Cubic Range Design Solutions (CRDS) specialises in the design, construction, fit-out, operation and maintenance of advanced training facilities and firing ranges for Military, Police and Special Forces.

CRDS has the experience and skills to manage all stages of project development; starting with training needs analysis, scheme and detailed design of architectural and structural elements and building services, and the selection of training equipment and simulators; construction, installation and commissioning of the specialist fit-out and range systems; end-user training, and the long term maintenance of equipment and specialist systems.

Working directly for governments or through formally approved contractors and consultants, each skill may be offered independently or linked to provide a comprehensive turnkey operation.

With an unrivalled portfolio of firearms training facilities completed all around the world, coupled with our intimate knowledge of construction in Asia, enables us to offer the highest standards of specialist service.

CRDS has previously undertaken consultancy, design and the specialist fit-out of many shooting ranges and Close Quarters Battle (CQB) buildings in the United Kingdom, the Middle East and Southeast Asia.

CQB ranges have been built for, amongst many others, the UK Ministry of Defence and the Hong Kong Police.

CRDS provides a comprehensive and professional service to ensure that you receive a training facility of the very highest quality.

Extensive in-house experience in range design, bullet traps and ballistic protection, simulation technology, targetry equipment, and safety and monitoring systems means that all your requirements can be dealt with by one company.

We strive to provide safe, innovative training facilities that meet all recognised international and local standards.

**COMPANY HISTORY**

The Nitor Group was created in 1982 as a UK-based company comprising multi-disciplined consulting engineers and military experts specialising in the design of shooting ranges and parachute training systems.

Consultancy services included the full study of threat analysis to determine training requirements, schematic and outline proposals, multi-disciplined design work and detailed equipment specifications.

In the mid 1980’s the Nitor Group expanded to undertake the role of Prime Contractor for specialised training facilities involving complex turnkey requirements. One of Nitor’s prime skills was finding bespoke solutions to complex problems.

As a result of an increasing workload in Southeast Asia and the Middle East, subsidiary companies were formed in Singapore and the United Arab Emirates. Since 1989, the Singapore office has undertaken many projects in Southeast Asia for regional Police forces and Military clients.

At the end of the 1990’s the Nitor Group was purchased by Advanced Interactive Systems, Inc.

ORGANISATION
Cubic Range Design Solutions Ltd is a UK-based company providing range design services and small arms training simulators to customers in Europe, Africa and the Middle East.

With an international network of offices in the UK, UAE and Singapore, we are able to maintain a truly global perspective on all range-related matters.

Our aim is to provide the latest technology and services to meet virtually any professional or commercial training requirement on a global basis, and offer customers a clear choice for a one-stop service to meet their training, simulation and security needs.

Europe
Unit 3, Bridge Court
River Lane, Wrecclesham
Surrey GU10 4QE
United Kingdom

Phone +44 (0)1252 725500 • Fax +44 (0)1252 725566

Middle East
Mohammed Bin Zayed City
PO Box 8230
Abu Dhabi, UA8230E
United Arab Emirates

Phone +971 2 5552910 • Fax +971 2 5542002

Asia Pacific
138 Joo Seng Road #04-03
Singapore 368361

Phone +65 6841 8223 • Fax +65 6749 7179

www.cubic.com
**CORE CAPABILITIES**

**INDOOR SHOOTING RANGES**
CRDS has a proven track record as range design consultant and contractor for a variety of indoor shooting ranges, including 100m tactical drive-in ranges for Military and Police units.

Our team of range designers, architects, project managers and engineers work closely with end users to analyse their training needs. This analysis is used to develop the final design and deliver a safe, effective training facility.

Our designs incorporate the most advanced range equipment available in the market today. From bullet traps and bullet protection systems to safety and monitoring equipment, airhandling plant, access control systems, force-tracking, targetry and simulation equipment, we specialise in integrating these technologies to give you a safe range environment that leverages on the latest technological advances to maximise the training experience.

- Bullet traps
- Acoustic materials
- Anti-ricochet floors, walls and ceilings
- Ventilation systems to remove lead-in-air
- Lighting systems to simulate day, dusk and moonlight
- Specialist distraction lighting
- Bulletproof doors and windows
- Video monitoring
- Access control systems
- PA and intercom
- Electronic targetry and video simulation systems

**OUTDOOR SHOOTING RANGES**
CRDS has extensive experience in Range Danger Area (RDA) templating, design, construction and fit-out of all kinds of outdoor ranges, from regular 25m Barrack ranges to 600m gallery ranges, through to large-scale Military Operations in Urban Terrain (MOOUT) and Urban Operations ranges, as well as other specialist outdoor ranges.

Our designs are undertaken in accordance with JSP403. All elements of the design—bullet catchers, ballistic protection, targetry equipment, and the safety and monitoring systems—are considered to ensure safe range operation.

We specialise in integrating the latest technologies into our range designs to give you a safe, effective range environment that maximises the training experience without compromising on safety.

