

Megacode 2006: from concept to reality

Moutia and Baker describe the planning of the emergency management exercise, Megacode 2006, and the lessons learned from this exercise

Abstract

Disaster exercises are critical in ensuring agencies are well prepared when a real incident occurs. In order to be effective, exercises need to be carefully planned and replicate the real world conditions likely to confront responding agencies. Megacode 2006 was the culmination of 8 months of careful planning and was focused upon evaluating the response of St John Ambulance volunteers to a multiple casualty incident (MCI). The exercise was well received by all attending agencies and successfully highlighted areas which challenged St John responders and which require consideration in future MCI training of St John Ambulance volunteer members and team leaders.

Introduction

The management team of St John Ambulance Australia, Granville Division have long recognised the importance of maintaining skills through scenario-based training. This is particularly true when it comes to Multiple Casualty Incidents (MCI). Emergency services and, in particular, volunteer first responders have little exposure to MCIs and, therefore, exercises are an important training tool. Megacode was devised in response to the identified and critical need for advanced training and skills development in ensuring organisations and individuals are adequately prepared and equipped for MCIs.

Megacode is an exercise held every two years in the Sydney Olympic Park precinct. The exercise is primarily designed for St John first responders. The first Megacode exercise was conducted in 1997 and consisted of a simple motor vehicle collision. Since those humble beginnings, Megacode exercises have continued to evolve in both complexity and realism. Megacode 2004 was the most ambitious exercise to date. Simulating an improvised explosive device detonation at an Olympic Park facility, Megacode 2004 was complex and challenging for the responding and organising teams. This article will explore the Megacode 2006 exercise from its initial conception through to evaluation.

Megacode 2006

The Megacode Organizing Committee (MOC) comprised eight individuals. Most members of the committee are active members of St John Ambulance Australia. In addition to St John representatives, the committee included several members of local emergency services, namely NSW Fire Brigade and the Ambulance Service of NSW. MOC was overseen by a steering committee that brought together senior representatives of both MOC and St John Ambulance Australia NSW state staff. The project was managed using PRINCE2 project management methodology.

As with all previous Megacode exercises, the first major hurdle was to determine an appropriately challenging scenario for the responding agencies. When considering potential scenarios, it was important to devise a full-scale, realistic and challenging exercise that tested the capabilities of all services. Following considerable consultation with all agencies, it was decided that simulating a crash between a bus and a large truck would prove challenging and would be a situation which would realistically be encountered by volunteer St John responders working in close proximity to the incident.

A collision involving a bus and truck would provide to all services the challenges associated with treating and extricating casualties. For St John first responders, managing a bus full of casualties would test their triage and treatment capabilities and as Baker (2007:232) states, "Planning, rehearsing, and exercising various scenarios encourage the flexibility, adaptability, and innovation required in disaster settings." For the rescue services, this exercise would provide much needed experience in extricating individuals from large vehicles and often above shoulder height as well as providing teams much sought after 'tool' use.

Vehicle acquisition and crash

With the scenario determined, the MOC quickly moved its attention to acquiring the necessary vehicles for the exercise. These vehicles had to be relatively undamaged so that any damage sustained on impact during the exercise would be directly related to the crash. Procuring a passenger bus and truck when the intention was to destroy them and render them unusable was a challenge in itself. MOC team members spent several weeks contacting numerous organisations nationwide. Persistence paid off when team members received good news from both Westbus and National Transport Insurance. Westbus kindly located and donated a bus for the exercise. The bus was approximately 40 years old, 9 tonne, 12.5 metres long and recently decommissioned. National Transport Insurance (NTI) also offered MOC a vehicle in the form of a 17 year old Isuzu truck which was unroadworthy due to a bent chassis rail. The truck weighed 8 tonnes and was 25 feet in length.

With the vehicles and towing secured, the next major hurdle was to crash both vehicles. MOC enlisted the assistance of RTA Crashlab. The RTA Crashlab is a business unit of the Roads and Traffic Authority of NSW and is a state of the art independent test facility. RTA Crashlab provided significant support to MOC in the form of technical advice and ultimately in physically crashing both vehicles at their Huntingwood vehicle crash test facility. The enormity of this task cannot be overstated considering that this crash would prove to be the largest crash test in Australian history and that there would be only one shot at getting this crash right.

