

# LIGHTWEIGHT FIREPOWER

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The Joint Services Small Arms Program (JSSAP), established by the US Department of Defense to define and harmonise small arms requirements across the armed services, has conducted extensive analysis of the performance of small arms in the ongoing conflicts in Afghanistan and Iraq. The JSSAP has developed a model of 'Battlespace Depth' which defines the close quarter battle space as 0-50m, the close battle as 0-100m, the mid-range battle as 50-600m and the far range battle as 300-3,000m. Some 80% of engagements fought by US forces in the Global War on Terror have taken place within 300m, reinforcing the analysis of most post-1945 conflicts. As the US Army and US Marine Corps seek replacements for their ageing 5.56mm M249 Squad Automatic Weapons (SAW) the debate has reopened about the relative merits of belt-fed light support weapons (LSW) and magazine-fed light machine guns (LMGs). Manufacturers are offering weapons of both types.

To improve engagement capabilities in the far range battlespace the US Army and US Marine Corps are taking a number of measures:

- increasing the allocation of 5.56mm and 7.62mm sniper rifles for precision engagement; (see Asian Military Review April 07)
- reducing the weight of the 7.62mm M240 series medium machine gun and developing a lightweight .50 calibre machine gun to provide suppressive fire;
- and, developing improved grenade launchers with computerised fire control systems and programmable ammunition to accurately engage targets at long ranges. (see Asian Military Review Feb 07)

Following the US Army's cancellation of the Objective Individual Combat Weapon and the USMC's selection of the M16A4 as its new assault rifle both services have set the replacement of the 5.56mm M249 Squad Automatic Weapon as their first small arms priority.

FN Herstal's Minimi light machine gun was officially type classified by the US Army as the M249 on 1 February 1982 following its selection to meet the service's SAW requirement. It both replaced and augmented the M16A1 carried by the automatic rifleman in each army and marine fire team, as well



"Get the General!" as they say in the British Army. The FN MAG-58 is still the pre-eminent light and general purpose machine gun, and there are few tactical situations where it is not welcome. (Photo: Karl Linn USMC)

as the 7.62mm M60 general purpose machine gun in the Platoon. During the Vietnam War the disadvantages of humping the 11.1 kg M60 and its ammunition outweighed the ability of the 7.62mm round to penetrate logs, termite hills and undergrowth.

Taking a gamble, which eventually paid off handsomely, Belgium's FN Herstal developed the 5.56mm Minimi in anticipation that NATO would adopt the 5.56 x 45mm cartridge as its second standard small arms calibre. The Minimi was unveiled in 1974 and was

thus well placed when the US Army issued a Materiel Need Document for a 5.56mm SAW two years later. The standard Minimi weighs 7.1kg unloaded and measures 1.04 m in length. Although usually belt-fed from 200-round plastic boxes the weapon can also be fed from 30-round NATO standard magazines without modification. It has a cyclic rate of fire of 1,000 rpm and an effective range of 1,000m. The US Army describes the effective range of the SAW against point targets as 600m, against area

targets as 800m and in the suppressive role as 1,000m. More than 30 countries have acquired the Minimi and the weapon is made under license by Beretta for the Italian armed forces, by Thales Australia for the Australian and New Zealand defence forces, Sumitomo Heavy Industries for the Japanese Ground Self-Defence Force and Taiwan's Hsing-Hua Arsenal. In the Australian, Belgium and Canadian armies the Minimi replaced the heavy barrel automatic rifle (HBAR) variant of the FN 7.62mm FAL assault rifle.

Since 1996 FN Herstal has produced the Minimi New Standard weapon offering improved reliability and ergonomics. The company also offers variants for users willing to

four-man fire teams within an infantry section is now issued with a Minimi for the primary purpose of providing suppressive fire at ranges out to 600 m. The BAE Systems L86A2 Light Support Weapon now equips the designated marksman in each fire team; the combination of bipod, heavy barrel and optical sight enables the accurate engagement of targets out to 800 m.