- Conventional gallery and open ranges for pistols and rifles
- Baffled ranges
- Tank ranges
- Bullet catchers
- Electronic targetry
- Automatic marking systems
- Shooter's monitors
- Video monitoring
- PA and communications systems
- Lightning protection
- Perimeter safety systems
- Control and support buildings
CLOSE QUARTERS BATTLE HOUSES

CRDS has been at the forefront of Close Quarters Battle (CQB) house design and fit-out for over 30 years, having delivered a number of the world's most sophisticated live-fire training facilities to various Special Forces.

CRDS has designed and constructed a wide range of CQB facilities, incorporating land, aviation and maritime-based training functions tailor made to meet end users specific needs and to accommodate the latest tactics and weapon systems.

Our CQB's range from simple opentop shoot houses all the way through to fully ventilated tactical assault houses, incorporating the latest safety and monitoring systems, firearms simulators, targetry, force-tracking systems and AAR suites.

- Close Quarters Battle (CQB) houses
- Full-size training mock-ups (aircraft, ships, oil rigs, etc.)
- Mechanical and/or Explosive Method of Entry buildings
- Aviation, maritime and littoral options
- Re-locatable partition systems
- Safety and video monitoring systems
- Bulletproof doors and windows
- Force-tracking systems with full After Action Review capabilities
- Fully ventilated and/or air-conditioned
- Ballistically rated to 5.56mm ammunition
- Tactical assault options (QuickRange)

SPECIALIST TRAINING FACILITIES

CRDS has the capability to design, fabricate, deliver and install bespoke facilities together with simulation and training solutions.

We have designed and constructed a wide range of specialist facilities including full-size vehicle and aircraft mock-ups, urban ranges with house and building façades, driver training areas, Close Quarters Battle houses, Method of Entry buildings, sniper towers, parachute trainers and counter terrorist training camps.

CRDS has the skills and experience to design effective solutions to meet your training requirements.

- Close Quarters Battle (CQB) houses
- Method of Entry buildings
- Maritime counter-terrorist facilities
- Urban ranges and training villages
- Partition ranges
- Live-fire full size mock-ups (aircraft, ships, oil rigs, etc.)
- Sniper and commando towers
- Trainasiums and battle skills fitness training solutions
- Live-fire drive-in ranges and driver training circuits
- Modular live-fire shooting ranges (QuickRange)
CORE CAPABILITIES

AIRCRAFT MOCK-UPS
CRDS has designed, fabricated and delivered a range of bespoke aircraft mock-ups to many customers around the world. Client requirements have varied from part-task trainers to fullscale aircraft with internal ballistic fitout to incorporate live-fire shooting.
Our aircraft mock-ups feature realistic passenger and cargo doors to give assault teams a training environment where they can practice door-opening techniques and entry drills. Anti-ricochet seats and bullet protection systems provide a safe environment for trainees to shoot, whilst preventing rounds from leaving the aircraft.
Custom-made ventilation systems—with HEPA filtration systems—remove lead-in-air from the cabin.
Each project starts with a training needs analysis to establish the requirements for the mock-up. This is followed by a systematic design process leading to the development of a full bespoke solution.
We have delivered mock-ups of Boeing 747, 777 and Airbus A340 aircraft. Other aircraft mock-ups are available.
CRDS offers a full turnkey design and build service that delivers a complete training solution to your site.

- Full-scale or part-task fuselage
- Reclaimed interior or mock-up seating, lockers and interior doors
- Realistic passenger and cargo doors
- Bullet protection systems and anti-ricochet finishes
- Air-conditioning and mechanical ventilation
- Safety and monitoring systems
- Live or laser-fire judgemental training simulators for aircraft security personnel

QUICKRANGE
QuickRange® is a complete full service prefabricated live-fire shooting range that can be delivered to your location ready to use.
QuickRange eliminates the time needed to design and construct a traditional shooting range. It is the ideal solution for military, law enforcement and security agencies that do not have their own purpose-built facilities for live-fire training.
Each QuickRange is a self-contained two-lane shooting range in a bulletproof container, complete with shooting stalls, bullet traps, lighting and HVAC system.
QuickRange is available in lengths from 12 to 50 metres or more, and is customisable for style and convenience. Modules can be linked together to provide a complete range with multiple lanes.
QuickRange is handcrafted to the highest specifications and delivered fully assembled. With its customisable size, you can put it almost anywhere.
Every QuickRange meets OSHA, NIOSH and EPA regulations for safety, noise reduction and air-quality, through the use of anechoic foam and HVAC systems fitted with HEPA filters.
QuickRange can be supplied with a two-lane target retrieval system. The motor for the retrieval system is controlled from the shooting stall, allowing each shooter to set the target distance independently. The entire system is designed and fabricated to ensure durable and continuous operation.
QuickRange can also be fitted with the PRISim Suite® live-fire judgement training simulator. PRISim Suite gives trainees feedback to learn and confirm correct behaviours and to grow more confident in their ability to make decisions under extreme pressure.
Recoil Kits
We can supply recoil kits to convert the most popular handguns and rifles into simulator weapons using CO2 gas to create recoil. We also offer a bespoke service to convert existing small arms weapons into simulator weapons.

