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FINAL
CONTRACT REPORT

THE USE OF REAL-TIME GROUND-TO-AIR VIDEO DURING AEROMEDICAL RESPONSE TO TRAFFIC CRASHES

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Department of Emergency Medicine
University of Virginia Medical Center

Contract Research Sponsored
by
Virginia Transportation Research Council

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ABSTRACT

Deteriorating traffic conditions and resulting safety problems on I-81 have long been a topic of concern. This, coupled with increasing traffic congestion along this largely four-lane highway, has resulted in increased crash rates. Emergency medical service (EMS) responders summoned to motor vehicle crashes along I-81 are trained volunteers with experience in dealing with motor vehicle crashes but do not have critical care treatment abilities. In serious crashes additional expertise is needed at the crash site to prevent disability or death. In these cases, a medical transport helicopter is summoned to the site to bring critical level care to victims and transport them rapidly to the nearest trauma center. A significant number of motor vehicle crash victims along the I-81 corridor are eventually transferred to the University of Virginia Hospital, the closest level 1 trauma center, by the Pegasus medical evacuation helicopter staffed by specially trained critical care providers.

Since critical care trained providers, doctors, and nurses cannot be present at each crash site, the next best situation would be if such personnel could see the crash site remotely through ground-to-air video and be able to give treatment advice to EMS responders. To this end, companies with "off-the shelf" technology that could potentially work for this project were identified and contacted, and they subsequently provided information and/or demonstrations of their products. The project director made a determination as to whether the equipment could perform in a technically acceptable fashion and whether the company was willing to make any modifications to ensure proper configuration of the equipment.

A public demonstration of the identified and customized equipment was held at the Charlottesville-Albemarle Airport in July 2001 and was attended by representative stakeholders, end-users, and members of the media. The demonstrated equipment performed in accordance with all expectations. Thus acceptable technology exists for the deployment phase of this study to proceed.

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INTRODUCTION

Deteriorating traffic conditions and resulting safety problems on I-81 have long been a topic of concern for the people living along the I-81 corridor, their elected representatives, and local government administrators. Increasing congestion along the largely four-lane highway has resulted in increases in crash rates. A higher percentage of tractor-trailer traffic in the vehicle mix on I-81 has increased the vulnerability to injury of passenger car occupants involved in those crashes. Table 1 illustrates that fatal crashes on I-81 have remained relatively constant, in the twenties and low thirties, but the number of injury and property damage crashes have steadily increased in recent years.

Table 1. Traffic Crashes on Interstate 81 by Year

All Crashes on I-81												
Type	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Fatal Crashes	21	20	26	37	33	25	24	27	25	24	21	283
Injury Crashes	499	561	609	654	715	741	723	810	752	686	696	7,446
Property Damage Crashes	652	697	742	881	865	880	903	1,140	1,174	1,146	1,115	10,195
Total	1,172	1,278	1,377	1,572	1,613	1,646	1,650	1,977	1,951	1,856	1,832	17,924
Truck Crashes on I-81												
Type	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Fatal Crashes	6	10	11	13	11	8	11	9	11	6	8	104
Injury Crashes	115	128	131	185	190	204	184	191	190	169	208	1885
Property Damage Crashes	148	201	205	238	255	242	278	313	390	354	316	2940
Total	269	339	347	436	456	454	473	503	591	529	532	4929

In Virginia, Emergency Medical Services (EMS) personnel from local rescue squads are responsible for stabilizing persons injured in these crashes and for providing medical care during transport to local hospitals. Even though rescue squads personnel are extremely dedicated and well-trained volunteers, the extent of their training and capabilities vary widely among local squads and even among individuals. Indeed, this situation exists not only along the I-81 corridor, but similar conditions exist throughout Virginia and in the majority of rural areas across the United States.

