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in this issue

Army Tactical Medical Materiel Fielding Process by MAJ Stephen Spulick

Providing supplies and equipment to healthcare facilities allows for the best level of care for patients at the facility. The Army maintains a separate Lifecycle Management Command to provide this service to any unit that is authorized any level of medical equipment. This can range from a simple combat medic bag to an entire 248 bed hospital. The Army further differentiates between fixed facilities (such as Landstuhl Regional Medical Center or Brooke Army Medical Center) and those tactical units with healthcare capabilities. How does the Army efficiently and effectively manage this equipping task given the same constraints many smaller healthcare networks face?

This task has been taken up by the US Army Medical Materiel Agency (USAMMA). *Materiel* as it provides the equipment and material for the military to complete a specific mission. Medical materiel is one of ten separate classes of supply and is commonly referred to as Class VIII. A handy chart that defines all the classes can be found on this link.

USAMMA is the Life Cycle Management Command for CL VIII. One

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Autonomous Vehicles: Reliability Issues for Defense and Civilian Applications by Russell A. Vacante, Ph.D.

There is no doubt that the era of autonomous vehicles is with us. All one has to do is type the term "autonomous vehicles" into a computer search engine to be overwhelmed by articles pertaining to this subject. In fact, many automotive manufacturers are vigorously competing with each other to be among the first to introduce autonomous vehicles to the marketplace. Recently, Uber announced that their version of an autonomous driver assisted commercial vehicle has been traveling Arizona's highways since November 2017. Embark reports that it has successfully completed a test run of a self-driving truck from California to Florida without incident. General Motors and Tesla, among many automakers, are also rushing to introduce autonomous passenger vehicles to the marketplace. Cadillac's CT6 self-driving super cruise vehicle is a remarkable technological accomplishment.

Autonomous vehicle technology is an exciting and emerging opportunity that has been long anticipated by both defense and civilian communities. That acknowledged, the technology must demonstrate high operational reliability capability and the design, development and manufacture of these vehicles should be focused on mitigating risks to drivers, passengers, pedestrians and general infrastructure.

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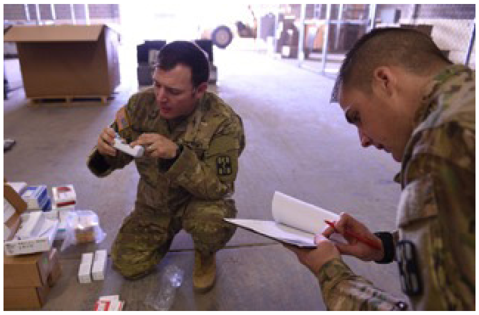
Photo Credit: Ellen Crown, USAMMA

mission of the Agency is the procurement and delivery of medical equipment, Sets, Kits and Outfits to all Branches of Army units, worldwide. These include Active Duty, National Guard and Reserve units, as well as Army Prepositioned Stocks (APS). Within USAMMA is the Directorate charged with executing the procurement and delivery mission, the Force Sustainment Directorate (FSD). This Directorate seeks to be fiscally responsible in a budget constrained environment. This fiscal responsibility includes a recent shift in how Class VIII materiel is delivered to units.

Units are supplied, in part, through the use of specific types of sets tailored to a specific mission. Previous fielding operations used a methodology called "Total Package Fielding" in which all components of a set were delivered to a unit when an upgrade mission was executed. The process resulted in predictable procurement expenses and predictable times to complete a fielding. However, this process also resulted in unnecessary excess materiel delivered to a unit (as some material duplicated what they had not previously used up) and the ability for fewer units to be upgraded, given limited budgets. This challenge has been addressed through a modi-

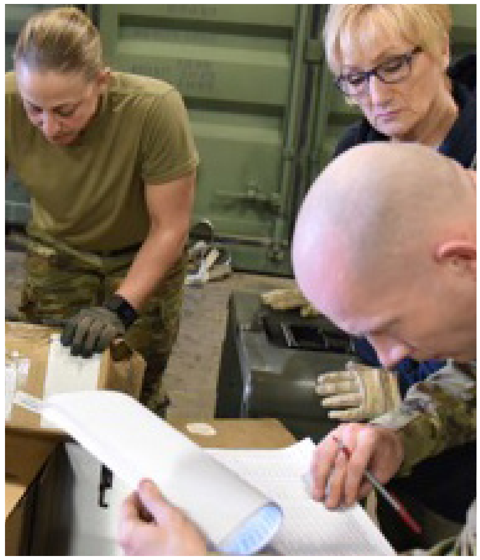
Photo Credit: Ellen Crown, USAMMA

fied methodology called "Precision Fielding". This process begins upon receipt of a modified Dynamic Army Resource Priority List (DARPL) which prioritizes Army units for fielding activities.