ShootBack
Cover and concealment techniques can be learnt and practised with the patented ShootBack® system. The ShootBack cannon fires polyurethane projectiles at the trainee. The firing of the cannon can be synchronised with the hostile actions of the video actors on the screen.

Less Lethal Devices
We offer a range of less than lethal devices including TASER, chemical spray agents and PepperBall to enable trainees to fully interact with the training scenario. The laser-modified TASER X26 comes with two heads, a functioning light and LCD display, and a visible aiming laser. The laser-equipped OC spray canister are coded so that when the trainee uses the spray, the simulator responds by showing the correct branching outcome. A range of flashlights are also available for low light training.

Language Support
We can tailor PRISim Suite to run in your own language. We can also provide pre-recorded video scenarios dubbed into other languages.
PROFESSIONAL SERVICES
The design of each range or training complex begins with a training needs analysis to understand the client’s training requirements. This leads to the development of schematic and outline proposals.
Once the initial design is approved, we develop full and detailed construction drawings and provide equipment specifications to match training needs.
With a detailed design complete, the project can move to the tendering phase.
Our project management team can generate tender documentation, provide contract supervision and assist with the assessment of potential suppliers and contractors.

Construction & Fit-out
Our team of professional project managers and subject matter experts bring a wealth of experience and knowledge to manage the construction and fit-out of each range or training complex.
Having completed a large number of ranges in many countries around the globe, we have the experience to manage projects of all sizes; from range refurbishments and upgrading to the construction of major Police and Military training camps.
Our project managers can supervise construction of the building infrastructure works and coordinate the installation of lighting, electrical, ventilation and bullet protection systems.

SPECIALIST FIT-OUT
CRDS puts range safety above all other considerations when it comes to the design and fit-out of our shooting ranges. We follow international standards, including the UK MoD JSP 403 guidelines, for the design and construction of our ballistic protection systems.
Selecting the right kind of bullet trap is dependent on the type of range involved, the ammunition to be fired and the anticipated range usage.
CRDS has the experience and knowledge to be able to match the right bullet trap to your training requirements and still meet your budget.
The careful selection of ballistic materials, combined with extensive testing using the same or similar rounds under controlled conditions, ensures that the risk of backsplash and ricochets is minimised.
All of our protection systems undergo thorough testing to ensure they are safe for use.
For indoor shooting ranges, the management of lead-in-air is crucial to the health and safety of all range users—especially firearms instructors—as well as protecting the environment. Our subject matter experts can provide complete M&E designs to ensure that a constant flow of air through the live firing areas reduces the chances of lead dust building up on the range floor.
Using HEPA filters within extract plant means 99.95% of all contaminants are trapped in the system and not released to the atmosphere.
Noise pollution is another area that can have a great impact on range users. We combine acoustic materials with innovative design to prevent the transmission of high-impact noise from the live firing areas to control rooms and other non-live firing areas within the range building. Safety and monitoring systems remain key components of any shooting range or live firing facility. CRDS can integrate access control systems with bulletproof doors, to manage and control access to the live firing areas. In the event of an emergency, integrated e-stop mechanisms release the magnetically locked doors, enabling all personnel to quickly evacuate the range.

Using an internal and external video monitoring system provides an extra layer of safety. Range staff can monitor training activities inside the range, and still be notified of any perimeter security breaches outside the range. CRDS can supply non bullet-proof and bullet-proof partition systems to enable CQB-like tactical training within large indoor ranges. These partition systems can be used to form rooms of varying sizes, with reusable doors and windows to allow trainees to practice tactics and room-entry drills.

RANGE MAINTENANCE
CRDS provides comprehensive range maintenance services for all types of ranges. From small 25-metre ranges to large urban training areas, we have the expertise to operate, deploy and maintain all types of range systems. Regular preventative maintenance ensures that equipment runs smoothly and range utilisation is maximised. Our team of specialist technicians provide technical support, which means a faster response time and less range downtime.

HVAC Systems
The importance of maintaining a good, clean supply of fresh air in indoor ranges cannot be understated. Airhandling systems are specially designed to manage this critical component, and ensure that lead-in-air levels are not allowed to exceed prescribed limits. With our extensive experience and knowledge CRDS knows how to properly maintain these critical systems with regular maintenance, replacing filters, and testing to make sure that systems perform as designed to give you a safe working environment for training.