Prior to the crash of the vehicles, it was determined that the bus was too high for the facility and, therefore, the crash could not proceed as initially planned i.e. with both vehicles moving at the time of the collision. It was decided that the only alternative was to perform a 'shoot through' crash where the truck would be propelled through the Crashlab complex and into the stationary bus parked at the back of the facility. In order to simulate a closing speed of 60 – 80kms/hr where, in fact, only one vehicle was mobile, the truck would need to be propelled at 80kms/hr and the bus would need to be lightly chocked.

The crash was conducted without incident. Once the vehicles had come to rest, the MOC team members went about the labour intensive work of cataloguing the scene. The intention was to use this data to later recreate the crash scene on the day of the exercise. Once the cataloguing was complete, the vehicles were packed and stored at RTA Crashlab.

Casualties

Consistency of the scenario namely between the mechanism of injury and moulage, is a key consideration when it comes to Megacode exercises. Prior to specifying the injuries of the casualties, the MOC team undertook a thorough literature review. Several articles and research papers proved useful in determining the injury patterns one might expect in a head on collision between a bus and truck. Of particular interest was a series of reports by the American National Highway Traffic Safety Administration (NHTSA) documenting findings from a comprehensive series of full scale dynamic crash tests incorporating a series of sled tests.

The crash tests conducted by NHTSA focused upon American school buses which are similar to the bus donated to Megacode by Westbus. The literature review conducted by NHTSA indicated that the most significant factor in fatal "two vehicle" bus accidents was the posted road speed limit i.e. roads with a posted speed limit between 88.5 and 96.5 kms/hr and secondly accidents with heavy trucks, 83% of which were frontal impacts (Sullivan et al, 2001: 2). The literature further revealed that of those involved in school bus accidents, 86% of passengers have minor injuries, 10% are moderately injured and 4% are critically injured (Sullivan et al, 2001: 1). These statistics fitted well with our intended scenario and gave the team an early insight into the types of injuries responders would be expected to encounter.

The crash test dummies used for the school bus series represented different types of passengers. Of particular interest to MOC were the Hybrid III 50th and 5th percentile crash test dummies. The 50th percentile dummy represents the typical height and weight of an adult male whereas the 5th percentile dummy represents the typical height and weight of an adult female or adolescent passenger.

The bus procured for Megacode had no restraint systems fitted and, therefore, the unrestrained sled tests provided the most usable data for determining casualty injuries. Of particular interest was the discovery by Sullivan et al (2001: 8) that "... when an unbelted 50th male dummy was seated behind either a 5th female or another 50th male dummy, the unbelted dummy could override the seat back to strike the head or back of the dummy seated in front of it". The tests concluded that unrestrained passengers caused significant rear occupant loading and when dummies overrode the seat in front incidental contact resulted in high HIC values which indicates the risk of head and neck injuries was high (Sullivan et al, 2003, 9). Considering the low back seats in the MOC bus and the likelihood that occupants would override these seats, it was, therefore, highly

likely that a number of occupants in the scenario would suffer head, neck, chest and lower limb injuries..

With the results of the NHTSA dynamic crash tests and in consultation with RTA Crashlab, members of MOC proceeded to determine injuries and assign them to casualties in the bus. It was decided by MOC that St John Ambulance volunteers were to be used as casualties for the exercise. St John volunteers have the distinct advantage of understanding the pathology associated with injuries and would therefore act out their injuries appropriately. As St John volunteers were recruited, MOC took photos of each volunteer so later skin colour matching could be undertaken by the moulage team. Skin matching in previous exercises proved vital in ensuring prosthetics look appropriate for the casualties' complexions.

Moulage for Megacode 2006 was provided by the Art and Technology of Makeup College (3 Arts). 3 Arts has a long association with St John Ambulance Granville and has provided moulage for all previous Megacode exercises. MOC team members met with 3 Arts regularly to discuss the exercise, the specific injuries and, where appropriate, provided 3 Arts staff with technical guidance.

