

# MILITARY ENGINEERING

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**M**ilitary engineering provides the knowledge base and engineering principles to deploy and sustain an effective warfighting force.

According to Encyclopedia Britannica, military engineering is defined as the art and practice of designing and building military works and of building and maintaining lines of military transport and communications. Military engineering is the oldest of the engineering skills and was the precursor of the profession of civil engineering.

The term Military Engineering covers all aspects of engineering works that support military operations. It encompasses a wide range of disciplines from traditional civil, electrical and mechanical engineering to more recent disciplines such as computer and software engineering. The Malaysian Armed Forces (MAF) has three branches namely the Army, Navy and Air Force. All three branches have their own divisions which require engineers from numerous disciplines.

The Army, Navy and Air Force engineers each have their own way of performing their roles and tasks. Military engineers in the three services are performing jobs in support of the different operations. However, all three services have personnel of similar disciplines in engineering.

The primary role of engineers in military services, is to ensure that the Armed Forces can maintain their effectiveness in terms of firepower, mobility and survivability on land.

The technical branches of the Navy and Air Force are responsible for the operations and maintenance of aircraft, ships and submarines. They do have engineers in the construction disciplines for the purpose of planning and maintenance of bases and installations.



## CONTRIBUTION TO THE ENGINEERING FRATERNITY

In Malaysia, Military Engineering is relatively very low profile in comparison with the United States where unclassified innovations by military engineers are publicised. Nevertheless, Military Engineering in Malaysia has contributed much to the engineering fraternity not so much in terms of inventions but in the training of engineers to further their career paths.

According to First Admiral Ir Hj Ahmad Murad bin Hj Omar, Director General of Engineering at Navy Headquarters, Ministry of Defence, engineers in the Navy are a specialised group of people focused on ensuring that the operational availability and mission capability of naval assets were always at its highest state, ready to meet national defence needs.

He added Military Engineers had a higher burden when discharging their duties in protecting the national maritime interests in peacetime and in war as well as providing a secure environment for the country's economy to prosper. "Therefore, the systems belonging to the assets that are deployed must be at its optimum level at all times. The systems include propulsion, power generating sets, water making plants, air-conditioning, missile launchers, sonar and fire control systems just to name a few," he said.

On the issue of Military Engineers contributing to the engineering fraternity, Ahmad Murad said military engineers were a pool or a place where young engineers could get trained.

He said qualified engineers who join the military (in this instance, the Navy), is required to go through the navy training curriculum by taking



the Application Course at the Kolej Tentera Laut Di Raja in Lumut. Upon completion, they are immediately assigned engineering positions within the military core. "The Application Course is to rehabilitate the engineers to military life as they are either civilians or fresh from university," Ahmad Murad said.

He said after the Application Course, they are ready to be posted out to ships, maintenance depots and bases. There, they use their engineering knowledge and academic training that they obtain from their respective universities plus the training they receive in the navy to do their function as engineers.

"Some choose to be maintenance engineers whilst others do design and planning in our Headquarters; they are very much what an engineer does in Tenaga Nasional or Petronas," he added.

He said young engineers had an advantage in that they could gather experience that could prove valuable in their



career paths whether in the navy or outside in civil life. "The young engineers not only gain experience in maintenance but also in planning and management," he said. Ahmad Murad said the Navy is giving young engineers the opportunity to further their studies up to doctorate level adding that the Navy had already sent navy officers up to PhD programmes and has two qualified PhD holders.

"Besides furthering academic excellence, we also provide specialised training where we send engineers to overseas equipment manufacturers' premises where they are exposed to in-depth knowledge and skill development," he said adding that in civilian life, major private and multinational companies did the same.

Providing several examples, he said that with regards to a combat system developed by STN Atlas GmbH, a German manufacturer of combat systems, the Navy sent two of its engineers to Germany for a period of two years to study and develop the system side by side with the manufacturers.

He said currently, the Navy has sent several engineers to Marseille, France to oversee that the specifications of the Fenec Eurocopter is met. Malaysia had just purchased six units of the helicopter.

"We provide such opportunities for engineers to work in an overseas environment," he added stating that such training was not only valuable for the engineer in his or her career path but also for the country's development through the transfer of technology.

"Should they choose to leave the military, they will be an asset to the country and will be highly demanded by defence related companies such as Sapura, AIROD Sdn Bhd and PSC Naval Dockyard Sdn Bhd," he said.

Ahmad Murad also said for fresh school leavers, Akademi Tentera Malaysia (ATMA) in Sg Besi in collaboration with Universiti Teknologi Malaysia (UTM) offers a prospective student a degree in engineering.

"It is just like a university course except here, they wear uniforms but will not be commissioned until they complete their courses," he said. Upon graduation, they will be commissioned and absorbed into the various services and for naval engineers, they will progress through the Application Course and later absorbed into the mainstream engineering.

According to Lt Kol Ir Chapiti bin Hj Redzwan, PEng, Komandan Institut Kejuruteraan Medan Tentera Darat, Kam Mahkota, Kluang, military engineers have contributed a lot to the engineering fraternity and many are members of the Institution of Engineers, Malaysia (IEM) and are registered with the Board of Engineers Malaysia (BEM) as graduates and professionals.

"A number of us are members of IEM sub-committees and principal interviewers for BEM. Some of those who have left the service went into private practice as consulting engineers and contractors. One particular ex-service consultant had held a seminar on blast resistant structures in 2003. Others work in corporations and the public sector," he said.