Based on the SAW the Minimi Special Purpose Weapon (SPW), classified in US service as the M249E4, features the short barrel and stock of the Para model as well as Mil-Std-1913 'Picatinny' rails mounted on the feed cover and handguard. To further reduce weight the bipod, STANAG magazine port and the tripod-

to a 2001 USSOCOM requirement for a new 7.62mm LMG to replace its worn out M60s. The weapon revives the 7.62mm Minimi which FN Herstal developed in the early 1970s in parallel with the 5.56mm version in case NATO decided not to adopt the smaller cartridge as an official calibre. The Mk 48 weighs 34% less than the US Army's standard FN Herstal M240B 7.62mm medium machine gun and has 70% parts commonality with the M240, M249 and Mk 46. The USSOCOM has ordered 989 Mk 46 LMGs and 703 Mk 48s to date and plans to buy 272 Mk 46s and 256 Mk 48s in Fiscal Years 2008 and 2009.

Under the Rapid Fielding Initiative (RFI) the US Army is continuing



**The Para Minimi, while more compact, is not substantially, if at all, lighter than in conventional configuration.**

sacrifice range in order to save space. The first to appear was the Para Mini which has a 349 mm barrel in place of the standard 465 mm barrel and a sliding buttstock which reduces the weapon's length to 766mm when the butt is retracted and 914mm when extended. Maximum effective range is reduced to 800m. Recognising that most engagements occur in the 50-600 'mid-range battlezone' many recent customers including the British Army and Royal Marines have selected the ParaMinimi for general infantry service. In the UK, each of the two

mounting lug of the Standard and Para models are eliminated. At the request of the US Special Operations Command FN Herstal developed an even lighter model based on the SPW, which is type classified as the Mk 46 Mod 0 LMG. The Mk 46 weighs 27% less than the M249 although it retains 80% parts commonality. It incorporates an improved rail hand guard and uses the standard fixed buttstock which is lighter than SPW's retractable unit.

FN Herstal has recently introduced the 7.62mm Minimi, a variant of the Mk 48 Mod 0 LMG developed in response

to enhance the M249s deployed in the GWOT by issuing short barrels, collapsible buttstocks, 100- and 200-round 'soft pack' magazines and incorporating Picatinny rails mounted on the feed cover and handguard. The US Army Infantry Center interviewed thousands of soldiers about the effectiveness of individual and crew served weapons used in Iraq. The report noted that the age of the M249 SAW has created reliability, durability and maintainability issues although soldiers' ratings of the M249 SAW were "moderately positive and increasing"

as a result of RFI enhancements. In the FY08 defence budget presented to Congress on 7 February the service announced its plans to buy a further 32,000 M249s to add to more than 100,000 already in service or on order. Further enhancements include the introduction of the Magnified Combat Optic sight

The heaviest items of equipment carried by an automatic rifleman in US service are:

- M249 SAW with 200-rounds of ammunition
- spare 5.56mm ammunition (400 rounds)
- combat body armour and helmet
- communications equipment
- water

As part of the Joint Services Small Arms Master Plan the army launched the Lightweight Machine Gun and Ammunition, later renamed the Lightweight Small Arms Technologies (LSAT), programme in 2004. The weight of the M249 and 600 rounds is 17.3kg; the LSAT programme goal is to cut this weight by 38% (35% for the weapon and 40% for ammunition) to 10.7kg. During Phase I of the project two contractors developed virtual prototypes of a weapon and ammunition leading to the selection of AAI in March 2005 to develop a prototype that will be ready for operational testing in late 2007. AAI proposed a solution using polymer cased telescoped 5.56mm ammunition which would weigh 10.3kg (44% saving) and a higher risk solution using caseless telescoped 5.56mm ammunition weighing 8.6kg (52%). In parallel, a Company Machine Gun study is underway to determine the feasibility of a single weapon replacing both the 5.56 mm SAW and the 7.62mm M240. AAI's LSAT team includes: ARES, ATK, Battelle Memorial Institute, Omega Training Group and St Marks Powder. The benefits of the LSAT project are not expected to appear until well into the 'Far Term' (5+ years) timeframe.

