Journal of Conventional Weapons Destruction

Volume 10
Issue 2 *The Journal of Mine Action*

Article 12

November 2006

Cluster Munitions and ERW in Lebanon

Daniele Ressler
Center for International Stabilization and Recovery at JMU (CISR)

Elizabeth Wise
Center for International Stabilization and Recovery at JMU (CISR)

Cluster munitions can be dropped from the air as seen here being dropped from a B-1B Lancer, or launched from the ground as were most of the cluster munitions used in the 2006 conflict between Hezbollah and Israel.
PHOTO COURTESY OF AP/U.S. AIR FORCE, HO

Cluster Munitions and ERW in Lebanon

The recent 34-day conflict between the Lebanese armed faction Hezbollah and Israel from July 12 to August 14, 2006, saw extensive use of surface-launched munitions and air-dropped munitions (to a lesser degree), resulting in wartime casualties for military and civilian actors in both Lebanon and Israel. Since the ceasefire agreement, international post-conflict attention has become focused on Lebanon due to the large number of explosive remnants of war left behind after the conflict. In particular, cluster munitions are proving problematic for post-conflict reconstruction activities in Lebanon due to their apparent high failure rate[1] and the potential threat they pose to returning civilians, aid workers and military personnel. This article examines cluster munitions and the impact of their presence in Lebanon.

by Daniele Ressler and Elizabeth Wise [Mine Action Information Center]

Early cluster munitions were used in World War II and were later deployed extensively by U.S. forces in Southeast Asia during the American/Vietnam War. Millions of tons of cluster submunitions were dropped on Laos, Cambodia and Vietnam—90 million on Laos alone.[2] Cluster munitions were further used extensively during the Gulf War of 1991 (by the United States and allies), in Kosovo and Yugoslavia in 1999 (United States, United Kingdom and Netherlands), Afghanistan in 2001–2002 (United States) and Iraq in 2003 (United States and United Kingdom).

A cluster weapon consists of a munitions container deployed by a weapon-delivery system such as a bomb dropped by aircraft, rocket launcher or artillery projectile, which then releases smaller munitions in mid-air that are spread over a particular area. These smaller munitions, or submunitions, are designed to explode on impact or close to the time of impact. Typically the delivery systems are designed to carry and deploy hundreds of submunitions at a time. Submunitions are also called *bomblets*, *bombies*, *BLUs (bomb live units)* or *grenades*.

Cluster munitions can be delivered by air or surface. Air-dropped cluster dispensers (or *cluster bomb units*) are released or fired from airplanes, and after a specified amount of time or distance, the dispenser opens to allow submunitions to effectively cover a wide target area. With the exception of sensor-fuzed weapons, CBUs all fall into the "dumb bomb" or unguided category, meaning once released, their trajectory cannot be controlled or re-directed.[3] Surface-launched munitions are delivered by artillery launchers on the ground that are fired over a long range to detonate either in the air or on impact. In the case of cluster munitions, each dispenser (e.g., missile, rocket, projectile) carries a payload of submunitions that is released after the dispenser is in flight, to drop over the target area.

During a conflict, cluster weapons are used by the military for attacking an area where the target may be moving, such as a military convoy, either to attack and destroy the enemy by dropping explosive bomblets (*impact*) or to prevent or slow enemy movement from or to an area by dropping devices that essentially function

as landmines (*area denial*).[3] It is important to note that submunitions are different and not all are explosive or harmful in the way that it is popularly understood; for example, area-denial submunitions do not explode but are victim-activated and classified as landmines.[4] For the purpose of this article, the submunitions discussed are understood to be those meant to explode on impact.

The area a single cluster munition can cover with submunitions is known as a footprint, and depending on the delivery system and type of weapon, one cluster munition salvo may strike an area as large as one square kilometer (247 acres).[1] Cluster munitions are useful to a military because the size of the cluster-munition footprint is much larger than that of a single bomb.

