

Emergency Vehicle Automatic Crash Notification & Event Reporting Technology

*A Powerful New Tool
for Saving Emergency
Responder Lives and Mitigating
Emergency Vehicle Crashes in the Future*



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Emergency Vehicle Automatic Crash Notification & Event Reporting Technology

A Powerful New Tool for Saving Emergency Responder Lives and Mitigating Emergency Vehicle Crashes in the Future

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Introduction

Emergency vehicle crashes occurring during response to emergencies represent the second leading cause of professional firefighter loss of life.

The intent of this paper is to define how:

- Automatic Crash Notification & Event Reporting can help mitigate firefighter deaths caused by emergency vehicle crashes, and;
- Crash Event Reporting can assist vehicle safety design improvements for safer fire vehicle operation.

Automatic Crash Notification & Event Reporting

Automatic Crash Notification (ACN) is the next major advancement in consumer auto safety. Telecommunications, automotive and location definition technologies are now converging to make instant and automatic notification of serious vehicle collisions to emergency call centers possible. ACN systems employ wireless telecommunication technologies to immediately alert an emergency call center when a crash victim presses the car's Mayday button or the car's air bag deploys. In an emergency, the dispatcher at the call center quickly informs the appropriate emergency responder of the vehicle's location so care can be sent. Reducing emergency response times saves lives and reduces the impact of injuries. Knowing the seriousness of emergencies and their precise locations can save significant tax dollars while more effectively deploying emergency resources.

The next generation of ACN technology, specifically Automatic Crash Notification & Event Reporting (ACN&ER), holds spectacular promise. In addition to exact location and voice, ACN&ER technology will provide emergency call centers sophisticated vehicle crash data, including severity of impact. Vehicle crash data is then enriched with critical personal medical information, such as pre-existing medical conditions (previously registered with a medical information database company). This bundling of crash and medical data enables the dispatch of highly appropriate care, facilitates effective treatment at the crash scene and in route to the emergency room, and enables hospital emergency rooms to anticipate the critical care needs of the incoming crash victim.

The following example demonstrates this next generation ACN&ER technology at work in a hypothetical crash:

Immediately upon impact, an ACN device, located in the crash vehicle, is activated. A wireless call is automatically routed to the most strategically located emergency call center and specific crash data is sent from the vehicle. Data may include: (1) the speed at which the vehicle was traveling, (2) the principal direction of force, and (3) whether the vehicle rolled over. Upon voice confirmation of the identity of the crash victim by the emergency operator, the vehicle crash data is fused with personal medical information, such as (1) medical conditions, (2) primary physician name, and, (3) emergency contact information. The consolidated crash event information is then forwarded wirelessly to an on-board patient monitoring and measurement system in the responding ambulance.

How Automatic Crash Notification & Event Reporting Can Help Reduce Severity of Firefighter Injuries and Save Lives Today

Approximately 100 firefighters die in the line of duty annually. Twenty percent (20%) of these deaths are the result of emergency vehicle crashes responding to and returning from emergencies. Fire Departments have the responsibility of deploying mitigation techniques and technologies in order to achieve a reduction in the severity of firefighter injuries and deaths caused by emergency vehicle crashes.

To this end, the introduction of ACN&ER will enable an emergency dispatch operator to pinpoint the emergency vehicle crash location, receive vehicle crash data, automatically access the emergency responders' personal medical data, and wirelessly forward the consolidated crash event information to responding roadside medical personnel.

ACN&ER provides emergency dispatch operators real-time access to all necessary data supporting rapid management of "informed responses". Much of the guesswork about the severity of the crash and potentially related victim condition (i.e.; personal medical data of firefighters, such as cardiac conditions) is

eliminated. Appropriate response resources are quickly identified and prioritized by a dispatcher in possession of real-time crash event information.

ACN&ER will allow emergency dispatch operators to be notified, and be fully informed, about emergency response vehicle crashes. Furthermore, this solution will facilitate the smooth and timely electronic flow of crash event information from dispatch to and among multiple public safety agencies, including; hospitals, transportation agencies and dispatched roadside medical responders.

