

- (2) **Developing Software.** To share the information, a common software need to be used by all. A company may be hired to develop this software.
- (3) **Conducting NCO.** Once the project is ready to be implemented a full scale NCO may be conducted by a joint force to finalize the concept and doctrine of NCW.

#### c. Long-term Scheme.

- (1) **Improved Communication Facilities.** If Bangladesh launches its own satellite, the Armed Forces can share a channel or satellite, communication could be established between the forces upto battalion, squadron and flotilla level. However, the hired satellite channel could also be used for military purposes.
- (2) **Articulate Doctrine on NCW.** Basing on the performance of NCW and its effectiveness, a doctrine can be developed on NCW.
- (3) **Development in IT.** Since the information age is advancing rapidly, continuous update of technology will be required. Therefore, research and development in NCW must be pursued.

**The Concept of NCO for Bangladesh.** The basic concept of NCW is to have shared battlefield awareness through the network. NCW is therefore implemented for better synchronization of events for achieving greater speed in command and for increasing lethality, survivability and responsiveness. For Bangladesh, the available communication means need to be integrated through command nodes, and connectivity must be assured between battalion/frigate/squadron, brigade/division/bases and services headquarters. The central command node should be located in the Joint Operation Command Centre to enable it to receive all required information to predict battlespace situations. The joint forces operating dispersely will share common picture of the battlespace, which knowledge will then assist commanders in making decisions. Customised software will collate all the information sent from the nodes and the central server will display the location and activities of own and enemy forces. The command control authority will remain with the respective commander; however, the higher commander can always superimpose his decision or modify his concept of operations based on the rapid development of situations.

#### Training for NCW

In the short-term scheme, the general awareness and training should get the priority. The objective of this training will be to familiarise the officers and soldiers with the NCW and to provide adequate knowledge for them so that they can operate in NCW environment. A group of officer and soldiers should be trained to

163

14. John J. Garstka, Network-Centric Warfare Offers War Fighting Advantage, Signal Magazine, May 2003.
15. Dr. Carlo Kopp, Understanding Network-Centric Warfare, Australian Aviation, January/February 2005.
16. Clay Wilson, Network Centric Warfare: Background and Oversight Issues for Congress, March 2005.
17. Department of Defence, Network Centric Warfare, A Report to Congress, July 2001.
18. Robert Seymour, Daphne G Sands, Anne-Marie, Mark Unnewise, Jon Vaurghan and Ron Baumgart, Application of Network Centric Warfare Concepts to Land-air System- An Experimentation Approach, South Australia.

#### Seminar

19. Lieutenant General Davinder Kumar VSM Bar, Signal Officer- in-Chief, Indian Army, Seminar on Infrastructure for Network Centric Warfare, Delhi, 2004.

#### Interview

20. Interactive session between Air Marshal Shah Mohammed Ziaur Rahman, ndc,fawc, psc, Chief of Air Staff and the course member of AFWC 2008 on 21 May 2008.
21. Brigadier General Rafiqul Islam, ndc, psc, Director Signals interviewed on 22 Jun 2008.
22. Lieutenant Colonel Mustafizur Rahman, psc, General Staff Officer- 1, Signals Directorate interviewed on 22 Jun 2008.
23. Mr. Mohd Moklesur Rahman, Senior Consultant, Telecommunication Engineer, BTRC interviewed on 24 June 2008.
24. Survey carried out taking opinion of 40 officers of different rank of Armed Forces.

#### Internet Websites

25. <http://indianarmy.nic.in/ncw.htm>
26. <http://intellbriefs.blogspot.com/> 2007.
27. <http://www.india-defence.com/reports-3968>
28. <http://www.gis.com>
29. <http://www.mors.org/publications/phalanx/dec00/feature.htm>

167

establish communication structure and maintenance. As the concept of NCW involves the relation between the sensors, shooter and the decision-maker, training programme should be organised for the soldiers to enable them to learn about the function of sensors and action taken after receiving the decision. The technical personnel will be trained in computer software, establishment of data-links, satellite functions and communication connectivity. At the decision-making level, the senior officers must understand the concept, procedure and techniques used to operate electronic equipment and in the decision-making process. The following training schemes could be organised:

- a. **Basic NCW Training.** This common training programme could be organised for all soldiers to impart basic lessons on NCW. The terminal objective of this training will be to acquaint all soldiers with the NCW environment so that the method of NCO can be applied in the battlefield, i.e. the relation between the physical and cognitive domain of NCW should be taught.
- b. **NCO Technical Training.** The training programme is for technical personnel involved in establishing communication network and maintenance. Knowledge and skill in computers, satellite connectivity, programming, data-link connections etc should be made prerequisites to undertaking this training. The objective of this training is to develop a skilful those technician who can operate communication networks.
- c. **Officers Technical Training of NCW.** The objective of this training is to prepare qualified officers to establish and sustain network connectivity. Technical training will impart lessons in computer programming, developing software, planning and setting up the networks between the forces. This training may be conducted at Military Institute of Science and Technology (MIST).
- d. **Senior Officers' Training on NCW.** The objective of this training is to acquaint senior officers with the doctrine, theory and concept of NCO. The training will enable a commander to understand the procedure of sharing information in the battlespace and it will also allow them to understand the decision-making procedure involved in NCW.

#### RECOMMENDATIONS

The Bangladesh Armed Forces has already taken up some steps in the line of NCW. But the project is still in its infancy. If the Bangladesh Armed Forces agrees to develop full-scale NCO capabilities, the following measures should be taken into considerations:

164

#### Author

*Lieutenant Colonel Mohammad Quamrul Islam, afwc, psc was commissioned in the East Bengal Regiment in 1967. He held various command, staff and instructional appointments including that of Platoon Commander in Bangladesh Military Academy, Brigade Major of an Infantry Brigade, General Staff Officer- 2 of Infantry Directorate, Army Headquarters and Chief Instructor, Tactics Wing, School of Infantry and Tactics. He commanded an infantry battalion. He attended a number of professional courses both at home and abroad. He is a graduate of Defence Services Command and Staff College, Mirpur and obtained his Master in Defence Studies from National University, Bangladesh. He participated in United Nations Peacekeeping Operations in Mozambique (ONUMOZ). He also served in United Nations Mission in Ethiopia and Eritrea (UNMEE) where he was awarded with Force Commander's commendation for his excellent performance as Operational Staff in the Force Headquarters, UNMEE. He attended Armed Forces War Course-2008 at National Defence College, Mirpur. He is currently serving as General Staff Officer- Grade 1, Operations Directorate, Army Headquarters.*

- a. A group of experts should further analyse the requirement of NCW, its concept, modalities, equipment and budgetary requirements.
- b. A general awareness programme about NCW should be undertaken in the Armed Forces to familiarise all with the subject.
- c. A perspective plan for integrating all communication resources and establishment of information structure should be undertaken immediately to bring NCW in reality within the next 5 years, which falls under short and mid-term schemes.
- d. A Satellite channel including GIS hard and software should be hired to carry out field tests of NCO.
- e. Local software engineers could be employed to develop software of NCW.
- f. To implement the concept of NCW, a groups of personnel (military officers, technical persons and civil software engineers) could be sent abroad for training.
- g. A doctrine on NCW can be formulated which will enumerate the modalities and application of NCO during peace and war.

#### CONCLUSIONS

As one of the important subjects of 'Revolution in Military Affairs', NCW has given the opportunity to the Armed Forces to better connect people and war fighting machines. It can contribute to reduce Clausewitz's 'fog and friction' in warfare. NCW helps the commanders to obtain and share information which ultimately can increase speed of command, control and execution in the battlespace. The concept of NCW is based on information sharing to develop the situational awareness during wars. The process acts as a force multipliers like other tenets and provides opportunity to self-synchronize commander's action that can enable him to maintain operational tempo.

NCW has not yet been fully materialised in many developed countries. But the value of conducting NCO in future wars is well understood by now. However, the perception and implementation of NCW will take time to bring it into reality. The necessity of information gathering and sharing in the thick fog and friction scenario can only be realised by a commander when he strives for the critical information required to make a decision. Therefore, efforts should be taken to provide all available information to a commander, which is only possible by adopting the concept of NCW.

165

#### IMPACT OF INFORMATION TECHNOLOGY (IT) ON REVOLUTION IN MILITARY AFFAIRS (RMA) IN BANGLADESH PERSPECTIVE

Wing Commander Md Alamgir Hossain, afwc, psc

#### INTRODUCTION

The nature of war never changes: "war," after all, "is an act of force to compel our enemy to do our will," as Karl Von Clausewitz stated over a century and a half ago in his book "On War". But the manner in which war is conducted has undergone considerable changes. Sometimes these changes are so dramatic that war itself must change its form. Indeed, a historical discontinuity or revolution can occur in the way war is fought. There were a number of revolution happened in military affairs in the history. But it is important to remember that independent technologies or innovations alone cannot bring the Revolution in Military Affairs (RMA). RMA occurs when a combination of technological, organizational, social, doctrinal and politico-economic changes take place in conjunction and affect the way militaries plan, equip and train themselves to wage war.