Because there are many kinds of cluster munitions and bomblets with different abilities and uses, a convoluted understanding of these weapons can occur. For example, an MLRS rocket salvo is capable of releasing thousands of submunitions over an area within a one-kilometer (0.6-mile) radius,[5] but most other strikes have fewer submunitions and a far smaller area of impact.[4] Upon impact, deadly shrapnel from each submunition can be projected over a radius of up to 50 meters (55 yards) from the largest bomblets dropped by air;[1] however, most of the submunitions found in Lebanon and discussed in this article have a fragmentation radius of less than 10 meters (33 feet).

While in no way intending to undermine the potential threat of cluster munitions both during and after conflict, it is important to examine cluster munitions and their submunitions individually rather than grouping them together and making generalized assumptions. This is particularly true as international attention has recently focused on cluster munitions and is discussing their potential regulation or prohibition based on the potential threat submunitions may pose to militaries and civilians during and after use.

Controversy about Cluster Munitions

The dud rate for cluster submunitions varies dramatically; reported failure rates can typically range anywhere from under 2 percent to over 30 percent.[6] The potentially high failure rate of some cluster submunitions is one reason they are controversial. The range in failure rate is extreme in part because different types of cluster munitions and their parts vary greatly, particularly the fuzes, resulting in varying levels of successful design. In fact, not all cluster munitions have an unacceptably high failure rate; for example, while faulty fuzes can be a reason munitions fail to explode, some fuzes are extremely reliable in their design.[7]

Even testing and reporting failure rates is problematic because there may be a difference between the failure rate in ideal testing conditions and combat conditions.[8] In official testing, submunitions may be dropped on hard surfaces without obstructions such as vegetation, leading to lower failure-rate statistics than are reflected in real conditions.[8, 9]

Since conditions in the field are not necessarily the same as those during testing, in some cases cluster submunitions may have significantly higher failure rates during use. Failure-rate statistics based on field use, however, typically can only be derived from anecdotal or incomplete records taken during the conflict and are therefore harder to rigorously document and prove.[9, 10] Thus, failure rates quoted for cluster submunitions may be underestimated if based on an ideal testing environment and may be unreliable or over-estimated if based on spotty in-conflict data.

Reasons for a high failure rate vary and can depend on the age of the submunition; storage conditions; production (design, construction, quality of fuzes); deployment (arming and delivery technique, altitude of delivery); or landing (angle of impact; softness and slope of terrain; vegetation such as trees or bushes, marshes, snow or water, and extreme heat or cold).[6, 9]

Cluster munitions are often delivered as "unguided bombs," meaning that they can be aimed, but once fired, there is no controlling exactly where they land. This results in a higher probability that they may miss the intended military target and hit civilian areas. Factors such as weapon design, altitude at which the dispenser is dropped or opens, wind, dispenser spin rate and the slope of the ground can all affect the size and location of a cluster bomb's footprint, contributing to potentially inaccurate dispersal, unpredictable results and undocumented locations of subsequent unexploded submunitions.[10]

With these concerns in mind, Human Rights Watch has been developing a list of the "worst offender" cluster munition weapons it considers to be particularly inaccurate and unreliable. In 2003 (during the Iraq war), HRW called on the United States and other countries to halt the production, use and sale of four such munitions: the CBU-99/CBU-100 containing Rockeyes; the CBU-87/B with the BLU 97 Combined Effects Munition; 155-mm Dual Purpose Improved Conventional Munition artillery projectiles with M42 and M46 submunitions; and Multiple Launch Rocket Systems with M26 warheads (containing M77 bomblets).[11] Recently HRW expanded its list, which now totals 12—a "dirty dozen"—cluster munitions.[12]

Recent Cluster-munition Use in Lebanon

Before the recent conflict in Lebanon involving Hezbollah, Israel used cluster munitions in its 1978 and 1982 incursions into Lebanon.[13] The two-decade-old unexploded submunitions from Israeli campaigns have continued killing and injuring civilians, with over 200 civilian casualties recorded between 2000 and 2005. To be fair, it must be understood these casualties include both

Various types of ordnance that the United Nations has collected in southern Lebanon in its efforts to clear the region of landmines, unexploded missiles and cluster bombs. Unexploded cluster submunitions are reportedly being found in high numbers in southern Lebanon, indicating a high failure rate of some of these munitions when used during the 2006 conflict (see story on page 38).
PHOTO COURIESY OF AP/ALFRED DE MONTESQUIOU

landmines and UXO; however, after these (and other) conflicts, clearance teams have found at least six confirmed types of unexploded cluster submunitions contributing to Lebanese civilian casualties.[14]