Knowing when and where the emergency vehicle crash occurs, its severity, and personal firefighter crash victim medical information helps the timely dispatch of appropriate care. As importantly, it enables care providers to begin advanced medical treatment of the crash victim before arrival at the hospital. The ultimate objective is to save firefighter lives and reduce severity of injuries by getting the right information in the hands of the right people at the right time.

How Automatic Crash Notification & Crash Reporting Can Help Save Firefighter Lives *in the Future*

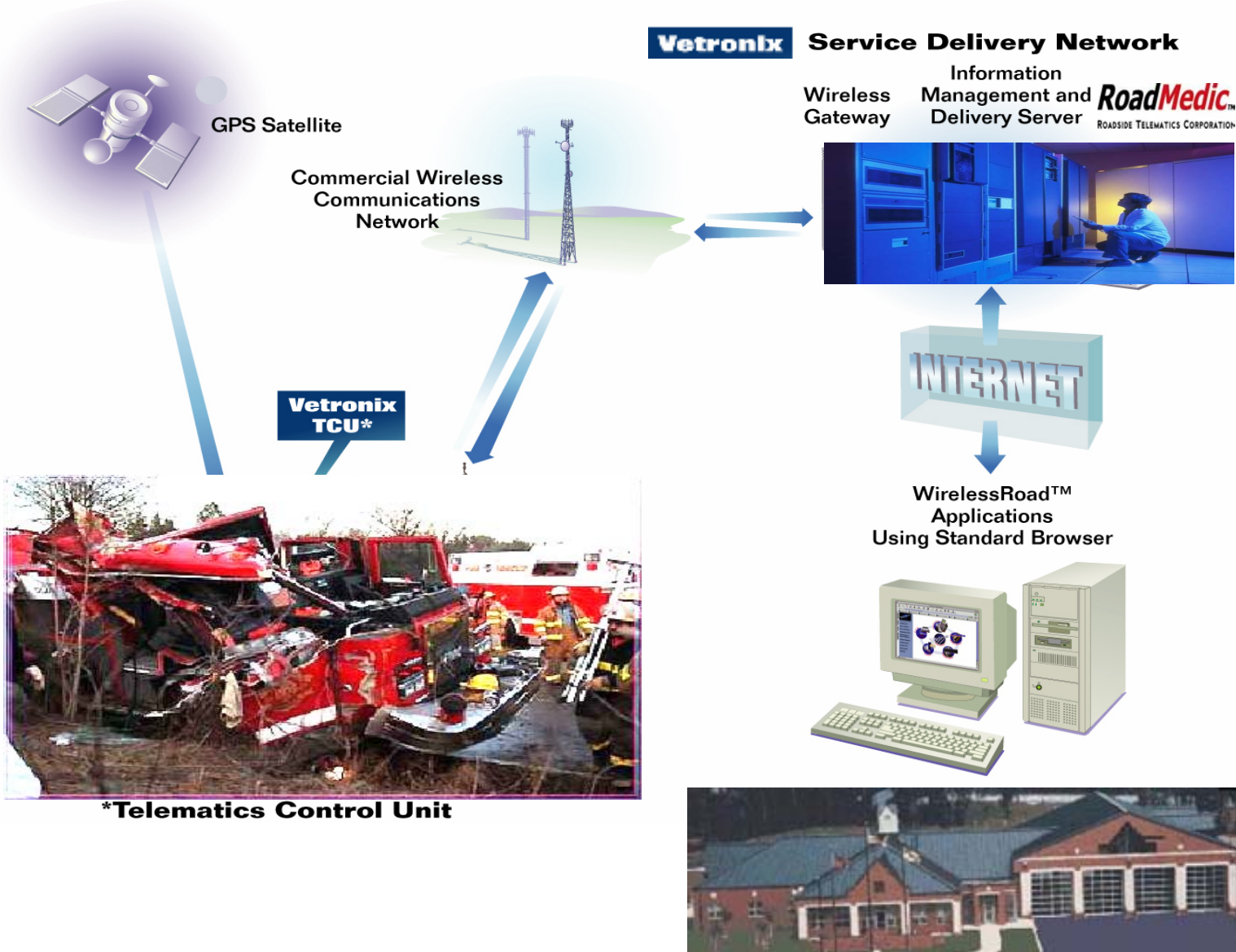
Another benefit of ACN&ER is the analysis of pre- and post crash event data harvested from on-board the crashed emergency vehicle. The collection of objective and accurate data will result in 'understanding what occurred in a crash'. In turn, crash reconstruction will help identify and effect vehicle design improvements for safer vehicle operation in the future.