Electronic Targetry Systems
CRDS has extensive experience in supporting and maintaining all kinds of electronic targetry. We have worked with most of the major targetry system suppliers. We can supply spare parts and perform repairs on most types of targetry systems for infantry, armour and aircraft training ranges. We can also offer upgrades to legacy targetry equipment to keep these systems operational, even after the OEM has stopped providing support.
CRDS was appointed as the specialist range designer and specialist fit-out contractor for a live-fire indoor tactical shooting range for a Special Forces unit in Southeast Asia. The building was completed in 2010. The design included elevated and depressed firing, drive-in capability, 180-degree engagement, specialist mock-ups and re-locatable partition system to create bespoke training scenarios. The tactical range features the latest in electronic targetry and eight live-fire PRISim Suite® training simulators for marksmanship and judgemental firearms training. Force-tracking technology combined with the video monitoring system allows soldier movements to be tracked in real-time. These can be later reviewed in the dedicated After Action Review suite. The tactical range features both sound and lighting distraction systems to immerse trainees into the battlefield scenario.

CRDS completed the architectural, structural and M&E designs. CRDS also completed the specialist range design, including the ballistic design, specialist range ventilation system and range safety system. CRDS supervised the construction works and then carried out the ballistic fit-out and commissioning of the entire facility. We are currently operating and maintaining the tactical range.

- Project value: USD 15 million
- Project duration: 24 months
CRDS was the appointed specialist contractor for the initial design, fit-out and subsequent upgrading of a Close Quarters Battle (CQB) building for a Special Forces unit in Southeast Asia.

The original building was completed in 1992, with work on a second phase of additions and alterations commencing in 1999. This multi-storey CQB building was commissioned in 2000.

The customer required a modern CQB facility to provide indoor training using live-fire weapons. The customer wanted flexibility to deploy portable target mechanisms in corridors and rooms without compromising on safety.

The scope of work for this project included:
- design of all architectural, structural and civil works
- provision of air-conditioning and building services
- bullet protection systems and anti-ricochet finishes
- public address and video monitoring systems
- safety and access control systems
- electronic targetry equipment
- live-fire aircraft mock-up

Two live-fire PRISim® judgemental training simulators, a shipside mock-up with diving pool, and a ship’s bridge were added to the CQB building during the second phase upgrading works. The judgemental trainers were linked to form a duelling system for realtime training in hostage rescue techniques and hostage negotiation. A package of locally-filmed video scenarios was developed to enhance the training value of the simulators.

CRDS continues to provide regular de-leading and range cleaning services for the CQB building.

- Project value: USD 6 million
- Project duration: two phases, each 24 months
SPECIAL FORCES FACILITY

CRDS provided the specialist design and fit-out of a
3-storey CQB building and several small arms outdoor
ranges for a military commando unit in Southeast Asia.
The customer required a modern CQB facility to provide
all-weather training to its military officers using live and
non-live-fire weapons. The design of the facility needed
to accommodate firearms training at all levels, from basic
marksmanship training to advanced level tactical training
and firing at very close quarters. Two state-of-the-art
judgemental training systems were required to enhance
officers’ competency in judgement skills and to practice
rules of engagement.

CRDS were the appointed specialist contractor for the
design and fit-out of the CQB building and the outdoor
ranges. The project was completed and commissioned in
December 2004. CRDS supplied all of the specialist range
systems including:
- air-conditioning and mechanical ventilation equipment,
  small power systems and lighting within the CQB
  building
- bullet protection systems and anti-ricochet finishes
- targetry equipment for the CQB building and the
  outdoor ranges
- two PRISim® judgemental training systems

The camp now provides a modern and state-of-the-art
training complex complete with both indoor and outdoor
small arms shooting ranges, and a CQB facility with
a basement floor area for conducting VIP and Close
Protection training.

Training Facilities
- 3-storey CQB building for practising Small Team and
  Multiple Team Assaults, Method of Entry techniques
  using dedicated MOE modules, VIP and Close
  Protection training, hostage rescue and hostage
  negotiation, and tactical training in large partition rooms
- 25-metre indoor range for pistols and sub-machine guns
- Two 6-lane 25-metre outdoor ranges
- 600-metre outdoor gallery range, configured as 12-lanes
  at the 300-metre firing point and 6-lanes at the
  600-metre firing position
- A live-fire single-screen PRISim judgemental training
  system
- A laser-fire single-screen PRISim judgemental training
  system with ShootBack and simulator pistol and MP5
  weapons
- PRISim duelling system links the two simulator rooms
  for real-time training in hostage rescue techniques

- Project value: USD 7 million
- Project duration: 18 months
CRDS was the lead joint-venture partner in the design and construction of an indoor shooting range complex in Southeast Asia. The project was completed and commissioned in 1999.

The customer required a modern, integrated facility to provide all-weather training for elite officers using weapons with live rounds, from pistols and rifles to general purpose machine guns. The design of the facility needed to accommodate firearms training at many levels, with officers undergoing basic law enforcement training and then progressing to advanced level tactical training and firing at very close quarters. Following a training needs analysis, CRDS designed two indoor shooting ranges and a multi-storey Close Quarters Battle building.

The customer recognised the benefits of using simulation technology to create a more flexible environment for marksmanship training within the confines of the larger of the two indoor ranges. With this in mind, a live-fire simulation system capable of displaying targets at up to 300-metres was added to the requirement.

CRDS and its project partner were awarded a full turnkey design and build contract incorporating all building and specialist works.