Although the EMS responders that are summoned to motor vehicle crashes are trained volunteers with experience in dealing with motor vehicle crashes, they are not doctors or nurses, and there are times when additional expertise is needed to prevent disability or death. In these situations, the advice of a more highly trained professional is needed at the crash scene. Multiple previous research studies have shown that the single most important factor affecting disability and death rates from crashes is the length of time between injury and access to critical care.[1,2] Since it is impossible to have critical care trained doctors and nurses at each crash site, the next best situation would be if experienced critical care medical providers could remotely see the crash site and be able to give advice to EMS responders at the scene, possibly with communication through video connections. The most obvious immediate benefit of such communication would be the provision of critical care to the crash victim faster than would otherwise be possible. There are also several other important potential benefits of such a program. Faster critical care to crash victims has been shown to increase survival rates and decrease long-term disabilities. Video technology of this type may also prove beneficial in clearing incidents faster, with return to normal traffic flow and less chance of "watershed incidents" from traffic moving around the accident scene. As the video transmissions can be taped, they may later be helpful in subsequent accident reconstruction.

A significant number of motor vehicle crash victims along the I-81 corridor are eventually transferred to the University of Virginia Hospital, which is the closest level 1 trauma center, by the Pegasus medical evacuation helicopter. The Pegasus Helicopter Program, based at the University of Virginia, began in 1984 as a regional medical evacuation helicopter. It routinely performs medical missions within a 110-mile radius of Charlottesville, Virginia. The Pegasus helicopter accomplishes approximately 800 flights per year, with 40% of these involving meeting with ground EMS responders. The medical personnel staffing the Pegasus helicopter have extensive experience in treating critically injured crash victims and are specially trained medical professionals with additional certifications in critical care. If is was possible for the Pegasus helicopter crew to provide advice to local EMS responders while in transit to pick up a crash victim, critical level care could reach the crash victim sooner than would otherwise be possible. To do this, they need as much information about the crash and the victim's resulting injuries as possible. High resolution, mobile real-time video transmissions would allow the Pegasus crew direct audio and visual access to the crash scene, the patient, and the care being provided, without requiring a detailed verbal description from EMS responders. This effectively would allow critical care capabilities to reach crash victims sooner than is now possible potentially reducing morbidity and mortality of the crash victim.

PURPOSE AND SCOPE

The purpose of this feasibility study was to determine whether the use of ground-based video imaging by local rescue squad personnel, along with real-time transmission of this information to the Pegasus helicopter medical crew, is technically feasible and of sufficient quality to be used as a tool to improve pre-hospital care provided to crash victims. The scope of this project was to investigate various types of existing technology and equipment that may allow for the desired communication linkage between aircraft and ground responders either as is or with achievable modifications. Additionally, other stakeholder entities in this project would be identified and approached to solicit cooperation in the subsequent deployment of the equipment.

METHODOLOGY

Rather than trying to create the necessary equipment de novo, potentially re-inventing the wheel, the project director together with telemedicine consultants began a search for companies who might have equipment similar to what was envisioned for this project. This equipment should ideally create a digital signal that could be encrypted to ensure security of the transmission and be of sufficient pixel quality to allow for clear visualization of small details.[3,4] Thus, there should be minimal snow (such as what one sees on a TV station that is not clearly tuned). The transmission signal should be real-time and have minimal time delays, with no more than 10-second total delay.[5,6] Other requirements were that the equipment be easy to use with minimal training, virtually indestructible, and of small size and limited weight. In addition, although not essential, it was hoped that the equipment would leave the EMS provider's hands free and that various aspects of the picture, such as the zoom, would be controlled remotely. All equipment identified was evaluated based on these criteria. If the equipment did not met all the criteria, the company was asked if modifications could be made where necessary to meet the desired criteria.

