PARTNERSHIP BETWEEN THE GREATER NEW ORLEANS EXPRESSWAY COMMISSION AND THE NATIONAL WEATHER SERVICE FORECAST OFFICE IN SLIDELL, LOUISIANA

Alan Johnson, Paul Trotter and Freddie Zeigler

NOAA/National Weather Service Forecast Office
Slidell, Louisiana

Abstract

For the safety of life and property in southeast Louisiana in hazardous weather situations, a strong partnership has developed between the NOAA/National Weather Service Forecast Office in Slidell, Louisiana and the Greater New Orleans Expressway Commission. This report outlines the products developed by the partnership concerning dense fog events affecting the traffic on the Lake Pontchartrain Causeway, the longest bridge in the world.

1. Introduction

The Lake Pontchartrain Causeway in Louisiana is the longest bridge over water in the world (38,422 km; 23 miles 1,538 yd). The first span opened to the public in 1956, the second in 1969. It allows one-way driving safety on straight, two-lane railed surfaces 80-ft apart connected by seven crossovers to provide pullover areas for vehicle emergencies. Over 30,000 commuter vehicles make a round-trip crossing of the lake daily. The bridge connects Jefferson Parish on the South Shore and Saint Tammany Parish on the North Shore. The NOAA/National Weather Service Forecast Office (NWSFO) in Slidell, Louisiana has developed a partnership with the Greater New Orleans Expressway Commission in order to strive to give the Causeway Commission more precise forecasts and advisories. Consequently, products developed can be used to assist in preparation for such significant weather events as high winds across the lake which impede certain vehicles such as recreation vehicles, glass transporters and motorcycles as they try to make their way across the bridge. Other types of inclement weather that affect bridge operations are dense fog, severe thunderstorms, heavy rain, hailstorms, hurricane conditions, waterspouts and winter freezes.

One of the purposes of this study is to show how the local NWSFO in southeast Louisiana has used local research to develop forecast techniques for the formation of dense fog over the tidal lakes. Safety of motorists across the Causeway is extremely important. The Causeway Police Department is greatly concerned with sudden and rapid weather changes which affect visibility as well as the ability to control high profile vehicles. Since the bridge initially opened in 1956 with two lanes across the lake, the span has been rammed by marine traffic about sixteen times. Also, there have been incidents where vehicles have been knocked off the bridge into the lake.

Applying local forecast techniques using the latest numerical guidance, enhanced technology, automated and manual surface observations, NWSFO Slidell has significantly improved the forecast lead time for the development of dense fog over the tidal lakes. Figure 1 illustrates the typical synoptic pattern conducive to dense sea/lake fog development. The motorists can be notified by using the Internet to access Web site: www.thecauseway.com or the NWS Web site: www.srh.noaa.gov/ix. The latest dense fog advisories are given in the Hazardous Weather Outlook (HWO) twice daily and updated as needed. This product, issued routinely at 0630 local time and 1100 local time daily, lists weather hazards which may cause visibility problems for motorists during the following 24-hour period. It is also issued on the NOAA Weather Radio (NWR) as well as to the news media. In the short term, the Causeway provides current weather information to the motorists on the variable message signs approaching the bridge as well as the Causeway's Information Advisory Radio Station (a low-power radio station at 1700 AM).

Another purpose of this study was to show how public awareness campaigns have been provided. This has been done through the publishing of a fog brochure. The brochure was designed and developed as a coordinated effort between the Slidell NWSFO and the Causeway Commission of Greater New Orleans. This brochure informs motorists of the safety procedures for crossing the world's longest bridge. See Fig. 2 for picture of the Causeway.

