

ITS Field Operational Test Summary

Colorado MAYDAY

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Introduction

The Colorado MAYDAY ITS Field Operational Test implements and evaluates an automated mayday system. The system allows users to request help and provides authorities with specific information about the location of the motor vehicle and the type of roadside assistance required. The test area includes the City of Denver and several counties in the northeast quadrant of Colorado. The test area covers about 12,000 square miles and includes both rural and urban roadways.

Phase I of the project concluded in 1995; Phase II concluded in 1997. Phase III has been canceled. The final Evaluation Report is expected in the second quarter of 1998.

Project Description

The proposed Colorado MAYDAY project was originally designed to be conducted in three phases. The test was then shortened to comprise only two phases. However, the evaluation plan was reconfigured to include in the final evaluation report the institutional, regulatory, and service provider issues that are relevant at both the local and national levels.

Phase I of the test developed, installed, and operated the prototype in-vehicle mayday units and other system components. Phase II assessed the accuracy of the system and determined its reliability and area of coverage using a limited number of prototype mayday units. Phase III proposed to assess the system performance using a larger number of prototype units and was to evaluate the preliminary user response to the system design.

The Colorado MAYDAY system consists of an in-vehicle device, a response center, and a dispatch center. Figure 1 presents a conceptual diagram of the MAYDAY system. The low-cost in-vehicle device is called TIDGET[®]. The TIDGET[®] provides Global Positioning System (GPS) data and contains the communications system control equipment. The user interacts with the TIDGET[®] through a button box. Depending on the distress situation, the user activates the appropriate button on the box and the TIDGET[®] processes the request. The TIDGET[®] then sends data on the vehicle's location and the requested service to the response center using the vehicle's communication system. The Colorado MAYDAY system uses an analog cellular two-way wireless communication system.

The response center receives all emergency assistance requests originating from the in-vehicle units. At the response center, computer software calculates the vehicle's position using the raw GPS data sent by the TIDGET[®], supplemented by positioning information collected at the center. If the response center cannot determine the vehicle's location, the call defaults to voice mode. If the center can determine the location of the vehicle, the center sends the information to a dispatch center. Depending on the accuracy of the location determination, the response center may alert the dispatch center that the exact location may be in question.

From the response center, the dispatcher receives the caller, incident, and location information. The dispatch center establishes direct voice communication with the vehicle's operator. The dispatcher can view a screen display map of the caller's location and relevant information about the vehicle and operator. The dispatcher determines the needs of the caller and dispatches the appropriate response to the location.