Companies with "off-the shelf" technology that could potentially work for this project were identified through a literature search, web search, attendance at conferences or shows where like technology was being demonstrated, and word of mouth between manufacturers, medical researchers, and EMS agencies or organizations. Each of these companies was contacted, and they provided information and/or demonstrations of their product. In cases where similar research was being conducted, the project director was contacted for information on the scope of that project, the technology being employed, and any problems encountered to date. In the search for acceptable equipment, each "lead," identified through the above process, was followed up through direct contact by the project director along with the assistance of the telemedicine department at the University of Virginia. Contacts were initially made via email and phone interviews, followed by face-to-face contacts and demonstrations with those companies that were felt to have the most promising equipment options. The project director, along with the telemedicine consultants, then made a determination as to what equipment was technically acceptable for this project.

Companies Contacted

The following is a list of companies and contacts investigated during the feasibility study. Information obtained and the contact outcomes are noted for each identified company in the Results section.

1. Meridian Company
2. NavTec Systems
3. ARNAV Systems
4. University of Texas, Dreams Project
5. University of Maryland
6. CISCO
7. ARINC, Inc
8. New York State EMS Authority
9. U.S. Coast Guard
10. American Airlines
11. Uniformed University Casualty Research Center
12. WESCAM and subsidiary Broadcast Sports Technology.

In addition to identifying acceptable equipment, it was also necessary to determine other entities or stakeholders that would need to partner with the study team for successful project completion. Identified partners included ground EMS providers, other hospitals in the proposed study area that might be called upon to receive patients, and other state or governmental agencies that might be impacted and/or could be involved in providing services necessary for successful project completion. The following is a list of such stakeholders who were contacted by the project director, along with other members of the study team. Outcomes of these meetings are detailed in the Results section.

Other Stakeholders

1. Rockingham Memorial Hospital
2. Stonewall Jackson Hospital
3. Virginia Department of Aviation
4. Virginia Department of State Police
5. Central Shenandoah EMS Council.

RESULTS

Literature Review

The use of real-time remote audiovisual links has been employed in the care of patients through telemedicine since the early 1980s.[7] Until recently, this technology was totally dependent on connections with T1 data transmission lines that required hard-wire connections

between sites. Real-time video links without hard wire connections have only been possible in the last few years, with ground to ground linkages accomplished through the use of microwave, satellite, or cellular technology.[8-12] Currently, there are four ongoing ground based projects investigating the feasibility of video links without hard wire connections to enhance patient care in EMS vehicles. These studies are ongoing at the University of Maryland; Houston, Texas; Las Vegas, Nevada; and the New York State EMS authority. To date there has been no successful real-time video imaging connecting aircraft with ground personnel. Within the past 3 years, two clinical trials have been performed with variable results. These trials were undertaken by the U.S. Coast Guard and the U.S. Navy producing mixed results. Problems noted in both these trials included grainy, sub-optimal resolution of the video and unacceptable delay in transmission time between connected sites.[13-16] As a result, all further testing by these two entities was suspended pending further technological advances in this area.

Company and Partner Interviews

Companies identified as having equipment that could meet the project criteria, either as is or with some modifications, were contacted by the project director. An overview of the findings is presented here.

1. *Meridian Company* (Noah Rifkin)—This company represents clients looking for specific cutting edge technology and puts appropriate manufacturers in contact with potential customers. Mr. Rifkin had no direct knowledge of manufacturers or companies with real-time video technology as proposed for this project. He did note the use of "some communication linkages" beyond normal radio transmissions between NY EMS systems and receiving hospitals. Additionally, Mr. Rifkin offered to investigate other potential sources of equipment that might be useful in this video project, but subsequently could not identify other companies beyond those already identified by the project director.

2. *NavTec Systems* (Geoff Leighton)—This is a British-based company specializing in microwave real-time video connections between two ground points. The company is currently working on achieving aircraft transmissions from air to ground units through satellite up-link connections. The transmission signal is analog, and thus grainy and difficult to encrypt to secure against interception by other users.

3. *ARNAV Systems* (Frank Williams)—This system employs computerized real-time point-to-point flight following techniques using aircraft identifiers, microwave, and radar transmissions. This company does not employ video feed nor have a platform that would support video equipment. Mr. Williams was unaware of companies with such technology.