Once a unit is identified as having equipment or sets that are outdated, the FSD staff conducts analysis at the Unit and Equipment levels to identify only those items that require upgrading. Those items are then placed on order for delivery as either a formal fielding, where a team from USAMMA visits the unit to conduct inventories and obtain signatures for property transfer documents, or as a direct shipment to a unit location. This latter method is used when it is not considered economically feasible or required for a team to meet face-to-face with a customer unit. There have been several benefits to this new methodology.

The most visible benefit is the reduction of USAMMA acquired materiel that is excess when compared to a unit's required amount. Only items that are obsolete or require disposal/reallocation should remain upon

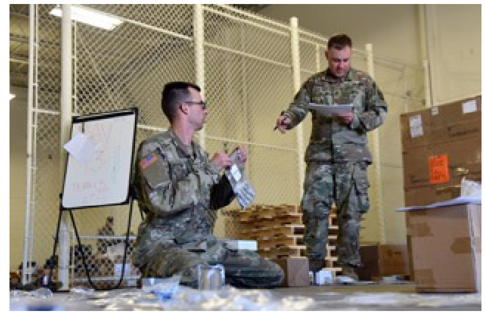
Photo Credit: Ellen Crown, USAMMA

fielding completion. This reduces the burden on unit personnel to perform unnecessary storage, inventory and turn-in activities, leaving only what is required for their mission, minus those items needing disposal. Additionally, this methodology allows the FSD to address shortages at more units than was previously possible, given the previously mentioned budget constraints, constraints that most businesses face as well.

This methodology does not relieve any unit for proper maintenance of medical equipment to include proper maintenance coding for required repairs or evacuation to higher levels of maintenance for more complex repairs. This routine maintenance is a Commander's responsibility and handling of equipment requiring repair or replacement must continue outside of the USAMMA fielding operations. That is, a fielding action won't fix or replace otherwise repairable equipment. A unit must exercise proper care of their equipment.

Ongoing guidance from Army G-4 (Logistics) and G-8 (Finance) to be good stewards of Army resources, reduce excess in the force and achieve logistics efficiencies are all realized through this approach. USAMMA continues to assess the effectiveness of this methodology and seeks to incrementally introduce efficiencies that provide modern, clinically viable equipment to the field. Budget constraints, as are found in all classes of supply, prevent total force modernization in a given year, however, this approach allows for the greatest current year impact to equipment readiness and unit capability. ■

About the Author

MAJ Stephen Spulick is the Deputy Director for the Plans, Programming, Analysis and Execution Directorate, and the Commander of the Medical Logistics Support Team – Japan, at USAMMA. He has previously served as the Chief of Fielding and the Operations Chief at USAMMA. He holds a PhD in Supply Chain Management and Logistics. He has previously served the Army in the fields of Military Intelligence, Field Artillery and the Medical Service Corps. He has held assignments in Korea, Germany and Iraq.

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Articles can range from one page to five pages and should be of general interest to our members.

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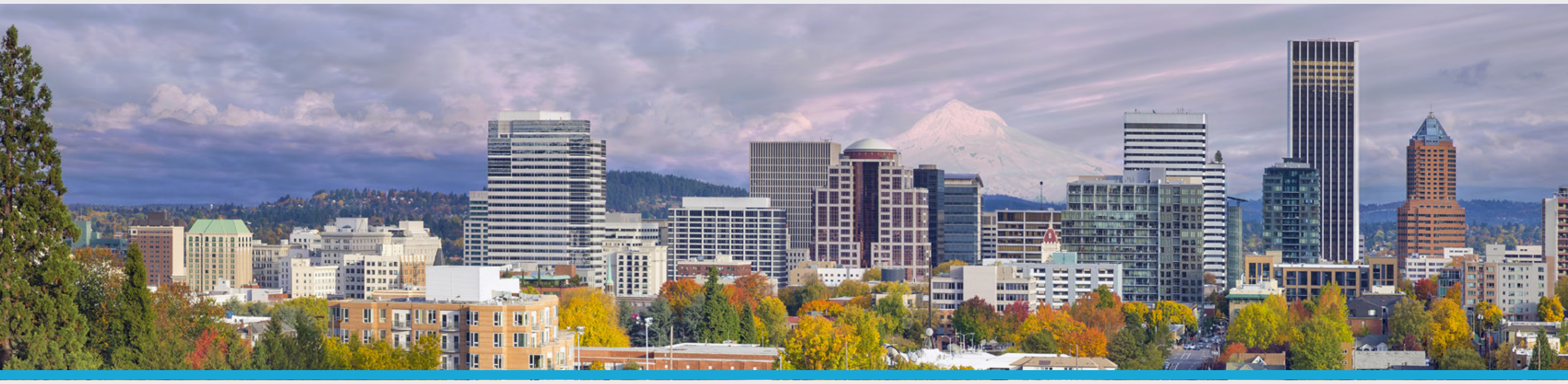