On the issue of careers in engineering, Chapiti said that in the military an engineer must acquire knowledge of other disciplines necessary for performance of a job. The term 'Jack of All Trades' is appropriate for military engineers. The scope of engineering works is so wide that one must continue to learn. This keeps the 'learning curve' sloping and affect motivation. Beside engineering knowledge, military engineers have to undergo military training for leadership, communication skills, etc., in a formal environment. Because of the training and experiences, probably ex-service engineers have better organising and communication skills than civilian engineers. As the military deals with men and equipment, interpersonal skills would be developed as one performs his or her job. In terms of emolument, it is similar to other engineers in the public sector.

#### MILITARY TECHNOLOGY USED IN CIVIL LIFE

Chapiti also added that the engineering used in the military, is also used in civil life as well and vice versa. In other words, the technology and inventions discovered by military engineers, are applied in civil life as well despite many people not knowing about this.

He said, "As it is now, we are using all available technology and inventions, (be it military or civilian, ) for the purpose of supporting military operations. In other words, what is useful in civil life is also useful for military purposes."

In the early days, before and after independence, the Army Corps of Engineers (now known as Royal Engineer Regiment or *Rejimen Askar Jurutera DiRaja*) was responsible for the construction of infrastructures such as roads, bridges, airfields, etc., particularly in the rural part of Peninsular Malaysia and in Sabah and Sarawak. The infrastructure constructed include:

- Lahad Datu-Silibukan-Bakapit road.
- Serian-Tebedu road.
- Semporna Airfield.
- Bau Airfield.

- Naka-Nami road including Jambatan Sultan Abdul Halim.
- Belia Dusun Tua Camp.
- Reconstruction of Temerloh Bridge when the original bridge was washed away by flood.
- The aborted demolition of two blocks of Highland Towers in the aftermath of the collapse of one tower.
- The mechanical 'Giant Ball' for the opening ceremony of SUKOM 98 (by the Royal Electrical and Mechanical Engineer Corps).

He however added that the technology and inventions discovered by military engineers were mainly used for military purposes. This is also the view of Ahmad Murad.

Ahmad Murad said that in the US, defence research was made known to public and made use of by civilian scientists if the discoveries were not classified. "In our context, it is done by a civilian organisation, Pusat Sains dan Teknologi Angkatan Tentera (STRIDE). It is an organisation that handles all scientific innovations and research and forms part of Kementerian Pertahanan," he said. Military engineering discoveries and inventions in Malaysia are still in its infancy stage. The Malaysian Armed Forces is still relatively young taking into consideration that Malaysia's Independence was only obtained in 1957.

Chapiti said, "We are not very advanced in terms of discoveries because we lack the expertise. We are getting more engineering graduates from Akademi Tentera Malaysia (ATMA) and graduates from other universities are also joining the service. We hope that we can develop enough expertise to complement the overall government plan for the development of the defence industry in Malaysia," he added.

Among the contributions by military engineers in





the Armed Forces include a seminar on blast resistant structures and the 'Giant Ball' for SUKOM 98. The Royal Electrical and Mechanical Engineer Corps has won 'Anugerah Tangan Emas Perdana Menteri 1997' in the automotive category. The Royal Engineer Regiment came out champion in the National TQM Award for its invention of a demolition 'Firing Device'. The Royal Malaysian Navy (RMN) has achieved numerous awards of excellence such as the Ministry of Defence Quality Award – IT Application Category, Ministry of Defence Special Award for Readiness, thus demonstrating that military engineers are also able to contribute towards innovation and excellence.

#### WESTERN MILITARY ENGINEERING VS MALAYSIAN MILITARY ENGINEERING.

When asked about the differences between Malaysian and Western Engineers, Chapiti said there was no difference. The roles and tasks of the various disciplines of military engineering throughout the world remain similar. Malaysia have been working together with military engineers from other nations (including Western countries) in United Nations operations. Differences could be in terms of equipment and technology. Western military engineers work

closely with their nations' defence industry for the development of equipment and technology. Ahmad Murad said that in Western countries, the budget for research and development was very high and that is why Western countries could go into in-depth research.

"Also in Western countries, the military work closely with the weapons and arsenal producing industry due to their close proximity. In Malaysia, there are no weapons systems manufacturer that is indigenous to Malaysia," he said.

#### SELLING TECHNOLOGY AND INNOVATIONS

Ahmad Murad also said there was good potential for the military to sell its technology and innovations to friendly Asian countries. He gave an example of Malaysia's potential, the construction of Offshore Patrol Vessels, constructed in Malaysian Shipyard Engineering, Pasir Gudang and built with a combat system to warship standards. The vessels were built in collaboration with Korean Shipyard Corporation in Pusan, South Korea. "From 1984 to 1987, we built two ships, one in South Korea and the other in Malaysia, benefiting from the transfer of technology; however, it was not pursued further," he added.

He said currently, there were new generation patrol vessels built by the



Penang Shipyard Corporation (PSC) Naval Dockyard in Lumut. He said the PSC Naval Dockyard had a contract to deliver six vessels. They are to be built in collaboration with Blohm + Voss GmbH in Hamburg, Germany. The first two were built in Hamburg and the four to follow-on are to be built in Malaysia. The project started in 1999.

Chapiti adds that the future was promising in terms of contribution for the advancement of engineering and science for the nation. There are numerous requirements for inventions to support military operations which could later be applied for the betterment of civil society. According to Ahmad Murad, the military was providing training for a second career opportunity for engineers and also to develop the country's engineering image and skills.

"From the Navy's perspective and training perspective, it is a good place to gain knowledge," he said. He added that the military engineer is not only trained in engineering skills but is also trained in discipline, an advantage which not many other institutions provide.

"It is the discipline that enhances the engineering skills and this value adding element makes military engineers that are able to be resilient and are able to endure the highly rigorous demands of their jobs," he said. ■