4. *WESCAM and subsidiary Broadcast Sports Technology* (Norm Boese, Mark Merrill)—WESCAM and its subsidiary, Broadcast Sports Technology, have been the major supplier of real-time video equipment for several of the projects identified in this study. This company was contacted early on; however, the equipment available

at that time was analog only, which resulted in delayed transmission time due to satellite uplink requirements when used in aircraft. The limitations of this technology were well demonstrated by previous projects identified in other portions of this text. In March 2001, the company was again contacted for an update. By that time, further modifications had been implemented that made digital transmission possible, along with augmented microwave transmission between an aircraft and the ground. This had not been technically feasible prior to this time. This break-though in technology occurred largely duè to funding by the FOX Network sports channel, primarily for NASCAR transmissions. The new product debuted at the Indianapolis 500 in March 2001, exceeding network executive's expectations. The product was then shown at the Paris Air Show in June 2001. The third demonstration of this technology occurred in Charlottesville in July 2001 (see the equipment demonstration section of this document).

5. *University of Texas, Houston, Dreams project* (Doug Tindell)—This project uses real-time audio and video to connect Houston EMS with the University of Texas. The transmission signal is analog and microwave based. The project has been complicated by lack of ability to transmit over distances due to large buildings in downtown Houston, which block the microwave signals. Microwave signal transmission is largely line-of-sight transmission, and thus cannot penetrate buildings well. Their equipment is first or second generation real-time video from WESCAM and is a variant of that utilized in the military demonstrations.

6. *University of Maryland* (Marian LaMonte, M.D.), Brain Attack Project—This project uses real-time telemedicine video feed through microwave transmissions to connect ground EMS in Baltimore City with the University of Maryland hospital. This technology is employed in suspected stroke patients to allow neurologists to perform a neurological examination on the patient prior to arrival to shorten the time interval to thrombolytic drugs. Their equipment was developed in the biomedical department at the University of Maryland. The equipment cannot be used on aircraft secondary to transmission bandwidths interfering with bandwidths used in routine transmissions from aircraft.

7. *CISCO Project,* Southwest Research, Tucson, Arizona—This project is just beginning and is projected to connect ground EMS with receiving hospitals in a real-time video connection. It is projected to eventually include aircraft linkages.

8. *ARINC* (David Miller)—ARINC is a company that works with clients to put together specific systems by identifying equipment or components necessary to build the desired system. This company was contacted by way of referral from the Virginia State Department of Aviation. Mr. Miller was not aware of any system capable of providing real-time video/audio feed necessary for this project.

9. *New York State EMS Authority* (Carol Phielman)—This project transmits photos of an incident scene to the receiving hospital to be used by medical personnel in determining the potential extent of a patient's injuries based on the accident

mechanism. This project uses static displays and no video or audio transmissions. The information is not real time, with the photo reaching the hospital at or about the same time as the patient.

10. *U.S. Coast Guard* (Commander Art French, M.D.)—The Coast Guard, in conjunction with other branches of the military, has an interest in this type of technology from two perspectives. First, to be able to provide surveillance of other craft remotely by officers on land through video stream from a Coast Guard vessel. Second, the ability to offer instructions to Coast Guard personnel providing medical care to patients encountered on the high seas. The Coast Guard conducted limited tests approximately two years ago with variable success. Equipment was provided by WESCAM and was similar to that supplied to other branches of the military for testing (see 12 below). Problems encountered included an analog signal that could not be sufficiently encrypted to protect against others intercepting the signal, and grainy video quality with such poor resolution that individuals on land could not make out sufficient detail to perform the mission. The mode of data transmission was satellite uplink.

11. *American Airlines* (Kendall Greene, M.D.)—American Airlines along with its partner, British Airways, have investigated ways to provide real-time flight following with cockpit video for Trans-Atlantic Flights. To date, no equipment has been tested that performed in a manner desired by these companies. The video feed was grainy and choppy and had up to a minute delay in transmission. The tested equipment used satellite uplink for transmission. Presently, the video quality precludes use for the routine cockpit monitoring desired by commercial airlines.