CRDS specifically provided:
- air-conditioning and building services
- bullet protection systems and anti-ricochet finishes
- computerised targetry equipment
- public address and communication systems
- safety and monitoring systems
- computer simulation and projection systems

In 2013 CRDS continues to provide de-leading and range cleaning of the indoor ranges and CQB building, as well as maintenance and support for the targetry equipment, safety and monitoring systems, and the live-fire simulation systems.

**Indoor Shooting Range Features**

- 25-metre indoor range for pistols and sub-machine guns, with a specialised lighting system for night shooting
- 100-metre indoor range for rifles and GPMG, with a multi-lane PRISim® system capable of simulating virtual targets at distances up to 300 metres.
- 3-storey CQB building for practising Small Team Assaults, Method of Entry techniques, hostage rescue and hostage negotiation
- Live-fire three-screen PRISim judgemental training system and a live-fire single-screen PRISim judgemental training system
- PRISim duelling system links the two simulator rooms for real-time training in hostage rescue techniques and hostage negotiation

- Project value: USD 11.5 million
- Project duration: 24 months
CRDS developed a comprehensive master plan design for what would become the King Abdullah II Special Operations Training Centre in Jordan. CRDS carried out a detailed needs analysis to determine the training requirements for this multi-role training facility.

The three centres would provide training in:
- Urban Operations and Close Quarters Battle
- Maritime counter terrorism
- Marksmanship and live-fire tactical training.

The design also provided individual components to support training for counter terrorism, internal security, peacekeeping operations, joint operations and NBC warfare. The master plan covered all aspects of counter-terrorist training, including a large live-fire urban village, multiple outdoor ranges, CQB houses, an explosive Method of Entry building, grenade ranges, aircraft and train mock-ups, a driver-training track, sniper training facility, and a maritime ship’s side mock-up.

- Project value: estimated USD 100 million
- Project duration: 24 months
Following a worldwide pre-selection process, CRDS was awarded a fixed price turnkey contract to design and build a state-of-the-art training complex. A key requirement was the ability to train and shoot in confined spaces using 5.56mm NATO ammunition. The client provided a bare desert site with no road access, water, power or telephone, and gave CRDS just twenty months to complete the project. CRDS conducted a full threat analysis, and then developed a unique tailored design including whole site modelling and models of individual facilities. Many of the requirements had never been achieved anywhere in the world at the time, necessitating unique designs with rigorous testing. The highly sensitive nature of the project required total secrecy, even from other armed forces within the country. CRDS constructed a multi-range complex with building façades, aircraft and vehicle mock-ups, a multi-purpose simulation range equipped with live-fire duelling, CQB rooms and a single-storey commando training structure. CRDS also developed, tested and built the world’s first re-configurable CQB room units, designed to capture 5.56mm ball ammunition. The modular design of these CQB room units allowed them to be lifted with a crane and stacked up to three storeys high. CRDS completed the project on time and within the budget.

- Project value: USD 20 million
- Project duration: 20 months
SPECIAL FORCES FACILITY GULF

After a worldwide pre-selection process by the Ministry of Interior, CRDS was pre-qualified as the specialist range contractor for a prestigious training centre to be built in Kuwait.

In November 2006, CRDS was awarded a USD 11 million contract to supply materials and equipment for the specialist fit-out of multiple ranges, several CQB houses and an urban training facility.

The training centre features:
- multiple outdoor ranges
- an indoor range complex
- CQB houses
- an urban training facility with building façades
- live and laser-fire simulation systems
- bulletproof partition systems
- electronic targetry systems
- video monitoring and safety systems
- an aircraft mock-up
- range management systems.

The project was completed in 2011.

- Project value: USD 300 million
747 AIRCRAFT Mock-Up

As part of a large scale Special Forces training facility for a Ministry of Interior in the Middle East, CRDS was awarded a project to design, fabricate and deliver a fullscale, live-fire Boeing 747 twin-deck aircraft mock-up.

The 747 aircraft mock-up was installed on a hydraulic jacking system within an airconditioned indoor battle hall. The aircraft mock-up is ballistically rated to 9mm Ball ammunition and incorporates the following features:

- full scale twin-deck fuselage
- realistic door access
- anti-ricochet interior to include cockpit, first, business and economy class seating, lockers, service areas and toilets
- bullet protection systems and anti-ricochet finishes
- air-conditioning and mechanical ventilation
- safety and monitoring systems
- electronic targetry systems.

The project was completed in 2005.

- Project value: USD 5 million
HOME TEAM ACADEMY

The Singapore Police Force embarked on the construction of a new law enforcement training village to replace their existing Police Academy, which was built in the 1950s. The new Home Team Academy has all modern training facilities and amenities and features a comprehensive range complex complete with indoor shooting ranges, electronic targetry and judgemental simulation systems.

The customer required a modern indoor shooting range complex that could provide training to law enforcement officers using a variety of small arms, ranging from .38 revolvers and 9mm pistols up to 5.56mm rifles. A key requirement was to provide computerised targetry systems to train officers in basic and advanced weapons handling, marksmanship and judgemental skills.