It is for this reason that Human Rights Watch and others expressed concern when it was reported that Israel was using cluster munitions in Lebanon in the recent conflict: first reportedly on July 19, 2006, in the town of Blida[15] and then in numerous strikes across the country with accelerated use during the last 72 hours of the conflict.[16] The United Nations estimates the Israeli Defense Forces fired up to 6,000 bombs, rockets and artillery a day into Lebanon.[17]

Now several months after the ceasefire, the United Nations and clearance groups are continuing to collect data to understand the implications of the conflict. The United Nations initially estimated there may be as many as one million unexploded cluster submunitions in Lebanon resulting from an exceptionally high overall failure rate of about 40 percent for the cluster submunitions fired or dropped in Lebanon during the conflict.[18] U.N. and Lebanese demining teams have found 770 cluster-munition strike locations as of October 10, 2006 and this number will continue to grow as the search continues.[19]

Reports made shortly after the end of the conflict documented initial findings of unexploded cluster submunitions on the ground in Lebanon, including M42s, M46s, three variations of M85s, M77s and BLU-63s.[4, 18, 20, 21] Notably, all four of the cluster munitions dispersing these submunitions are included in Human Rights Watch's "dirty dozen" list, meaning the primary cluster munitions used in Lebanon are reported to be among the most inaccurate and unreliable.[12]

The cluster submunitions dispersed in Lebanon appear to have been delivered most extensively via artillery projectiles, followed by Multiple Launch Rocket Systems and less so by aerial cluster bombs.[20] It is likely that additional cluster submunitions will be found during ongoing clearance in Lebanon, but these types, delivered by surface and air, are discussed in the sidebar on the next page. The United Nations also noted that in addition to cluster munitions in Lebanon, there are an estimated 15,300 items of unexploded ordnance including air-dropped bombs of 500 to 2,000 pounds (200 to 900 kilograms), ground- and naval-launched artillery rounds, and air-delivered rockets.[17]

Human Rights Watch released an unconfirmed report October 19, 2006 that stated Hezbollah fired a type of Chinese cluster munition into Israel as well during the conflict (see story on the next page).[22]

Effect on Civilians in Lebanon

When cluster munitions are dropped, the bomblets can be spread intentionally or unintentionally over a large area. The Multiple Launch Rocket System, for example, is believed to have a margin of error of up to three-quarters of a mile (1.2 kilometers) from the intended target.[23] Because of the imprecision of these rockets, an army may "flood" a battlefield with submunitions in order to increase the chance of striking the intended target.[23]

Unexploded cluster submunitions can in some cases be extremely unstable and unreliable. While some submunitions may be moved successfully without detonation depending on how they landed and the cause of failure, others may explode with even a touch. Older unexploded submunitions dropped in Lebanon such as BLU-63 bomblets may be more unreliable or unstable with age[24]; additionally, small submunitions such as MLRS-delivered M77 bomblets can be hard to see until it is too late (see story on the next page for information on both). In this way, some consider cluster bomblets with high failure rates to become *de facto* anti-personnel landmines.

Colin King, international landmine and explosive ordnance disposal consultant, notes that unexploded cluster bomblets are dangerous in part because their condition is unknown: They might be fully armed and ready to detonate, not armed and relatively harmless, or partially armed. If they are armed, they may or may not be capable of firing, adding to their unpredictability. One important challenge according to King is not only to clear the submunitions in Lebanon safely, but to further study what condition they were found in and *why* they failed to arm and explode.[4]

A United Nations Chinese battalion involved in demining the town of Hiniyah in Lebanon prepares to detonate unexploded ordnance. The soldiers locate the unexploded devices, remove and relocate them to a safe area, and then detonate them.
PHOTO COURTESY OF UN/MARK GARTEN

As of October 8, 2006 there have been 20 reported post-conflict fatalities and 120 reported injuries from UXO in Lebanon, in nearly all cases from cluster submunitions.[25, 26] Four of these fatalities and 42 of the injuries were children 18 years old or younger.[25]