Rather than refurbish its M249s the US Marine Corps is seeking a 'Mid Term' (2-5 years) replacement through the Infantry Automatic Rifle (IAR) project. According to the USMC the introduction of the magazine-fed IAR will enhance "the automatic rifleman's manoeuvrability and displacement speed, while providing the ability to suppress or destroy not only area targets, but point targets as well". According to the project manager, a Milestone C low rate initial production decision is scheduled for January-March 2008 leading to an initial operational capability in October-December 2009 and full operational capability in January-March 2010. The USMC plans to order 2,435 IARs over the first three years of the project.

At the National Defense Industries Association small arms symposium in May 2006 Colt Defense unveiled the prototype of its new M16 LMG which is clearly aimed at the IAR project. Unlike earlier proposed M16 support variants, the M16 LMG features a quick change barrel. Fed from standard 20- and 30-round NATO magazines or the Beta 100-round C-Mag the weapon has a rate of fire of 700 rpm. A Mil-Std- 1913 rail is integrated on the flat top upper receiver to accommodate day or night sights with flip up iron sights mounted as a back up. The M16 LMG can be supplied with either an M4 carbine style extending butt stock or a fixed

M16 stock. Selection of the M16 LMG for employment alongside the service's new M16A4 assault rifles would have obvious advantages in terms of training and support.

The M16 LMG faces a serious rival for the IAR requirement in the form of the new Mk 4 version of Singapore Technologies Kinetics Ultimax 100. The company notes that at 4.9 kg the original Ultimax 100 "still holds the record for being the lightest 5.56mm calibre machine gun in the world". The weapon was designed to be used with a unique 100-round drum magazine although it accepts modified NATO magazines. A forward pistol grip is fitted for easy handling and low recoil forces enable the Ultimax 100 to be fired with the buttstock removed. Unlike other machine guns that rely upon the weight of the receiver to absorb recoil force all versions of the Ultimax are based on the 'Constant Recoil' principle which reduces recoil and muzzle rise thus allowing for better control when the weapon is fired in automatic mode. Firing NATO standard SS109 ammunition the Ultimax 100 has an effective range of 1,300 m although customers can specify a barrel rifled for the US M193 round with a drop in maximum range to 460 m. The original Ultimax 100 had a fixed barrel but the current Mk 3 version is available with quick change 508 mm standard and 330 mm short barrels.



The 7.62mm Minimi is substantially lighter than the MAG-58 while retaining all the benefits of the 7.62 mm.



The new Mk4 Ultimax 100 improves on an already successful, though not well known weapon. (Photo: STK)

The Ultimax 100 was evaluated by the USMC alongside the Minimi and other LMGs in the 1980s and rated very highly although the corps endorsed the US Army's choice of the Minimi. Modifications in the new Ultimax 100 Mk 4 include replacing the original two position ('safe' and 'automatic') change lever to allow semi-automatic and automatic fire, mounting a Mil-Std-1913 rail on the top receiver and also at the 3, 6 and 9 o'clock positions on the forward handguard. The weapon accepts standard NATO magazines as well as the Beta C-Mag; L James Sullivan who designed the Ultimax 100 also designed the C-Mag.

#### **BELT-FED RIVALS**

The Israeli Weapon Industries Negev 5.56 mm LMG was designed to meet the requirements of the Israel Defence Force (IDF) for a multipurpose weapon that can be fed from belts and magazines allowing it to be used within infantry sections and also mounted on vehicles and helicopters.

The design was accepted by the IDF in 1997 and 'thousands' have since been produced for the IDF and export customers including Colombia, Costa Rica and Estonia.

The Negev's gas regulator has three positions: the first allows a rate of fire between 850 and 1,050 rpm firing the LMG with a magazine; the second position is for belt-feed at 850-1,050 rpm under normal conditions; and, the third increases the rate of fire to 1,050 rpm for use in extreme environmental conditions. The standard Negev weighs 7.4 kg, measures 1.02 m with the buttstock extended, 780 mm with the stock folded and has a 460 mm barrel. A shorter and lighter variant known as the Negev SF (Special Forces) is also available. Use of a 330 mm barrel reduces the weapon's length to 890 mm with the stock extended and 680 mm with the stock folded. Empty weight is reduced to 6.95 kg. For easy handling a forward handgrip is fitted. The Negev's iron sights are graduated from 300 to 1,000 m on the standard version while the

SF version has a 'flat top' receiver and additional Picatinny rails on the forward handguard. The Negev can be used with NATO standard 30-round magazines, 35-round Galil magazines and 150- and 200-round 'soft assault drums' made of nylon fabric.