CRDS, working in partnership with Intraco—a local main contractor—was appointed the specialist fit-out contractor for the indoor range complex. Work commenced in 2005, with project completion in the second quarter of 2006. CRDS provided the bullet protection systems and anti-ricochet finishes, bullet traps for all the indoor ranges and various types of targetry equipment.

In 2013 CRDS continues to provide de-leading and range cleaning of all indoor ranges, as well as maintenance and support for the electronic targetry, safety, monitoring and simulation systems.

Range Complex Features

- 100-metre walk down range
- 100-metre range that can be configured as a 25-metre indoor range
- Three 25-metre ranges, each with 12 lanes of retrievable targets
- Two live-fire PRISim judgemental training simulators
- A laser-fire PRISim simulation room with ShootBack

- Project value: USD 6 million
- Project duration: 15 months
Recognising the new opportunities provided by the British Government’s Private Finance Initiative, CRDS initially advised the Metropolitan Police Authority and later the operating contractor regarding the design, construction, finance and operation of the Metropolitan Police Specialist Training Centre (MPSTC) in Gravesend. The MPSTC was opened in 2003 to provide London’s officers with firearms and public order training, which would help to maintain the Metropolitan Police Service’s worldwide reputation as a leading law enforcement agency. CRDS provided all specialist firearms-related design, fit-out of the live-fire ranges with internal ballistic and anti-ricochet finishes, simulation and targetry equipment, and range sound systems.

In 2010, CRDS was awarded a further contract to upgrade the specialist indoor shooting ranges and simulation systems.

The upgraded training simulators feature:
- High-definition projection systems providing widescreen images
- Additional support for standard issue firearms and less lethal devices (TASER and OC spray)
- Export of scenario performance and debrief forms in a self-contained file for viewing on a remote PC
- Laser-based 3D virtual environments simulating indoor and outdoor ranges
- Course editor for creating bespoke training exercises.

- Search houses
- A widescreen PRISim® simulator for live-fire judgmental training
- A single-screen laser-fire PRISim simulator with converted MP5 and Glock 17 firearms
- Classrooms with extensive IT equipment
- Accommodation for over 300 officers, and leisure facilities.

Project value: USD 100 million (PPP/PFI/lease back)
Project duration: 24 months

Training Centre Features
- Specialist indoor and outdoor live-fire shooting ranges
- An assault house for practise Method of Entry (MOE) techniques
- An urban range with simulated road configurations and house façades
- An outdoor public order training facility with road patterns and house façades
- Train, subway and aircraft mock-ups
In 2007 a Middle East Police Force appointed CRDS as a specialist consultant to undertake a review of their firearms training requirements. The study, in conjunction with a survey of their existing shooting ranges, was then developed into a costed plan of recommendations for upgrading the shooting ranges to comply with international standards in range design and safety.

In the first of two phases, CRDS conducted a series of interviews with end-users to determine the types of training required. CRDS also carried out site surveys of four existing outdoor ranges, to determine if the current facilities met the training requirements. At the end of this phase, CRDS produced a detailed report on the conditions of the four shooting ranges.

During the second phase, CRDS analysed the data taken from the interviews and surveys and used it to write a report containing a list of recommendations for upgrading the existing shooting ranges. The report re-stated the client’s training objectives and design requirements, and concluded with a detailed road map for the development of future facilities to meet the end-users training needs.

- Project value: Confidential
- Project duration: two phases
In 2008 CRDS was appointed as the specialist consultant to develop a police training centre for a Middle East police force. The training centre would focus on the application of scenario-based training for more than 20 end-user groups, drawn from a 30,000 strong police force. CRDS undertook interviews with all end-user groups, using the data it collected to form a comprehensive picture of the police force's current training needs. CRDS produced a training needs review report, which described existing training practices, current levels of throughput, and the relationships between end-users. The training needs review concluded with a client brief, outlining requirements for a new training centre. This led to the development of a site master plan. The site master plan called for an area of approximately 2-million square metres, consisting of fifteen zones, with facilities in each zone targeted towards the needs of a specific group of end-users. The site layout was arranged to maximise the number of zones where training could take place concurrently, and give end-users the opportunity to share training areas for the conduct of joint training exercises. A key feature of the training centre is a 300 x 300-metre urban area mock-up. The urban area mock-up is divided into smaller zones, allowing up to nine concurrent training exercises to run simultaneously. When the project is completed, the training centre will have full administration facilities and provide high-quality accommodation for up to 400 personnel.
The Cleveland Police Authority and Durham Police Authority decided to combine their budgetary resources to build a state-of-the-art training facility in the north east of England. The Tactical Training Centre opened in April 2000.

The centrepiece of the Police Tactical Training Centre is a 100-metre indoor drive-in range designed for live firing. This indoor range features electronic targetry systems and an 8-lane live-fire marksmanship training simulator.