2. Partnership between NWSFO Slidell and the Greater New Orleans Expressway Commission

In the past several years, a unique partnership has been developed between the NWSFO Slidell and the Greater New Orleans Expressway Commission. Aided by the research and development of a "fog decision tree" by several NWSFO LIX forecasters in the early 1990's, the lead time for forecasting dense fog over the tidal lakes has been significantly improved. Using the latest enhanced technology, numerical guidance, observations, satellite imagery, and sea surface temperatures, forecasts for surface visibility can be made several days in

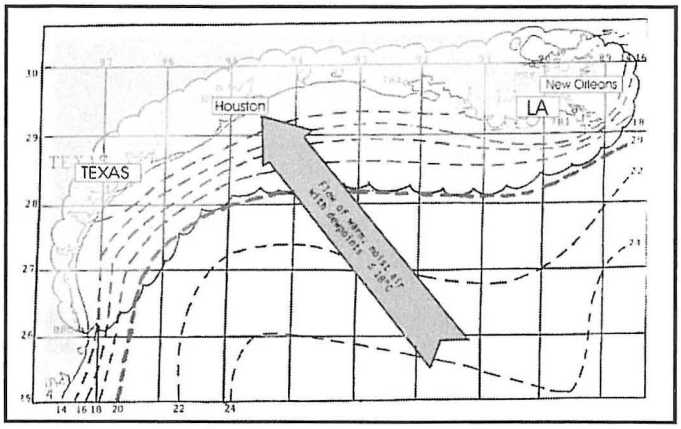

Fig. 1. Typical synoptic pattern during return flow in the Northern gulf in the wintertime.

Fig. 2. There has been several improvements concerning safety on the Causeway since the first span of two lanes was opened in 1956. In 1969, another span of two lanes was opened giving two lanes in each direction. The picture above shows the Causeway across Lake Pontchartrain looking north.

advance. The Causeway Police Department can then use this information for staffing purposes especially for the onset of the dense fog when convoying of motorists might become necessary.

Dense fog over the tidal lakes is the most important weather parameter motorists have to deal with during the year. That is, seasonally, dense fog events may last for several days except for minor improvement in visibilities during the mid-afternoon into the evening hours. Thus, convoying may become necessary for both morning and afternoon commuters.

In addition to the fog brochure which was made available for the first time at the beginning of the fog season in late 2001, several ads have been published in the *Times Picayune* of New Orleans newspaper and in the *New Orleans City Business Magazine*. These ads advise motorists of helpful guidelines to follow during fog conditions.

The Slidell NWSFO has direct contact with the Causeway Police Department. Besides issuing a Dense Fog Advisory to the public and news media, coordination calls are made to the dispatchers at the Causeway advising them of developing weather conditions. During the wintertime, dense fog is likely not only over the cooler shallow tidal lake waters, but also over adjacent land areas especially when the wind is light.

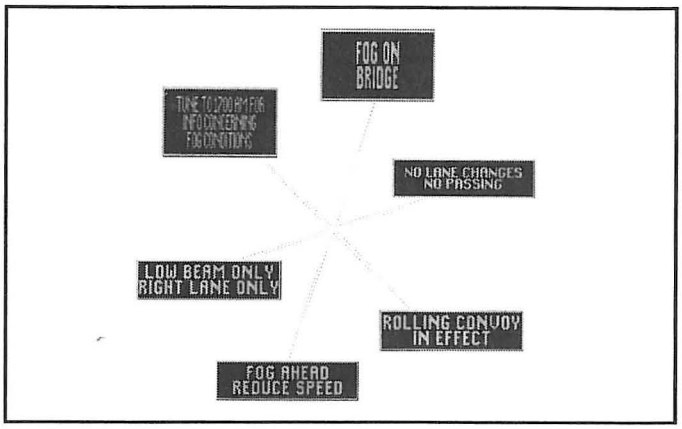

Fig. 3. These message signs are used to warn motorists of potential upcoming roadway conditions.