The exercise day

The exercise day started with the closing of a service road in Olympic Park. The road selected for closure was chosen through close consultation with Sydney Olympic Park Authority and MOC. MOC ensured the road was consistent with the scenario and an accident where the closing speed of the vehicles of 60-80kms/hr would be realistic.

Once the road was closed, the vehicles were placed in position with the assistance of NTI. The vehicles were placed in accordance with their final resting positions as recorded by MOC at Crashlab. MOC team members spent considerable time distributing the debris as catalogued at Crashlab in order to ensure the scene was authentic. Additionally, the bus interior was modified to reflect the damage expected with rear occupant loading i.e. passengers contacting the seats immediately in front of them.

Whilst the vehicles and debris were being staged, casualties started arriving at the makeup staging facility. Injuries ranged in complexity with some casualties requiring several hours of makeup whilst others required minimal makeup time. Once all casualty moulage was completed all casualties were transported to the scene. MOC team members placed each casualty in accordance with the casualty plan.

Immediately prior to the exercise all emergency services mustered at an agreed staging/assembly area. For the

purposes of the exercise, emergency services were given instructions to respond to the incident using average response times. Services involved included NSW Police, NSW Fire Brigade and the Ambulance Service of NSW. The St John teams participating in the exercise of which there were two were dispatched from local Olympic Park venues where as part of the scenario they were providing medical services. The MOC team were careful to ensure the St John teams were staffed in accordance with the type of event they were fictitiously covering. Each St John team were unaware of the other team and therefore the intent was to test inter unit coordination.

The exercise proceeded as planned. One of the St John teams had to contend with an unexpected situation when one of its members suddenly became ill and had to be removed from the exercise. The exercise lasted one and a half hours from the time the accident occurred through to the last casualty clearing the scene. The initial debriefing on the night indicated that the scenario was successful and all services felt the exercise was a worthwhile activity.

Evaluation

A senior nurse educator and member of MOC developed the evaluation tools for the exercise and coordinated the evaluation team. The evaluation focused heavily upon measuring the response of St John Ambulance volunteers to a Multiple Casualty Incident (MCI) as well as the success of Megacode as a multi service exercise.

The evaluation team consisted of four senior individuals representing St John Ambulance Australia, the Ambulance Service of New South Wales, NSW Fire Brigade and the Department of Health. Evaluation was conducted using purpose built questionnaires as well as interviews. All casualties, responding teams, project consultants and evaluators were given the opportunity to submit comments using evaluation tools specific to their role.

Incident management

Incident management is critical to MCIs and is challenging for both professional and volunteer services. The St John volunteer team leaders found incident management particularly difficult. This is not surprising considering that those members present on scene were general members. Team leaders focused upon providing immediate aid to injured passengers. This approach is a more traditional role for St John particularly when working alongside the Ambulance service. With the focus on patient care and less on scene management tasks, securing adequate scene access and appropriately siting Casualty Clearing Stations (CCS) was not a primary consideration. This focus upon treatment as opposed to scene management led to the CCS being placed too close to the bus, potentially posing difficulties

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The Megacode 2006 accident site.

for the rescue effort. Megacode 2006 highlighted the need for further training of general members on the SJAPLAN and their responsibilities should they be the first teams to arrive on scene.

Communication

Communication is a vital component of incident management and was another area which challenged St John responders. Whilst evaluators noted St John volunteers communicated well with Ambulance Service personnel, evaluators also identified difficulties with communications between St John members and other services such as NSW Fire Brigade. The communication difficulties observed may be due in part to a lack of familiarity between St John members and other services. St John volunteers work routinely with Ambulance Service personnel and therefore are more confident in communicating directly with these professionals. It is critical that future St John MCI training is targeted to educating team leaders on their role, the expectations of other services and development of effective communication strategies.

Personal protective equipment

With the worldwide increase in terrorism-related incidents, personal protective equipment (PPE) has become very topical in the rescue community. Although Megacode was not a hazardous materials exercise, it was however useful in evaluating available PPE and its use, particularly for St John responders who may be required to respond to an MCI during the course of a normal event and with no notice.