The United Nations has estimated it may take 12 to 15 months to clear most of the cluster submunitions and other UXO in Lebanon.[19] Because of the large footprints of cluster bombs, for each strike location clearance personnel must verify an area totaling 196,000 square meters (48.5 acres) to locate and destroy all unexploded submunitions.[19] The United Nations reported that as of September 26, over 350 Lebanese Army personnel along with some 200 nongovernmental organization and commercial company personnel were working on clearance under the management of the United Nations Mine Action Coordination Centre of South Lebanon and Lebanon's National Demining Office, with additional clearance coming from United Nations Interim Force in Lebanon troops.[26] More than 45,000 submunitions had been cleared by these operators as of October 10, 2006.[19]

Legality and Future of Cluster Munitions

The use of cluster munitions is not currently prohibited under international humanitarian law. However, part of IHL prohibits indiscriminate attacks, "which employ a method or means of combat which cannot be directed at a specific military objective."[27] Additionally, IHL prohibits disproportionate attacks, or any that "may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated."[27]

Israel claims its use of cluster bombs in Lebanon complies with international law. An Israeli military spokesman told Reuters news agency, "Everything the Israeli Defence Forces are using is legitimate."[28] Some disagree, arguing as Ken Roth from Human Rights Watch does that "the use of cluster munitions in or near civilian areas violates the ban on indiscriminate attacks, because these weapons cannot be directed at only military targets."[29]

The tension over cluster-munition use is an intersection of humanitarian concerns and military interests. This is reflected in debates over the future of cluster munitions. Some nongovernmental organizations—notably the Mennonite Central Committee—have long been advocating for a total ban on cluster munitions.[24] Other

NGOs have called for a moratorium on use, production or trade of cluster munitions until humanitarian concerns can be addressed; this is the position of the Cluster Munitions Coalition, created in 2003 and now with over 150 member NGOs.[30]

Rather than prohibiting use, some militaries have instead started taking a technological response to cluster munitions, creating weapons with lower failure rates, improved accuracy, self-destruct/self-neutralizing mechanisms or back-up secondary fuzes.[10] Rather than stop using them, the goal is to increase reliability. Not all militaries support this, with poorer ones, such as Russia and China, arguing they cannot afford such an approach.[24] Yet improvements to cluster munitions are supported by many within the military who have experienced the danger of fratricide to ground troops by unexploded submunitions deployed by their own military.

The U.S. Department of Defense's 2006 proposed military spending budget requested funding to update outdated cluster munitions.[31] Updating cluster munitions would potentially improve targeting and the dud rate. The Army requested $124.8 million to purchase 1,026 Guided Multiple Launch Rocket System munitions.[31] The GMLRS claims to reduce the dud rate of the current MLRS by 95 percent and the impact area by 85 percent.[31] These new munitions aim to solve many of the problems of the older cluster munitions: indiscriminant effects, high dud rates and attacks on civilians.

Conclusion

The Mennonite Central Committee has used the phrase "drop today, kill tomorrow" to describe the danger cluster munition UXO can pose for civilians.[32] This is clearly the case in post-conflict Lebanon, where unexploded cluster submunitions are already killing civilians. However, not all cluster munitions are created equal, and this issue is complex. The debate continues with some defending the use of cluster munitions, others advocating for improvements in technology or stronger legal regulation and still others decrying any use at all. What is undeniable is that cluster submunition duds have resulted in explosive remnants of war that continue to injure innocent civilians. There may be more than one solution to the problem of cluster munitions, but it demands an answer and should not be ignored.

For additional information on the use of cluster munitions in the recent Israel/Hezbollah conflict, see the MAIC fact sheet on page 113.

Special thanks to Colin King for his assistance in providing information for parts of this article.

For additional references for this article, please visit http://snipurl.com/15i42

See Endnotes, page 110

Cluster Submunitions Reportedly Found in Lebanon and Israel

As discussed in the adjacent article, early reports soon after the end of the recent conflict in Lebanon have documented that initial findings of unexploded cluster submunitions on the ground in Lebanon include M42s, M46s, M85s, M77s and BLU-63s. Human Rights Watch also released an unconfirmed report that states Hezbollah fired Chinese cluster munitions with Type-90 submunitions into Israel during the conflict. Most of the unexploded submunitions so far reported are surface-launched Dual Purpose Improved Conventional Munitions, with one air-delivered submunition also documented. These submunitions and their cluster weapon dispensers are examined here.