CRDS supplied a separate laser-fire PRISim® simulator with integrated ShootBack® cannon for judgement and use-of-force training. For close protection training, interactive video situations can be projected on to multiple screens, allowing officers to practise their shoot/no shoot skills.

CRDS provided all specialist firearms-related design, fit-out of the live-fire ranges with ballistic and anti-ricochet finishes, and all simulation training, targetry equipment and range sound systems.

In 2010 CRDS upgraded the existing marksmanship training simulator to a 16-metre widescreen simulation system. The new simulator projects high-definition targets on to the screen for classification shooting. This comprehensive upgrade of the facilities included:

- Advanced shot detection system for the live-fire simulators
- Wireless control and monitoring systems
- Additional judgement training capabilities
- Use of less-lethal devices such as OC spray and TASER
- Tetherless laser recoil weapon conversions
- Lighting and CCTV system upgrades.

Project value: USD 14.5 million
Project duration: 12 months
In April 2007 Mayor Bloomberg announced that the New York Police Department’s training academy, shooting range and driver training facility would be consolidated and moved to a new campus to be built in College Point, Queens. The new Police Academy will replace the existing Manhattan facility—opened in 1964—as the current site was inadequate for the quality of training and number of personnel required for future development of firearms training, driver training, and simulated training environments.

The new facilities will support an ideal curriculum, with increased emphasis on:

- scenario based training
- tactical training
- computer based training
- COBRA training.

The NYPD has training needs for up to 54,000 officers and civilians.

The New York City Office of Management and Budget (OMB) was mandated to provide a Value Engineering review of the new Police Academy. In support of this requirement, CRDS were appointed as the specialist range consultant for the Value Engineering team, led by US Cost, with experts drawn from all relevant disciplines.

As the specialist range consultant, CRDS leveraged on more than 20-years of experience in the design-and-build of shooting ranges, and on its familiarity with large urban ranges, to undertake a series of Value Engineering studies in order to identify potential improvements and cost savings in the original architectural design and layout. The choice of range configurations, range finishes and training aids was also scrutinised.

The new Police Academy will provide the NYPD with additional benefits through the consolidation of multiple training facilities into a dedicated training centre.

- Project value: USD 1 billion
CRDS and our associate companies and partners maintain a high level of security and a strict policy of confidentiality for all clients. In the lists below and on the following pages, we do not reveal the names of our clients nor contract values without authorisation.