The event data recorder (commonly referred to as the "black box" on board the vehicle) is able to record the emergency vehicle's velocity, engine RPMs, extent of accelerator depression, degree of brake application, seatbelts employment status, and what warning lights were on - - all from five seconds before impact.

ACN&ER technology will provide the most accurate process for gathering data on emergency vehicle crashes. It will serve as an objective method for tracking what goes on in the emergency vehicle before and during a crash and as a complement to subjective input now gathered from crash victims, eye witnesses and police reports. The National Transportation Safety Board (NTSB) considers this technology so important that it positions 'automatic crash sensing and recording devices' high on its current list of the 'Most Wanted' transportation safety improvements.

Accurate crash reconstruction will clearly help to examine issues involving human performance (driver) and technology (vehicle design) to discover effective mitigation methodologies and techniques for reducing the devastating effects of emergency vehicle crashes and help to save firefighter lives in the future.

The Service Delivery of Automatic Crash Notification & Event Reporting



The Technology Components of Automatic Crash Notification & Event Reporting

GPS Automatic Crash Notification and Crash Data Retrieval System



The Crash Data Retrieval (CDR) System from Vetronix Corporation enables an emergency call center operator, as part of a telematics enabled Automatic Crash Notification (ACN) alert, to download real-time, vehicle-specific crash data from vehicles involved in an air bag deployment or near deployment collision.

The CDR System collects the crash data stored on the airbag sensing and diagnostic module, interprets relevant portions, and presents it in easy to understand graphical and tabular formats in real-time on emergency call center desktop computers. Using a proprietary decoding algorithm, the CDR System is able to present such information as vehicle speed, engine RPM, throttle and brake data in one second increments for the five seconds preceding the crash.

Additionally, for some airbag modules, the CDR System shows the change in velocity, or delta-V, immediately after the impact. Other features in some air bag modules include seatbelt usage, status of the Malfunction Indicator Light (MIL) on the dashboard, and whether or not the passenger's airbag was disabled.

In 1997, the National Transportation Safety Board (NTSB) made the recommendation that vehicle manufacturers and the National Highway Traffic Safety Administration work together to gather information on vehicle crashes using on-board collision sensing and recording devices.

The CDR System furthers the NTSB's recommendation by creating a product that captures the data stored in recordable airbag modules and allows the recorded crash data to be downloaded in real-time as part of a telematics enabled ACN alert.

Emergency Roadside Medical Messaging



The RoadMedic web service from Roadside Telematics Corporation enables an emergency call center operator, to securely retrieve and seamlessly fuse crash victim vital medical information, such as pre-existing medical conditions, with vehicle-specific crash data and wirelessly forward the consolidated data to a responding ambulance.

The RoadMedic web service collects, manages and retrieves in a secure fashion, upon demand from an authorized emergency call center operator, a crash victim's vital personal medical information for the purpose of emergency roadside medical treatment. Upon retrieval, the crash victim's medical information is seamlessly fused with vehicle-specific crash data for a consolidated view of the crash event in real-time.

The emergency call center operator can then transmit the crash event data over virtually any commercially available wireless system, including cellular (AMPS, GSM), packet data (GPRS, CDPD, Mobitex, iDEN (Nextel)), and satellite (MSAT, INMARSAT, and Iridium) to the responding ambulance.

The RoadMedic web service is interconnected with a 12-lead on-board ambulance pre-hospital monitoring and wireless communication system. The on-board system has two main components in the ambulance, a wireless measuring unit, and a ruggedized point of care computer. The crash victim is attached to the measuring unit, which uses a Bluetooth radio to pass the data to the point of care computer for forwarding to the hospital, and use in an ambulance billing system.