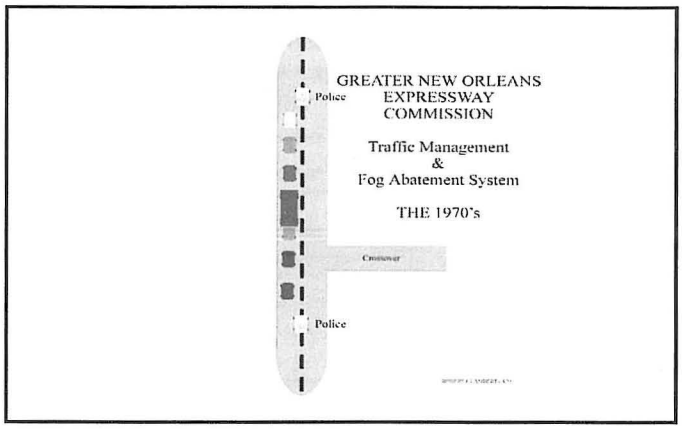

Fig. 4. Initial convoy system used by the Causeway police in the 1970's.

High winds, hurricane conditions, severe thunderstorms, hailstorms, waterspouts, heavy rains, and freezes are also weather phenomena which may affect travel over the Causeway. However, occurrences are a much smaller percentage when compared to the dense fog during the winter months of November to March. There are usually about 10 to 15 episodes of significant fog affecting travel over the world's longest bridge during a season.

3. Methodology Used by Causeway Police In Reducing Loss of Life and Property during Adverse Weather

According to Lambart (1991) there has been several improvements concerning safety on the Causeway since the first span of two lanes was built and opened in 1956. In 1969, another span of two lanes was opened giving two lanes in each direction. The Causeway police have established an excellent rapport with the commuters by exchanging roadway information over citizen band radios and cellular phones and, and of course, the AM broadcast. Safety enhancements were made in 1984 with the installation of the Motorist Information System (MIS). These

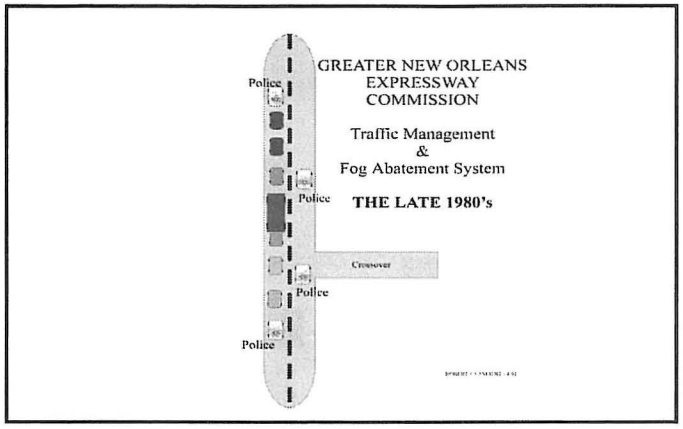

Fig. 5. Convoy system used in the 1980's utilizing a lead car in the front and one in the back.

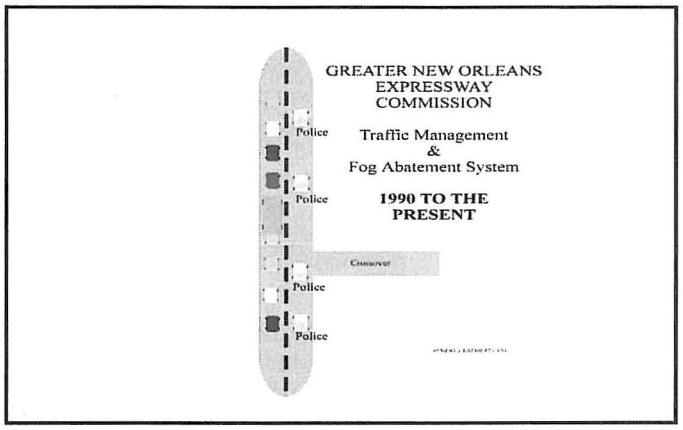

Fig. 6. System used in the 1990's to present time by Causeway police (riding herd) to prevent motorists from passing (used when visibility is below 500 feet).

are twelve variable message signs (Fig. 3) which are used to warn motorists of potential upcoming roadway conditions. As a toll facility, it is essential to avoid, if possible, a disruption in service of the daily commuters. Therefore, a convoy system was developed to provide safe travel across the Causeway should dense fog conditions exist (Fig. 4). Since there were not enough police units to escort the vehicles, another system would have to be developed.