12. *Uniformed University Casualty Research Center* (Joe Heck, M.D.)—The U.S. Military has had an interest in this technology specifically to enhance battlefield casualty survival. In theory, if physicians could provide remote medical assessments through video linkages with subsequent treatment instructions to field medics, the survival rate of battlefield casualties would be higher. The military conducted two field demonstrations of identified technology before putting further efforts on hold. The company WESCAM provided the equipment utilized in these demonstrations. There were several problems encountered. Poor video resolution resulted in physicians not being able to see enough detail to provide treatment direction, and a delay of up to 1 minute in video feed resulted in unacceptable delays in care, which were felt to have negatively affected survival. Finally, the transmission signal was analog, resulting in the inability to secure the transmission signal from interception.

In addition to acceptable equipment, participation and cooperation might be necessary from several entities or "stakeholders" for the project to move into the deployment phase. The project director, along with other members of the study team, met with each identified stakeholder to introduce the project and solicit ongoing cooperation and "buy-in" from each entity. Identified stakeholders and the outcome of these meetings are detailed here.

1. *Rockingham Memorial Hospital*—Kent Folsum, M.D., ED Director, and the ED Nurse Manager attended the meeting. Dr. Folsum expressed interest in the project on behalf of Rockingham Memorial Hospital and was particularly interested in the potential for video connections to exist between EMS responders and receiving hospitals if the technology being tested proved useful. He pledged support for the project and offered to train local EMS agencies and orient Rockingham Memorial ED physicians and staff on the nature of the project and the proposed protocols. The potential for crash victims from I-81 who are currently taken to Rockingham Memorial before transfer to UVA being directly transported to UVA as a result of this project was discussed. Dr. Folsum did not feel this would create any negative impact on his census or operations. It was agreed by both parties that the accident victim would be taken to Rockingham Memorial Hospital first if the ground transport time was shorter than the air transport time to UVA.

2. *Stonewall Jackson Hospital*—Colleen Arnold, M.D., ED Director, was present at the meeting. Dr. Arnold is also the local EMS Medical Director and could speak to involvement of the area EMS squads as well. Dr. Arnold expressed great interest in this project, as her hospital is the recipient of any serious accident victim in the southern portion of the proposed project study area. Stonewall Jackson Hospital is a small community hospital that lacks many resources to effectively care for a major trauma patient. Dr. Arnold felt that this study would result in accident victims being transported to a trauma center sooner, and that they might even bypass Stonewall Jackson altogether, which in her opinion was totally appropriate. She further indicated that the local EMS agencies would be happy to participate in the study, and that she would help facilitate and train the squads.

3. *Virginia State Department of Aviation*—Ken Weigand, Director, represented the department at this meeting. The department expressed ongoing interest in the project and a desire to be kept informed as the project moves forward. The department is currently in a competitive bid process for grant monies from NASA and the FAA to become a test bed for new technologies that can be integrated in aircraft to enhance communication capabilities. The helicopter video project is in line with other proposals for emerging technology in aviation and could potential integrate nicely with the efforts of this technology test-bed.

4. *Virginia State Police*—Colonel Gerald Massengill, Superintendent of the Virginia State Police, along with all District Sergeants and the State Police Chief Pilot, was present at this meeting. The State Police expressed interest in the project and a desire to be kept informed regarding equipment identified. Equipment similar to that necessary for this project has significant appeal and application to the law enforcement mission. The State Police agreed to assist in this project by allowing the portable video equipment that is to be operated by EMS to be carried in the trunk of their vehicles. Since State Police are almost always the first responding unit to a crash scene, they would be responsible for giving the equipment to the first responding EMS unit and re-securing the equipment after its use. Nothing further would be expected from the officer other than to provide the equipment to EMS and

re-secure it following its use. It was also noted in this meeting that the State Police are constructing a network of microwave towers along I-64 and I-81. This microwave network is obviously envisioned as being totally secure and for law enforcement purposes only, however, the opportunity to potentially use this network as part of the communication system for the proposed project was offered for a definable time period. This may be a potentially viable option.