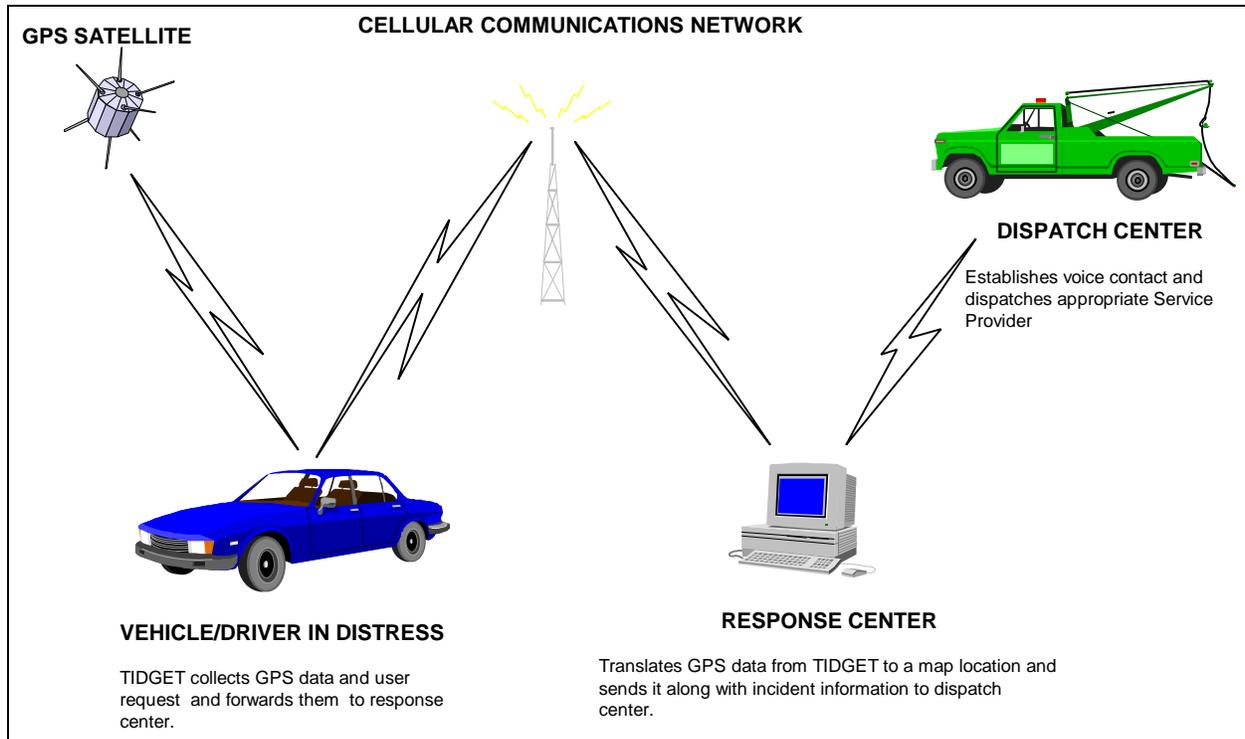


Figure 1: Colorado MAYDAY Conceptual Diagram

The evaluation of Phase I assessed the performance of the prototype units and identified where design changes were required. The Phase I evaluation also examined the human factor issues related to the in-vehicle units and the control center workstations. Phase II assessed the performance and accuracy of the system under varying cellular signal strengths over the proposed geographic test area. Phase III proposed to evaluate the system usability and acceptance, system marketability, and technical performance.

Test Status

The project's independent evaluator prepared evaluation summary reports for Phases I and II.

In Phase I, the evaluator made several conclusions and recommendations. In areas with favorable cellular coverage, the system can calculate a vehicle position that is sufficiently accurate for the system's purpose (averaging within 82 meters). In areas of marginal cellular coverage, the system could often achieve an approximate position and could warn the dispatcher that voice confirmation was needed. When the system could not determine a position, it would default to voice-only mode, ensuring that traditional methods could still be used. The evaluator recommended that the dispatch center support the ability to receive and process multiple, simultaneous incoming calls. The evaluator also observed that system developers needed to

address the critical issues of slow system speed, erratic reliability, poor user friendliness, better digital maps, receiving too much information, and better training. The evaluator also recommended testing alternate GPS technologies and developing closer partnerships with other projects testing similar technologies.

The evaluation report for Phase II presented results for each of the evaluation areas. The test participants rated the usability of the system through a survey prepared by the evaluator. These participants found the system easy to use and the buttons and messages understandable. The participants rated the ease of use of the MAYDAY system under a variety of incident scenarios. They responded that the system would be difficult or very difficult to use in incidents in which they would be seriously injured. The system would be easy to very easy to use in situations where they would require assistance or would observe another vehicle that needed assistance. The participants observed that the system took too long (from three to four minutes) before the call went to "voice mode." The participants also responded with their perceptions of the reliability of the system by observing that they were occasionally unable to conduct a test because the system malfunctioned.

The evaluator assessed the marketability of the Colorado MAYDAY system by convening two focus groups. The results of the focus groups led to the conclusion that the potential of the system is promising. The groups identified several critical issues that need to be addressed in terms of consumer acceptance, product features, and market factors. Much of the interest in the system as a product is related to its use as a safety device (for example, in violence or car jacking). In these situations, the focus groups were concerned that the system lacked the ability to communicate quickly and unobtrusively. The focus group participants were concerned about the reliability of the system in key situations (for example, rural or mountain driving). The participants also viewed as important the ability to have automatic and remote activation of the device and to have a cancellation switch. The results of the focus groups show that market acceptance of the concept is very high and participants have a good level of interest in purchasing the system. The primary barriers are the newness of the technology, its credibility, and its questionable reliability in certain situations. The participants felt that a purchase price of \$150 and a monthly fee of \$20 to \$25 would be reasonable.

The independent evaluator assessed the technical performance of the system during Phase II. During the testing, the contractor made improvement to the software that computed the vehicle's position. With the improved software, the system was able to locate the test vehicle to within 100 meters of its actual position in 44 percent of the trials that produced a valid solution. The system was able to locate the vehicle to between 100 and 200 meters of its actual position in 14 percent of the valid trials. In 10 percent of the valid trials the positional difference was greater than 200 meters. The remaining 34 percent of the trials were attributed to non-connection and errors in the cellular links. The cellular communications coverage was strong and reliable in densely populated counties in the test area (where approximately 90 percent of the state's population resides). In areas of marginal to non-existent cellular coverage, the analog cellular system was unreliable in transmitting data. Test participants expressed a desire to have a better verification system of the progress of the communication during a call.

The evaluator identified several problems with the map display system and the map database used in the system. The speed of the computer used for the map display system was adequate for the

test but might be too slow under real world conditions of multiple, simultaneous mayday calls. The display system needs to be enhanced to automatically display streets in the vicinity of the incident. The display system also needs the capability to display more than one incident at a time. The map databases and display should include all roads and road labels, geographic landmarks and bodies of water, and city, county, state and dispatch region boundaries.

Test partners made a decision not to proceed with Phase III due to the inability to negotiate an agreement with a public agency to receive the calls.

Test Partners

AT&T Wireless, Inc.

Colorado Department of Transportation

ESRI

Federal Highway Administration

NAVSYS Corporation

The ENTERPRISE Group (Departments of Transportation from the states of Arizona, Colorado, Iowa, Michigan, Minnesota, North Carolina, and Washington, plus Maricopa County, Arizona, Dutch Ministry of Transport, Ministry of Transport Ontario, and Transport Canada)

References

Castle Rock Consultants, MAYDAY Operational Test Project, Phase I Evaluation Summary Report (Draft), November 1995

Castle Rock Consultants, MAYDAY Operational Test Project, Phase II Evaluation Summary Report (Draft), October 1997