Of course, there were several other problems that slowed traffic. Figure 5 shows how the police units are used with a lead car and another unit in the rear of additional cars in the adjacent lane to the original lane that was being used for convoying.

Figure 6 illustrates how vehicles are controlled when the police are not actually convoying. They are "riding herd" to prevent motorists from passing while they are looking for breakdowns. If visibility is very poor in one area, signs will tell motorists the speed in that zone. While in another area if the visibility is better, another sign may increase the speed allowed. With this system the bridge is never closed to traffic. With this system, the crossovers come in very handy. When fog is developing over the lake, the police units have a roll call and give the visibility in their respective location. One of the things the police do is watch how fast the traffic is moving and

Fig. 7. Fog abatement sign configuration illustrates the view from ground level to what motorists would encounter when controls have been put in place on the bridge.

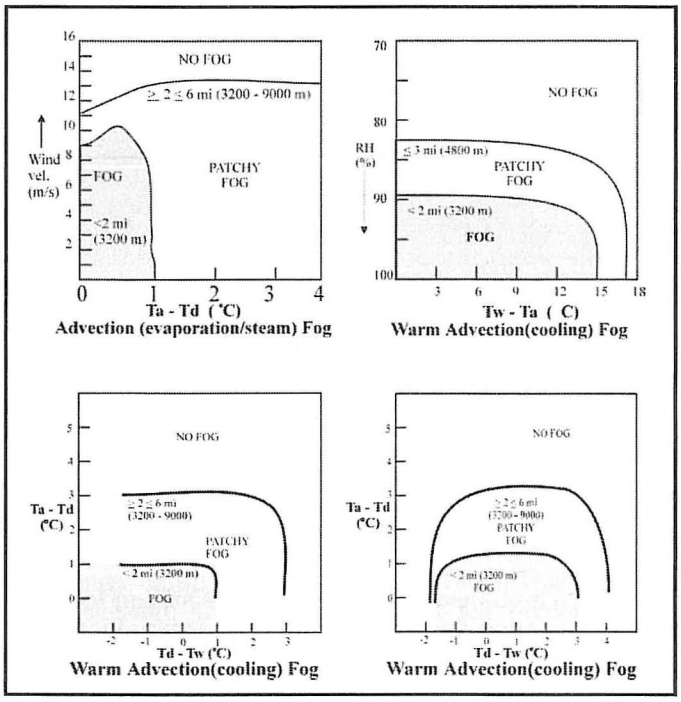

Fig. 8. Fog forecasting graphs used by NWSFO Slidell meteorologists.

whether the visibility is lowering. The criteria the police use now for the "riding herd" approach is when visibility is reduced to below 500 feet.

Figure 7 showing fog abatement sign configuration illustrates the view from ground level of what a motorist would encounter when controls have been put in place on the bridge. The usage of variable message signs are controlled by dispatchers through a computer system from their operation's building at the south end of the Causeway. This system for controlling traffic on the bridge will work with any type of inclement weather that may reduce visibility for an extended time. As stated earlier and in most cases, it is dense fog that causes the restrictions on the bridge.

Table 1. Fog related accidents over waterways.

