# AIMING FOR EXCELLENCE

Inaugurated on 4 October 2013, the Multi-Mission Range Complex is the world's first one-stop marksmanship training hub. Developed by DSTA in partnership with the Army, it was an ambitious undertaking that has redefined the way the SAF trains its soldiers.


TOP:
DSTA designed the Urban Operations Range to enable easy configuration to different training settings and shooting in safe environments.

FACING PAGE:
DSTA co-invented a single-rail moving targetry system to provide an equal line of sight to all shooters at the SAF's first multi-tier range.

The increasingly urbanised battlefield poses new challenges to the soldier – high civilian presence and dense infrastructure build-up provide increased opportunity for the enemy to create chaos quickly and hide away. Effective and efficient training must be conducted to ensure that soldiers hone their abilities to identify and take out hostile targets quickly and precisely, thus setting the stage for the SAF's Multi-Mission Range Complex (MMRC).

**"This complex is indeed a milestone for the Army and I would say it is a strategic platform for the SAF to maintain, if not improve, the competence of our individual soldiers. We learn from the best shooting ranges overseas, and I doubt you will find anywhere in the world, such a large and complex shooting range like this. This is really the front edge of development – it is state-of-the-art. We adapted the latest designs and best practices to our unique context, and the MMRC is a first-of-class in terms of scale and capabilities."**

– Excerpt from speech by Minister for Defence Dr Ng Eng Hen, at the inauguration of the MMRC, October 2013

Conceptualised as a one-stop marksmanship training hub for soldiers to hone and sustain their marksmanship competencies, the three-storey complex houses seven indoor live-firing ranges that facilitate both individual and group training under different operational scenarios. Besides incorporating conventional targetry systems available at conventional outdoor ranges, the MMRC is designed with innovative features and new modules – such as its Video Targetry System (VTS) and the Single-Rail Moving Electronic Targetry System (METS) – to elevate the SAF's training capabilities.

**The resourcefulness and innovation of DSTA's engineers had contributed to the development of the MMRC, which not only met existing marksmanship training requirements, but also enabled soldiers to train under new, challenging and realistic scenarios. Its successful delivery gained DSTA numerous awards and accolades, including the Defence Technology Prize 2013 Team (Engineering) Award, the MINDEF Innovation Project Award 2013 and the PS21 ExCEL (Public Service 21 Excellence through Continuous Enterprise and Learning) Awards 2013 – Certificate of Recognition (Most Innovative Project Category). DSTA's creative sourcing approach for the MMRC's development also won it the MINDEF Savings and Value Enhancement Award in 2013, for enabling the SAF to tap both public and private sector expertise to achieve the best value for money. In 2014, the team attained the IES (Institution of Engineers, Singapore) Prestigious Engineering Achievement Award for leveraging technology that not only realised advanced capabilities for the SAF, but also reaped significant land savings for Singapore.**

The integration of the VTS created an entirely new training capability – judgmental shooting. The VTS allows soldiers to train beyond the basic marksmanship settings provided by traditional baffled ranges, utilising simulation software to generate scenario-based (e.g. a hostage-taking incident) video targets that exercise soldiers' abilities to make swift decisions for accurate shooting. As the VTS can simulate distances of up to 1km, long-distance marksmanship training can be simulated within a mere 50m indoors range. Leveraging precision acoustic technology, the team also installed a Shot Detection System to work in tandem with the VTS – video targets are projected onto rubber screens fitted out with acoustic sensors that can detect, to millimetre accuracy, where the bullets hit.

The MMRC also includes two double-storey multi-tier ranges to train advanced shooting skills. For these ranges, DSTA collaborated with the industry to develop the innovative Single-Rail METS that removes obstructions to a firer's line of sight. If a conventional dual-rail system was used instead, target visibility would be obscured, especially for shooters shooting at higher level targets from the lower tiers. With this single-rail system, targets would appear the same in size to all shooters regardless of position, giving all shooters an equal exposure to take down the targets.

The team also ensured that safety and flexibility were designed upfront into the MMRC – movable partition walls and portable electronic targets can be easily reconfigured to simulate complex, realistic training scenarios; and the partition walls are built from robust steel plates and rubber panels that provide soldiers with ballistic protection and a safe training environment.

With the operationalisation of the MMRC in October 2013, the SAF has reaped significant savings in time, effort and resources required for marksmanship training. Previously, soldiers would need to train for up to three days at the outdoor ranges – waiting for nightfall for night shoots or for inclement weather to pass before continuing. The MMRC can now simulate natural day and night conditions at the flick of a switch, and its indoor ranges can train up to 900 soldiers a day regardless of weather. In delivering this complex, the DSTA team also managed to pack seven firing ranges within the footprint of a single 100m outdoor shooting range, saving land-scarce Singapore an area equivalent to 30 football fields, or 176 Olympic-sized swimming pools.

The first-ever, world-class MMRC has radically transformed marksmanship training for the SAF, and its successful delivery exemplifies how the ingenuity and expertise of Singapore's defence engineers transform challenges into opportunities for innovation.

**LEFT:**
**Soldiers honing their marksmanship skills at the 100m range.**

**RIGHT:**
**Targets can appear to move between various positions in the multi-tier range, which closely emulates urban scenarios in which soldiers need to take down threats behind windows in a building.**