Evaluators noted that all services used PPE appropriately where available. However, St John members did not have access to some PPE deemed necessary for management of MCIs particularly in a rescue environment. PPE selection is an ongoing challenge considering that the “one size fits all” approach is not suitable for responders who may be confronted by a number of different types of incidents and their inherent individual risks. Johnson (2006:46) suggests, “The personal protective equipment needed for disaster situations will vary according to the type of catastrophe and the extent of destruction.” Since PPE requirements vary according to the type of incident, Johnson (2006:46) suggests that, prior to and during an incident, hazard assessment and reassessment should be undertaken in order to determine the appropriate PPE to be deployed. Consideration should also be given to potential hazards to rescuers with the use of PPE such as heat stress etc.

In planning for the future, Megacode has highlighted the importance of acknowledging the potential for an MCI to occur at or in close proximity to a public gathering and, therefore, consideration must be given on how best to equip St John first responders with the appropriate PPE. Consideration should be given to the development of a PPE program/tool which ensures appropriate hazard assessments and reassessments are undertaken as the incident unfolds, ensures team leaders and team members are adequately trained in selection and use of PPE and, lastly, maintenance and monitoring of PPE is rigorously managed (Understanding PPE Selection & Use During Disasters ,2006:18).

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The bus interior was modified to reflect the damage expected with rear occupant loading.

Future exercises

The evaluations revealed that all those who participated and attended Megacode 2006 felt the exercise was successful and highly realistic. Comments included, “Frightfully realistic” and “Had to keep reminding myself that it was fake”. If Bruhnke’s (2004:2) statement is true, “... enjoyment is probably an indicator, rather than the cause of a successful multi-agency collaboration”, then Megacode was successful in establishing collaboration between all the responding services. Whilst the exercise was successful, the evaluations identified several considerations for the next Megacode exercise. Actors, in general, felt confident acting out their injuries. However, it was suggested that issuing tags to each casualty detailing their clinical presentation e.g. vital signs, symptoms and clinical progression etc would benefit the actors and would aid responding teams in making triage decisions. This suggestion will be incorporated into future exercises. Another suggestion was the expansion of the scope of the exercise to include local hospitals. Traditionally, Megacode has focused heavily upon pre-hospital management of MCIs. Historically, one of the difficulties with including local hospitals in Megacode exercises has been transport from the scene to the hospital. However Vaughan (2004:3) made a worthwhile suggestion in recommending the use of two sets of patients, one set for the incident scene and one set for the hospital. The use of two sets of patients may prove useful particularly for Megacode where as, Vaughan (2004:3) suggested, Ambulance transport is difficult to secure for a large exercise.

Summary

Megacode 2006 was successful as an exercise and demonstrated the importance of exercises as tools for evaluating the response of services and, in this case, namely St John Ambulance, to multiple casualty incidents (MCI). In the past St John has provided a supportive role to government agencies when participating in MCIs. However, Megacode placed St John first responders at the scene of an MCI and as the initial agency responsible for provision of medical care. The Megacode scenario did reveal that communication and PPE were areas which challenged St John team leaders and members most. Training programs which focus upon equipping St John members with communication skills necessary to operate in an MCI environment should be considered. Development of a PPE program/tool should also prove useful as an aid for St John and fellow services in determining how best to approach an incident, how to re-evaluate PPE as incidents progress thus ultimately safe guarding the welfare of first responders.

Exercises continue to be vital as collectively organizations seek better ways to manage MCIs. Megacode has established itself as a unique exercise where attention to detail aims to immerse responders in the scenario. It is the hope of the Megacode team that this paper inspires fellow services and communities to undertake their own MCI exercises and share their findings with the Emergency Management community.

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About the Authors

Didier Moutia is a registered nurse with a masters degree in trauma. He is currently the divisional superintendent of St John Ambulance Australia Granville Division. He has over 22 years experience in prehospital care working with a number of prehospital agencies.

Robert Baker is a student health professional and is the special projects manager for St John Ambulance Australia Granville Division. He has 22 years experience in St John Ambulance Australia and has held various portfolios such as public relations, training and special projects.

Contact Details

Mr. Didier Moutia
St John Ambulance Australia Granville Division.
P.O. Box 122,
Granville NSW 2142.

Email: didier.moutia@stjohngranville.org