was on Federal agendas; state planners were not present. |
| No comment (4%) | |

- **From the discussions at this workshop, what are the top three issues that need near-term attention:**

- Public education on evacuation (23)
- Real-time traffic information/detection including modeling and data issues (21)
- Interagency/inter-region communication and coordination (14)
- Funding (Grant) program and budgets (13)
- ETIS enhancement including funding issues (6)
- Contraflow guidance and simulation (4)

A list of all workshop attendees is attached and organized by state affiliation.

Workshop Attendees - Regional Hurricane Traffic Operations Workshops
(Held January – February 2002)

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