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NHTSA's NCAP Program and How Original Equipment Manufacturers (OEM) Integrate RMS Considerations into Vehicle Design by Christopher J. Bonanti

This article provides an overview of the main factors that led to the establishment of the New Car Assessment Program (NCAP) and discusses a few reliability, maintainability and supportability issues that are germane to Original Equipment Manufacturers (OEMs) when designing their vehicles to comply with Federal Motor Vehicle Safety Standards (FMVSS) and trying to achieve the highest star rating as part of the NCAP program.

Factor Leading to the Establishment of the NCAP Program

The National Highway Traffic Safety Administration (NHTSA) is charged by the U.S. Congress through its authorizing legislation to save lives on America's roadways, prevent injuries that are sustained by occupants in motor vehicles, as well as, reduce the number of motor vehicle crashes. To complete its mission, the agency utilizes several safety, regulatory, enforcement (defect investigations and recalls), and behavioral mechanisms.

In an effort to improve vehicle safety, the agency established the Federal Motor Vehicle Safety Standards (FMVSS), which fulfills its legislative mandate under Title 49 of the United States Code, Chapter 301, for Motor Vehicle Safety. FMVSSs are regulations that must be complied with by original equipment manufacturers (OEMs) of motor vehicles and manufacturers that produce equipment items that are specifically spelled out in the regulations. OEMs must conform and certify compliance with each of the FMVSSs that correspond to the type of vehicle or equipment manufactured.

Besides the FMVSS regulations that NHTSA has developed for regulatory and compliance purposes, the agency utilizes the NCAP program to serve as an "incentive" for manufacturers to make safe vehicles. This program enables vehicle manufacturers to compare their vehicle's safety record to that of their competitors and, in many cases, to make improvements that often exceed minimum standards required under FMVSS.

In the late 1960s and early 1970s, consumers who were in the market to purchase new vehicles had no way of comparing and evaluating safety features. This prompted Congress to establish Title II of the Motor Vehicle Information and Cost Savings Act of 1972, Pub.L. 92-513, 86 Stat. 947, which required NHTSA to establish the NCAP program. Under the auspices of NCAP, it was Congress' intent to utilize vehicle crash tests to help evaluate safety differences among various motor vehicle makes and models.

The agency initiated the NCAP program in 1978, beginning with frontal crash testing and documenting injury readings provided by Anthropomorphic Test Devices (ATDs) (or otherwise known as crash test dummies). Initially, when NHTSA began testing, motor vehicle manufacturers were reluctant to participate in the voluntary program. According to NHTSA, "vehicle manufacturers were slow to respond to the program by way of redesigning or making changes to their vehicles to improve vehicle safety performance ratings."

Between 1979 and 1994, NHTSA documented frontal crash tests as part of the NCAP program, but did not assign star ratings until 1994. After stars were introduced to help consumers evaluate the differences between similar model vehicles, OEMs changed their opinion regarding the program. Both the agency and vehicle manufacturers realized that there was a correlation between the number of NCAP stars to the salability of a vehicle. In short, stars sell cars!

In an attempt to improve vehicle safety and challenge the motor vehicle industry, NHTSA included side impact crash tests for model year 1997. The agency then established a new test for rollover resistance assessment. This test "measured static properties [on passenger vehicles] as reflected by a calculation known as the Static Stability Factor" and was initiated with the first ratings in model year 2001. The test was amended for the model year 2004 vehicles to include the results of a dynamic test for rollover resistance.

In 2008, NHTSA published a notice announcing that changes to both the "frontal and side crash ratings criteria would become more stringent by upgrading crash test dummies," which would include the 5th percentile female dummy, and by "establishing new injury criteria, adding a new side pole crash test, and creating a single overall vehicle score that reflects a vehicle's combined frontal crash, side crash and rollover ratings." The agency went further indicating that it would include information on crash avoidance technologies that have "potential safety benefits" as part of the NCAP program. Each of these new initiatives was tested in model year 2011.