FOG RELATED ACCIDENTS AS REPORTED BY THE *TIMES-PICAYUNE NEWSPAPER* IN NEW ORLEANS LOUISIANA

Date	Description of Event	Damage...Injuries...Deaths
Jan 14, 1999	Multi-car accident on I-10 Twin Spans between Kenner and La Place in the early morning hours	One Injury
Oct 3, 1999	Multi-car accident on I-10 Twin Spans between New orleans and Slidell	One dead and 5 injuries; east bound span closed for 6 hours
Jan 14, 1999	Multi-vehicle accidents on I-10 bridge over the Bonnet Carre Spillway; 90 vehicles involved in a series of pile-ups (23 separate collisions)	Despite the 90 vehicles involved there were no serious injuries; bridge closed for 8 hours
Jan 13, 1998	Multi-car accident on I-10 Twin Spans	One dead; east bound lanes closed for 9 hours
Dec 31, 1996	Multi-car accidents involving more than 100 vehicles on the I-10 Twin Spans between New Orleans and Slidell early New Years Eve	One dead; two dozen injured
Dec 14, 1995	Multi-vehicle accidents on I-10 Twin Spans and also on the Causeway Bridge between New Orleans and Northshore Communities	6 persons injured; nearly 50 vehicles involved; bridges closed for 8 hours
Oct 31, 1992	Multi-vehicle accidents involving more than 20 cars on I-10 Bridge over the Industrial Canal in New Orleans	25 persons injured; bridge closed for 3 hours
Nov 19, 1991	Multi-car accidents on Causeway Bridge	9 injuries mostly minor

4. Sea/Lake Fog Decision Tree Developed and Used by the NWSFO Slidell Meteorologists

As shown in an earlier study by Johnson and Graschel (1992), several meteorologists at the NWSFO Slidell developed an operational decision tree for forecasting sea/lake fog in the southeast portion of Louisiana and the adjacent coastal waters. The technique utilizes the current sea/lake surface temperature (SST) as well as the forecast surface temperatures, dewpoints, and wind direction and speed. The study indicated the critical water temperature for dense fog to be 68 degrees F or 20 degrees C. When these parameters are indicated to be coming together (wind speeds less than 10 m s^{-1} and wind direction from southeast to southwest), dense fog develops over water areas as well as adjacent inland areas some 50 to 75 miles inland. If the wind is too strong over land such as greater than 10 mph (8 kt) then the fog becomes more advected. Visibilities over large bodies of water such as the tidal lakes can be frequently reduced to less than one-fourth of a mile. Figure 8 shows the graphs used by the NWSFO Slidell meteorologists for forecasting dense fog over the tidal lakes.

Research has indicated that dense fog events especially over the water may take 6 to 9 hours to unfold once the air, dewpoint, and water temperatures get close, usually within one degree. The public and especially the news media need to be made more aware of the hazards of dense fog, especially when its patchy. This is because it may suddenly appear over the bridges and highways adjacent to large bodies of water. Visibilities can suddenly drop to less than one-fourth of a mile leading to a multi-car pileup such as what has happened on the I-10 Twin Span (another bridge which crosses the lake) and Causeway bridges in recent years. Table 1 lists the major accidents between 1991 and 1999 on bridges that cross the tidal lakes in Southeast Louisiana. The NWSFO's "call to actions" statements should be supplemented by emergency management officials and media information.

Since the "sea/lake fog" decision tree was implemented operationally, much longer lead times have been given in the zone forecasts of impending dense fog development. Through the use of the Internet, the Causeway police can be kept informed of potential dense fog development and make plans accordingly.

5. Conclusions

The NWSFO in Slidell, Louisiana, has developed an excellent partnership with the Greater New Orleans Expressway Commission in order to strive to give the Causeway Commission more accurate forecasts and advisories. These products can then be used to assist in preparation for significant weather events such as dense fog and very heavy rainfall reducing visibilities to below one-half mile, hurricane conditions and waterspouts. This study has shown how local research has helped to develop forecast techniques for the formation of dense fog over the tidal lakes. Also, another purpose of this study was to show how public awareness campaigns have been provided to the public through the distribution of fog brochures, critical weather messages displayed on the variable message signs located on the causeway and also broadcast on a local radio station.

When surface visibilities decrease to less than 500 feet during the early morning hours on regular work days, convoying of vehicles goes into effect. Since this procedure was instituted there has not been any major accidents on the bridge. The next goal in our partnership for improving our service to the motorists who cross the tidal lakes regularly is to secure cameras at several locations with fast access by satellite interrogation.

Acknowledgments

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