<table>
<thead>
<tr>
<th>Region / Country</th>
<th>Description</th>
<th>Ref.</th>
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</thead>
<tbody>
<tr>
<td>Southeast Asia</td>
<td>Lead Consultant for the design, construction and fit-out of a live-fire Military Operations in Urban Terrain (MOUT) outdoor range.</td>
<td>5500</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Supplied two 8-lane laser-fire simulation systems with recoil kits to a maritime Armed Forces.</td>
<td>5530</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Supplied four 8-lane laser-fire simulation systems with dry-fire weapon conversions and recoil kits to the Ministry of Public Security.</td>
<td>5710</td>
</tr>
<tr>
<td>Middle East</td>
<td>VIP training centre, consisting of a CQB house, driver training track, target facades, parade square, administration buildings, a 50-metre live-fire range, PRISim and Sky Marshal simulation systems.</td>
<td>448</td>
</tr>
<tr>
<td>Middle East</td>
<td>Detailed design of a Counter Terrorist Training Complex featuring live-fire urban built-up areas, CQB houses, indoor and outdoor ranges, live-fire aircraft mock-ups, driver training circuit, simulation systems, targetry and control systems.</td>
<td>436</td>
</tr>
<tr>
<td>Middle East</td>
<td>Supplied live and laser-fire simulation systems to an International Sports Club.</td>
<td>2483</td>
</tr>
<tr>
<td>Middle East</td>
<td>Supplied three 25-metre QuickRange modular shooting ranges, equipped with live-fire simulation systems to a Police Force.</td>
<td>1278</td>
</tr>
<tr>
<td>Middle East</td>
<td>Specialist fit-out of eight basement ranges with electronic targetry and live-fire simulation systems.</td>
<td>1253</td>
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<tr>
<td>Region / Country</td>
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<tr>
<td>USA</td>
<td>Provided support to a major Architectural and Engineering (A&amp;E) consultancy to deliver a Masterplan for a large multi-range Counter Terrorism and MOUT facility.</td>
<td>1180</td>
</tr>
<tr>
<td>Europe</td>
<td>Supplied a dual-screen live and laser-fire simulation system to a Government agency.</td>
<td>2296</td>
</tr>
<tr>
<td>Middle East</td>
<td>Design and supply of an aircraft mock-up, and the design of several indoor, outdoor and tactical shooting ranges, an urban training village and supply of simulation systems for a Special Forces unit.</td>
<td>1117</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Design, supervision and specialist fit-out of the first phase of a 100-metre indoor range. The range features eight live-fire simulation systems, portable electronic target systems, a force-tracking system, specialist lighting, partitions and AAR facilities.</td>
<td>5185</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Specialist fit-out of a multi-storey range complex within a law enforcement academy. The range complex featured two 100-metre indoor ranges, and three 25-metre indoor ranges with overhead retrievable targets. Supplied ballistic protection systems and bullet traps.</td>
<td>5128</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Supplied two live-fire simulation systems and one laser-fire simulation system to a Police Force.</td>
<td>5134</td>
</tr>
<tr>
<td>Middle East</td>
<td>Master plan and detailed design for a state-of-the-art tactical training centre. The design incorporated traditional firing ranges, live-fire and manoeuvre areas, vehicle and aircraft mock-ups, an urban assault complex, CQB house, a shipside facility, demolition ranges and a sniper range.</td>
<td>2174</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Design and fit-out of a CQB training complex, two pistol ranges and a 600-metre gallery range. The CQB training complex featured an indoor 25-metre range with electronic targety, a live-fire simulation range and laser-fire simulation room.</td>
<td>719</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Supply and installation of electronic targetry for an outdoor 25-metre (IPTS) range and a 300-metre rifle range.</td>
<td>994</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Supply and installation of 24 laser-fire simulation systems with over 200 weapon conversions to the Armed Forces of a Southeast Asian country.</td>
<td>155</td>
</tr>
<tr>
<td>UK</td>
<td>Design and fit-out of a £40 million Firearms and Public Order training complex for the Metropolitan Police. The training complex includes two urban ranges, aircraft, subway and train mock-ups, CQB ranges, a 50-metre drive-in range, a 600-metre outdoor range, mobile sniper tower, assault and search buildings, and two interactive video ranges.</td>
<td>316</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Turnkey design and build of an £8 million indoor shooting range complex. The range complex featured multimedia weapons trainers and a CQB house.</td>
<td>997</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Design, supervision and fit-out of a three-storey CQB complex with enclosed ship side mock-up, diving pool, oil rig mock-up, ship's bridge, re-configurable partition system and two live-fire simulation systems with duelling. Supplied specialist ballistic protection systems, bullet traps, electronic targety and audio-visual equipment.</td>
<td>663</td>
</tr>
<tr>
<td>Region / Country</td>
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<tr>
<td>UK</td>
<td>Narrow body aircraft mock-up approximately 40 metres in length inclusive of wing studs, fully functioning doors and cockpit.</td>
<td>316</td>
</tr>
<tr>
<td>Middle East</td>
<td>Turn-key contract for the design, construction, installation and supervision of a multi-range complex inclusive of external attack mock-up buildings, and aircraft, bus and car mock-ups. The A310 Airbus aircraft mock-up includes anti-ricochet finishes, crew stations, anti-ricochet seats, functioning doors and hatches, opening lockers and simulated lighting.</td>
<td>061</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Two-storey CQB house for external and internal attack including an elevated Airbus A320 aircraft mock-up and other specialist facilities. The aircraft mock-up includes bullet proof steel linings, anti-ricochet finishes, cockpit, crew stations, anti-ricochet seats, functioning doors and hatches, ventilation systems and a distraction sound system.</td>
<td>237</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Design of a range complex for a Southeast Asian Armed Force on a coastal site. The range complex features land and sea assault facilities including a live-fire urban range, several CQB houses, and aircraft, ship and oil-rig mock-ups. The B747 aircraft mock-up was designed for live-fire attack.</td>
<td>186</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Design and construction of a Close Quarters Battle facility for internal and external attack, including a large hall, helicopter mock-up and live-fire dueling facility. The facility features a wide-body mock-up of a 747/Tristar/Airbus with movable seat configurations.</td>
<td>280</td>
</tr>
<tr>
<td>Middle East</td>
<td>Design and construction of a wide-body Boeing 777/Airbus A340 aircraft mockup for a Ministry of Interior training facility. The aircraft mock-up has a variety of aircraft door mock-ups for practising assault techniques.</td>
<td>1117</td>
</tr>
<tr>
<td>North America</td>
<td>Mock-up Boeing aircraft interior complete with two-way interactive judgement training simulator for training Air Marshals. The mock-up realistically simulates the central section of the aircraft.</td>
<td>NA</td>
</tr>
<tr>
<td>Middle East</td>
<td>Live-fire Boeing 747 aircraft mock-up within a CQB range complex. The aircraft mock-up includes real 747 doors, bullet proof steel linings, anti-ricochet finishes, crew stations, anti-ricochet seats, functioning doors, simulated lighting, distraction system, public address, video monitoring system and electronic targets.</td>
<td>310</td>
</tr>
</tbody>
</table>
QHS CERTIFICATION


Our Quality, Health and Safety (QHS) system has evolved from the established practices of the CRDS group of companies. All policies and procedures are open to independent audit inspection if required.

CRDS maintains a consistently high quality of service, with a management representative ensuring that every project is conducted in accordance with our QHS policies.

Project activities are independently monitored and audited. Any deviations from our standards and controls that are likely to affect the final quality will be highlighted to the project manager responsible.