In an effort to further enhance the NCAP program, NHTSA requested and published industry and public comments. The agency's decision to continue to upgrade the NCAP program with safety initiatives has enabled NHTSA to encourage vehicle manufacturers to voluntarily improve their vehicle designs so they can ensure that they receive the highest NCAP rating possible.

How has the Integration of NCAP Testing Been Considered by OEMs when Designing for RMS Issues?

Since the establishment of the NCAP program and the initiation of the 5 star rating system, the automotive industry has increased the reliability, serviceability and maintainability of their vehicles. The industry has invested significant money towards research in an effort to increase their overall NCAP star ratings for each of the model vehicles they design.

By doing so they have increased the reliability of their vehicles.

The OEMs have made substantial strides in advancing crash worthiness research and reliability of their vehicles, but with the onset of new crash avoidance technologies, such as crash imminent braking, the OEMs have faced technology challenges in the integration of these technologies in their vehicles. The majority of OEMs have been able to meet the demands of production ready integration of the advanced technology, but the technology is not fail safe yet. One causal reason for this reliability issue may be that each OEM utilizes different algorithms in the software it deploys within the crash avoidance technology. This is the case even when more than one OEM uses the same Tier One supplier's technology. One OEM may have a very aggressive algorithm to initiate the technology where another OEM may be more liberal with the initiation of the technology. These differences cause the same technology to react to an alert in a different way, thus causing the system to produce false positives or negatives based on the algorithms provided in the software.

Overall, OEMs that are integrating crash avoidance technology into their vehicles consider the reliability of this technology. This can be measured through statistical analysis of the Mean-Time-Between-Failures (MTBF) or the vehicle's reliability, and the Mean-Time-To-Repair (MTTR) or the serviceability of the vehicle. Although the NCAP program that NHTSA administers does not provide consumers with the reliability of crash avoidance systems that are encouraged by the agency for specific vehicle models, NHTSA does provide a link to defects and other concerns and complaints that consumers have reported to the agency. Since most OEMs use test results in the establishment of MTBF and MTTR for both the vehicle, as well as, specific components or systems, the future of these crash avoidance system's reliability will increase to a level that will encourage consumers to trust the technology more than they currently do.

The use of the NCAP program to sell cars by the OEMs has been a very positive return on investment for the OEMs. It has also enabled consumers to compare apples to apples when it comes to safety. Consumers have seen a direct correlation with the safety of a vehicle to the reliability of that vehicle for systems that have an impact on safety, such as crash worthiness. That has not been the same outcome for crash avoidance systems on vehicles. The hope is to have consumers be able to use a safety comparison on crash avoidance systems presented in NCAP as a basis for reliability. There is some work to do on this front, but eventually the OEMs will find a way to ensure the reliability of their crash avoidance offerings in their vehicles with a demonstrated strong safety rating. ■

About the Author

Mr. Christopher J. Bonanti is a Senior Managing Consultant for Engineering Systems Inc. (ESi). As a consultant that specializes in Regulatory and Compliance related issues in all modes of transportation as well as in the product liability spectrum, he has been able to leverage engineering, policy, business practices and regulatory requirements to benefit outcomes for his clients. In addition, he has more than 20 years of experience leading and managing regulatory, legislative and infrastructure projects for all modes of transportation, including rail, motor vehicle and aviation.

As a former member of the U.S. Senior Executive Service, he served as the Associate Administrator for Rulemaking at the National Highway Traffic Safety Administration (NHTSA). He was the senior executive responsible for developing, writing and implementing rules, regulations, and standards for all ground transportation vehicles sold within the U.S., including, the automotive, trucking, motor coach, and motorcycle industries. These regulations included all Federal Motor Vehicle Safety Standards (FMVSS), and the Corporate Average Fuel Efficiency (CAFE) standard regulations for automobiles and light trucks, as well as, fuel efficiency standards for medium and heavy-duty trucks. He also served as Head of the U.S. Delegation to United Nations World Forum for the Harmonization of Vehicle Regulations.

Mr. Bonanti holds a Master of Business Administration from the Kellogg School of Management at Northwestern University, a Master of Engineering from the Pennsylvania State University and a Bachelor of Science from Rutgers University. He also serves as the Treasurer of the RMS Partnership.