5. *Central Shenandoah EMS Council*—Dr. Folsum is also the Regional EMS Medical Director for this EMS Council, and thus was able to articulate the desire of the Council to participate in the implementation phase of this project. Issues discussed included ways to in-service the ground EMS responders on the equipment, recurrent training that would be necessary during the study period, and the best ways to accomplish data collection regarding performance of the equipment being tested.

Currently, there are three projects using real-time video linkages between ground EMS units and hospitals to enhance patient care. There are no current projects using this type of technology in an aeromedical setting linking aircraft to ground locations. The project director, in conjunction with the telemedicine consultants, determined that WESCAM and its subsidiary was the best company to provide the equipment. It was felt that their equipment was the closest to meeting the criteria as presented in the Research Problem and Methodology sections. Company representatives worked closely with the project director to customize their equipment, enhancing its capabilities for this specific project. Customization included utilizing special receivers for the aircraft monitor that allowed for minimal effect of vibration on the signal quality, re-enforcement of the external carrying case to minimize damage by accidental dropping, and extended battery life for the remote pack. Once the equipment was customized, a public demonstration was scheduled including the stakeholders to test the equipment.

Equipment Demonstration

A public demonstration of the identified and customized equipment was held at the Charlottesville-Albemarle Airport on July 17, 2001. During this demonstration, the receiver component of the selected equipment was placed on-board a helicopter that made wide circles of approximately 20 nautical miles around the airport. The transmitter component of the equipment (video cam) was placed on a paramedic/responder who provided care to victims of a staged accident located near the parking lot of the airport. A viewing connection, in the form of a large screen TV, was linked to both the receiver on the helicopter and the video cam on the paramedic/responder. This allowed the audience to see both the picture transmitted from the helmet-cam and the video reception on board the helicopter. As one of the necessary attributes of the selected equipment was that it should be easy to use, both the helicopter crew and the paramedic/responder were given minimal instructions as to how to use the equipment prior to the demonstration. Following the product demonstration, enthusiasm was expressed by demonstration attendees, the helicopter medical crew, and the paramedic responders. The selected equipment performed according to all expectations. It was easy for the EMS paramedic responder and helicopter crew to use. The video quality was real-time, without any significant transmission delays, and of sufficient resolution to permit treatment decisions to be made by

providers. The signal clarity viewed by the demonstration attendees on the TV screen approximated that received on board the helicopter and was exceptionally crisp and clear. Even small details at the staged accident were discernable to the audience. The demonstration was also attended by members of the news media and resulted in subsequent coverage on local TV. A list of demonstration project attendees is shown in Table 2.

Table 2. WESCAM EMS Video Demonstration Attendance List.

Attendee	Organization
Greg Cross	VDOT Rural Intelligent Transportation Systems Planning
Michael D. Berg	Director, Thomas Jefferson Emergency Medical Services Council
Nick Saunders	Chief Pilot, Virginia Department of State Police
Cathy S. Wolz	Media Office, University of Virginia Health Systems
Lori Lichorobiec	NBC29 Television, Charlottesville, Virginia
Lewis Jenkins	Member, Thomas Jefferson Emergency Medical Services Council
Brett Henyon	Member and Project Contact, Pegasus-flight crew member and project contact
Jon DuFresne	VDOT-Intelligent Transportation Systems Division
Gary Allen	Director, Virginia Transportation Research Council
Art French	National Highway Traffic Safety Administration
Matt Mueda	National Highway Traffic Safety Administration
Gene Sullivan	Director, UVa Telemedicine Department
Kent R. Folsum M.D.	Emergency Department, Rockingham Memorial Hospital, and Regional EMS Medical Director
Steve Shergold	VDOT-Intelligent Transportation Systems Division
Jim McGowan	Administrator, Emergency Services, University of Virginia Patient Care Services
Michael Patterson	University of Virginia Department of Telemedicine