The newest belt-fed LMG on the market is the Heckler & Koch (HK) 5.56mm MG43 which was unveiled in September 2001 and subsequently type-classified by the Germany Army as the MG4. The service has begun fielding the weapon to replace the successful 7.62mm MG3 machine gun, a derivative of the Second World War MG42. The first MG4s were deployed with the German International Security Assistance Force contingent in Afghanistan in early 2006 and an order for a further 870 weapons is expected before the end of 2007. The German Army is copying the practise of many other Western armies by deploying two MG4s with each infantry squad.

HK engineers closely studied the design of the Minimi and other



LMGs and discussed with users their experiences with these weapons.

The MG4 is designed to function reliably under adverse conditions using ammunition from various sources without the need to adjust the gas system. The MG4 measures 1.05 m with the butt extended and 810 mm with the butt folded and weighs 7.5 kg without ammunition. The MG4's iron sights are graduated to 1,000 m in 100 m increments and optical and night sights can be fitted on a Mil-Std-1913 rail.

The MG4 can be mounted on the US M2 tripod or similar mounts for use in the sustained fire role. Hot barrels can be changed without the need for a protection glove.

barrel change. The Royal Netherlands Marine Corps uses the C7A1 LSW fitted with the flat top receiver of the C7A1 rifle enabling it to accept a variety of optical sights and the weapon is also in Danish Army service.

Like the other members of HK's G36 family in German service the MG36 has an integral x 3 optical sight while the export version features a x 1.5 sight. The G36 series uses a translucent polymer plastic 30-round magazine; three of these can be fastened together to facilitate quick magazine changes. As with many 5.56mm designs the C-Mag 100 round drum magazine can also be used. The MG36 weighs 3.98 kg with a loaded 30-round magazine and measures 990

integrated into the carrying handle. The weapon has an effective range of 800 m firing SS109 ammunition. The SAR 21 weighs 5.5 kg with a loaded 30-round magazine and measures 805 mm in length.

Since the mid-1990s some units of the Chinese People's Liberation Army have been equipped with the Type 95 5.8 x 42 mm bullpup assault rifle and its LSW derivative. The weapon is fed by a 30-round box or 75-round drum magazine. China North Industries Corporation markets an export version, the Type 97 LSW, which is chambered for M193 or SS109 5.56 mm ammunition. The weapon is fed from either a 30-round box or 80-round drum magazine.



Now in German Army service, the MG-4 lacks the magazine feed option of the 5.56mm Minimi. However the need for this option has not been as pressing as some had supposed and the MG-4 is now a very serious alternative to the Minimi as the leading 5.56mm belt fed LMG. (Photo: H&K)

### THE COMPLETE FAMILY

Although most 7.62mm HBAR designs were not particularly popular nevertheless most 5.56mm assault rifle families, with the notable exception of the French Nexter FAMAS, include an LSW with a heavier barrel and bipod. Colt Canada (previously Diemaco) produces the C7 LSW based on its C7 assault rifle which is an improved version of the M16A2. The C7 LSW features a heavy hammer-forged barrel which eliminates the need for

mm with the butt extended and 760 mm with the butt folded. Members of the G36 family are available with trigger groups permitting semi-automatic, two-round burst and fully automatic fire.

STK's 5.56 mm SAR 21 bullpup assault rifle family developed in the late 1990s for the Singapore Armed Forces includes the magazine-fed SAR 21 LMG fitted with a heavier barrel and bipod. As with other models, the LMG is fitted with a 1.5 x optical sight

There is no sign that the need for light machine guns is abating. Indeed the opposite may be true. However observers of infantry weapons should note that the need for a belt fed weapon at the fire team level is not the given many supposed it to be. Reliable 100-round magazines and individual weapons capable of more sustained fire may well begin to blur the lines between what was a traditional LMG and what was rifle.