Surface-launched DPICMs Found in Lebanon and Israel

Most of the unexploded submunitions being found in Lebanon are Dual Purpose Improved Conventional Munitions. DPICMs are designed for two purposes: anti-armor and anti-personnel attack. The anti-armor feature results from a "HEAT" (High Explosive Anti-Tank) shaped charge in the submunition that allows it to penetrate metal, while the anti-personnel feature occurs via an enhanced fragmentation case on the submunition that explodes to create a powerful blast with shrapnel.[4, 33]

The M42, M46, M85 and M77 have a drag ribbon, which, when fired, unfurls to stabilize the bomblet. The ribbon will vibrate in the wind, arming the bomblet. If the ribbon does not unfurl, or becomes entangled, the bomblet will not be armed, and therefore will not explode on impact, resulting in a dud that could explode later. Due to the compact size of these bomblets (sometimes compared with the size of a D battery), it is possible for a majority of the duds to become hidden when they land, resulting in UXO that not only may be hard to see but may also look like a toy to a child.

M42 and M46 (via M483A1). One type of surface-launched cluster munition used in Lebanon is the M483A1 155-mm artillery projectile. The M483A1 is delivered from a Howitzer, a type of cannon artillery that can fire from the ground at high angles. During flight, the bottom of the artillery projectile is blown off by a pre-set fuze, with the explosion forcing 88 submunitions out of the container to fall out over a target area.[33]

The submunitions in the M483A1 are M42s and M46s. Sixty-four of the submunitions (the M42s) are scored, or notched, to cause them to explode into anti-personnel fragments of metal; the HEAT warheads of all 88 of the submunitions can penetrate seven centimeters (2.75 inches) of armor.[34] The M42/46 DPICMs have a tested failure rate of 2 to 4 percent,[33] though additional testing of existing stocks has produced a dud rate closer to 14 percent.[11]

M85 (via M395/396). Two other types of cluster munitions used in Lebanon are the M395 and M396 155-mm artillery projectiles. These two Israeli-produced munitions contain 63 and 49 M85 submunitions, respectively. The range of the M395 is 23 kilometers (14.3 miles) and the M396 has an extended range to 30 kilometers (18.6 miles).[35]

The M395/396 are similar in ballistic performance to the M483A1.[35] Unlike the U.S. model, however, reported submunition failure rates in testing are much lower at 1.3 to 2.3 percent; this lower rate is due to the addition of a self-destruct device and a highly sensitive impact fuze.[20, 36] However, by September 13, 2006, the UNMACC-SL reported that out of a total of 5,045 submunition duds they had located and destroyed, 691 were M85 submunitions.[17] Steve Goose of HRW noted that the number of M85 duds was strikingly high for a submunition with a self-destruct feature that claims to dramatically reduce the failure rate.[20]

However, Colin King, international landmine and explosive ordnance disposal consultant, reports that in Lebanon, initial findings suggest that rather than one type of M85, clearance teams are actually finding three variations of the M85 with completely different designs. Two of these variations have a self-destruct capability, but the third type also used does not have this feature. While both the self-destruct and non-self-destruct varieties have been found unexploded, further research is needed to determine their individual failure rates, the condition they were left in and why each variety failed to explode and/or self-destruct.[4] This also implies that it is problematic for reports to refer to "the M85" without specifying which variety is meant.