DISCUSSION

During the course of this study many problems were encountered. This type of technology has only recently been available and in some cases is still partially in research and development. This made identifying companies and other projects very difficult, as there was essentially no central clearinghouse for such technology. Additionally, this study sought to place the technology in an aviation environment, where limited experience existed and the equipment was largely untested. Some companies, which had technology that was close to meeting the project needs, were not willing to share the information or provide technology for this project due to ongoing research and development issues.

Once appropriate technology was identified through WESCAM and Broadcast Sports Technology, efforts to customize the equipment for this project were successful and culminated in the local demonstration of the technology. This demonstration showed that the equipment produced a video signal of sufficient quality to allow medical personnel to make treatment decisions. There is virtually no delay in signal transmission resulting in true real-time receipt of information. The signal is digitized, and thus secure against other entities inadvertently intercepting the signal. This protects patient confidentiality when treating crash victims and transmitting information between EMS responders and the helicopter crew. Finally, the ability

to augment microwave transmission of the signal allows for air-to ground transmission over longer distances making aircraft connections between Charlottesville and I-81 possible.

In addition to identifying and testing the equipment necessary for completion of the project, significant cooperation and partnerships were developed with stakeholders for successful implementation of the helicopter video project. Key partnerships have been developed between Rockingham Memorial Hospital, Stonewall Jackson Hospital, Central Shenandoah EMS Council, and the Virginia State Police. Each of these has agreed to participate as related in the methods section of this report. In addition, the Virginia State Department of Aviation has indicated ongoing interest in this project and has been included in the information loop as this project has evolved.

Limitations of this study include the fact that technological advances are occurring so rapidly with the type of equipment necessary for this project that it is possible the technology identified for this study may be outdated in a few months. Likewise, it is possible that other appropriate equipment exists that may not have been discovered by the investigators.

CONCLUSIONS

1. Real-time video imaging is technically feasible between ground-based EMS responders and the helicopter medical crew, and off-the-shelf technology exists that can be modified for this purpose. This was clearly shown in the public demonstration of the identified equipment in July 2001.

2. Images produced by the identified video equipment are of sufficient signal quality to allow the helicopter medical crew to make patient care decisions remotely, and digitalization of the transmission signal allows for more complete encryption of information, thus ensuring security of the signal and patient confidentiality.

3. Stakeholders necessary for successful completion of the subsequent deployment phase of this project were identified and their cooperation was obtained.

RECOMMENDATIONS

Real-time video connections are technically feasible between ground-based EMS responders and helicopter medical crews. WESCAM and its subsidiary, Broadcast Sports Technology, were the only companies identified in the course of this feasibility study that could provide this video imaging in digital format. This type of transmission is absolutely necessary to maintain patient confidentiality and security of transmission signals between sources. Accordingly, it is recommended that WESCAM be the sole-source company to provide real-time video imaging technology for Phase II, the implementation phase, of this project.

SUGGESTIONS FOR FUTURE RESEARCH

Clearly, establishing the feasibility of using real-time video as part of aeromedical services does not ensure that problems will not arise during implementation or field evaluation. Once the WESCAM equipment is installed on the Pegasus helicopter, data must be collected on the ease of in-flight use, the quality of the images, and the practicality of its use. During the 3-month "shakedown period," changes may be made to medical protocols and in-flight procedures, as well as to the equipment itself, to meet the requirements necessary for optimal field operation.

At the end of the shakedown period, data collection on in-flight treatments of patients and medical outcomes can begin. The ultimate goal of the evaluation will be to test if care of crash victims on I-81 is improved with resultant decreased death and disability rates. Information should also be collected on incidence clearance rates to determine if incidents are cleared faster with the use of this technology.

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