Editorial, from Page 1

While the technology for defense and civilian ground vehicles may prove to be rather similar, the application and environment in which these vehicles will ultimately be used will differ substantially. Military application for autonomous operated ground vehicles in a combat environment has promising potential. Need and risk factors associated with the combat environment, especially when it comes to asymmetrical warfare, has created a relatively new and urgent requirement. The application of autonomous or driverless military vehicles may include delivering supplies, clearing transportation routes of mines, and the advancement of robot-driven tanks and other military vehicles to, potentially, rout out the enemy. Autonomous military vehicles can also be used during battle to evacuate civilian and military personnel, and for many other applications as circumstances warrant.

As suggested by the above applications, autonomous ground vehicles are needed across the DoD community. The military use of autonomous vehicles could also prove to be cost-saving and cost-avoidance. The vehicles could help free a large pool of drivers that could be employed in performing other critical mission tasks—thus be a force multiplier. This is especially true in the Army, which has a personnel-heavy intensive organizational structure.

The use of autonomous vehicles operating in the battlespace must be highly reliable to successfully perform the aforementioned missions. In open terrain, or relatively uncongested combat or non-combat areas, the reliability requirements for military vehicles, due to fewer road obstacles, may be less of a challenge to achieve than vehicles operating in urban, complex road, environments. If autonomous military vehicles have a human co-pilot, and are operating in a terrain that is frequently unpredictably changing, they must be highly reliable since the warfighter co-pilot can be distracted by other combat operations. Under these circumstances, the use of military autonomous vehicles could parallel reliability challenges of civilian autonomous vehicles.

The use of autonomous vehicles in the civilian-driving environment, whether for business or pleasure, also has a promising future but is not without many diverse and complex reliability challenges. Business use of autonomous vehicles could, for example, help alleviate the problem of truck driver shortages in the U.S., reduce driver personnel costs, cut transit time as a result of continuous operational capability, and reduce the need for personnel liability insurance costs—just to mention a few money-saving and cost-avoidance advantages.

The reliability challenges regarding the use of autonomous vehicles in a civilian environment are twofold. There are technological, as well as, human factor issues to be addressed. If autonomous vehicle use were restricted, from a technology perspective, to relatively straight, predictable, unchanging highway conditions the technical reliability challenge would be less daunting and relatively easy to address. However, most of us who travel along the roadways are confronted with numerous driving conditions that can be confusing and often "white knuckle" frightening.

For instance, successfully navigating construction zones is a challenge even for highly skilled drivers. Lane changes, concert barriers, flag directing personnel, traffic cones that expand and reduce the size and direction of lanes, can occur on an hourly or daily basis. These road conditions often stress the most highly reliable system people have at their disposal—their brain. Robot-type technology that can safely address these numerous and unpredictable circumstances is emerging although its capability still remains technologically immature. Reliability challenges that confront designers and developers of aircraft autopilots appear to be minor when compared to reliability issues confronting designers and developers of "hands-off" technology for ground civilian vehicles. Designing high reliability into a plane's autopilot system is a proven technology. Engineering design and implementation of a fully autonomous vehicle technology that has a 98% life saving reliability may be cost prohibitive.

Proponents of autonomous vehicles will sometimes argue that autonomous vehicles can be drive (co-pilot) assisted to improve their reliability and ensure that passengers and/or cargo reach their destination safely. Human nature being what it is may not be as reliable under autonomous vehicle driving conditions as we are wishfully thinking. Making hand and foot free vehicle driving experience available suggests that there is ample opportunity for driver distraction. It would not be surprising to learn that many drivers in robot propelled vehicles would spend even greater time texting, napping, or engaging in other distracting conversations and activities. The human reliability factor may be further degraded if the co-pilot driver is a teenager. If there was a 98% probability that co-pilot drivers of autonomous vehicles could remain focused on the road and not distracted by extraneous activities, then it would be safe to say that the implementation of fully autonomous vehicle technology may not be too far in the distant future. However, this is not the case, and probably will never be. When civilians usually think about autonomous vehicles technology they have a concept of not having to focus their attention on driving as much as they currently do.

While the advent of autonomous vehicle technology is promising and exciting, it is not without serious reliability challenges. As demonstrated in this short article, an application of autonomous technology to both military and civilian circumstances is promising, however, there are technical and human factor reliability issues that have to be seriously investigated to successfully integrate the use of fully autonomous vehicles in the battlespace and on U.S. roadways. Until these issues are resolved, those who are interested in hands-free driving are advised to travel by airplane or train.

Another Day At The Office

by Russell A. Vacante, Ph.D.