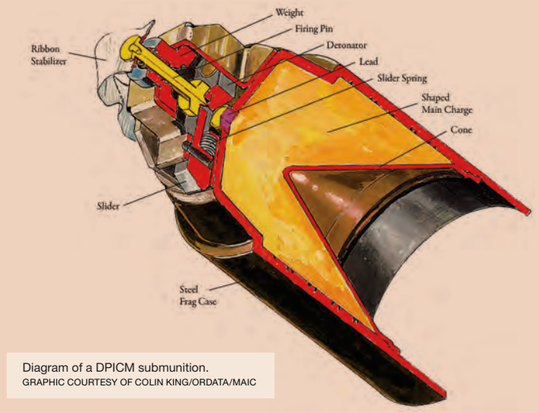

Diagram of a DPICM submunition.
GRAPHIC COURTESY OF COLIN KING/ORDATA/MAIC

An M85 submunition, one of the types recently found in Lebanon.
PHOTO COURTESY OF COLIN KING

An M77 submunition, one of the types recently found in Lebanon.
PHOTO COURTESY OF COLIN KING

M77 (via MLRS-delivered M26). Potentially the most lethal method for delivering cluster munitions from the ground to a target is the Multiple Launch Rocket System launching M26 warheads. This rocket system can hit a target from a mobile platform 32 to 38 kilometers (20 to 23.5 miles) away.[5, 9] The MLRS can fire 12 rockets in 60 seconds. Each rocket releases 644 M77 dual-purpose anti-armor and anti-personnel bomblets and can saturate a target 200 meters (650 feet) in diameter with these submunitions.[33] Submunition HEAT warheads can penetrate up to 10 centimeters (four inches) of steel while shrapnel can travel over seven meters (eight yards) in any direction.[37]

The average dud rate of the MLRS bomblets is 5 to 23 percent according to U.S. tests; British military tests put it at 5 to 10 percent.[5] That means that at a probable **minimum** (with a 5-percent failure rate), 32 bomblets from one rocket will not explode on impact, and have the potential to explode later. If an MLRS shoots 12 rockets in 60 seconds, **at least** 388 unexploded submunitions can be expected to be left on the ground over the targeted area during that minute.[37]

Type-90 (via Type-81). According to an unconfirmed Human Rights Watch report, Hezbollah fired into Israel Chinese-made artillery rockets called Type-81s that were previously unused by an armed force anywhere in the world.[22] The Type-81 is a 122-mm cluster munition rocket that contains 39 submunitions. These submunitions are called Type-90s (also known as MZDs) and are dual-purpose: as they explode on impact for an anti-armor effect, they fragment into hundreds of steel spheres about 3.5 mm in diameter over a wide area.[38] A reliable failure rate for this submunition is not known.[38]

Air-dropped Submunitions in Lebanon

BLU-63 (via CBU-58/B). CBU-58/Bs are aerial aircraft cluster bombs containing 650 BLU-63 bomblets, developed in the early 1960s and supplied by the United States. These unguided bomblets are ball-like submunitions three inches (7.5 centimeters) in diameter with a scored steel casing that can produce 260 fragments on impact for an anti-personnel effect.[39, 40] While a reliable dud rate is not known, HRW observers reported in the recent conflict seeing one canister stamped with load date of September 1973 and two catastrophic failures, where "the weapon completely failed to function and none of the bomblets were dispersed or exploded."[19] Unexploded BLU-63 bomblets were also found in Lebanon after Israel's cluster bomb attacks in the conflicts of 1978 and 1982.[13]

Daniele Ressler works as a Researcher, Writer and Assistant Editor for the *Journal of Mine Action*. She holds a Master of Science in violence, conflict and development studies from the University of London's School of Oriental and African Studies. She has studied in Switzerland as well, earning a Certificate for Applied Studies in peacemaking. Daniele has previously worked in Washington, D.C., and Seattle, Washington, in the field of conflict management, and has lived in Nairobi, Kenya.

Daniele Ressler, MSc
Researcher / Assistant Editor
Journal of Mine Action
Mine Action Information Center
E-mail: maic@jmu.edu

Elizabeth Wise was an Editorial Assistant with the *Journal of Mine Action* from May to August 2006. She holds a Bachelor of Arts in English and is currently pursuing a Master of Arts in technical and scientific communication at James Madison University.

Elizabeth Wise
Editorial Assistant
Journal of Mine Action
E-mail: maic@jmu.edu

Colin King
C. King Associates, Ltd.
Wych Warren
Forest Row
East Sussex RH18 5LP / UK
Tel: +44 1342 826 363
Fax: +44 1342 825 961
E-mail: info@ckingassociates.co.uk
Web site: http://www.ckingassociates.co.uk/