The current RMA is driven by technology, namely Information Technology (IT). The often-quoted definition by Andrew Krepinievich says that RMA occur when "... the application of new technologies into a significant number of military systems combines with innovative operational concepts and organizational adaptation in a way that fundamentally alters the character and conduct of a conflict. It does so by producing a dramatic increase - often an order of magnitude or greater - in the combat potential and military effectiveness of armed forces."<sup>1</sup>

Toddy any topic on military, strategic, or national security invariably promotes the concept of emerging IT-based RMA. The essence of the IT-based RMA is that it provides increase in the combat capability of armed forces "orders of magnitude" over any potential adversary who has not mastered it.<sup>2</sup> The current RMA includes different kinds of new tools and processes of waging war, like Information Warfare (IW), Network Centric Warfare (NCW), Integrated Command and Control (C4ISR), System of Systems, all of which are backed by IT.

Whatever else RMA is about, its primary emphasis is on the enhancement of military capability. But RMA has been neglected in Bangladesh Armed Forces because of many reasons. Considering the technological development of other

1. Carl Von Clausewitz, General, On War, translated by Colonel JI Graham, Produced by Charles Keller and David Widger, published in internet <http://www.gutenberg.org/files/1944/1944-h/1944-h.htm>, accessed on 13/04/08.

2. Andrew Krepinievich, Cavalry to computer: the pattern of military revolutions, published in internet at [http://findarticles.com/p/articles/mi\\_m2751/is\\_a570a2\\_16315042](http://findarticles.com/p/articles/mi_m2751/is_a570a2_16315042), accessed on 17/04/08.

3. Maj Leonard G. Litton, USAF, The Information Based RMA and the Principles of War, published in internet at <http://www.airpower.msu.edu/af/mil/aircraft/ics/lel.htm>, accessed on 24/04/08.

169

#### BIBLIOGRAPHY

##### Books

1. Lawrence T. Greenberg, Seymour E. Goodman and Kevin J. Soo Hoo, Information Warfare and International Law, USA Department of Defence, 1998.
  2. US Department of the Air Force, Cornerstones of Information Warfare 1995.
  3. David S. Alberts, John J Garstka, Frederick P. Stein, Network Centric Warfare- Developing and Leveraging Information Superiority, CCRP, USA, 1999.
  4. Alberts David, Garstka, Hayes Richard and Signori David, Understanding Information Age Warfare, CCRP, 2001.
  5. Toffler, Alvin, War and Anti-War, Boston, MA: Warner Books, 1995.
  6. Alberts David and Hayes Richard, Power to the Edge, Washington DC, CCRP publication, 2005.
  7. Christopher J Bowie, Robert P. Haffa. Jr. and Robert Mullins, Future War: USA: Grumman Corporations, 2003.
  8. The Office of Force Transformation, The Implementation of Network-Centric Warfare, US Department of Defence.
  9. Headquarters Indian Army Training Command, Indian Army Doctrine, Shimla, 2004.
- Report/ Articles/ Paper/Journal**
10. C.S.Boyd, S.A. Wilson, W.R.Williams and D.J. Skinner, Network-Centric Warfare- Prioritisation and Integration, ACPL report version 1.0, 24 April 2006.
  11. Office of Force Transformation, Implementation of Network-centric Warfare, US Department of Defence 2005.
  12. Office of Force Transformation, US Department of Defence, Implementation of Network-Centric Warfare.
  13. Lieutenant Colonel Edmund C. Blash, USAR, Network-Centric Warfare Requires A Closer Look, Signal Magazine, May 2003.

166

countries in this region, we need to prepare ourselves to face the variety of warfare tools that might be employed against us in the future conflict. As such, it is time for the Bangladesh Armed Forces to focus on possible changes required in its doctrine, organization and training for operational adaptability with the development of IT and IW to derive all possible benefits of RMA to face the future challenge for the armed forces and for the national security.

#### AIM

The aim of this paper is to analyse the impact of emerging IT on RMA, identify its implication on doctrine, organization and training, and suggest possible changes to address the RMA issues in Bangladesh perspective.

#### UNDERSTANDING THE REVOLUTION IN MILITARY AFFAIRS (RMA)

##### Basic Understanding about RMA

A number of revolutions have happened in military affairs over the years. In the 20th century the development of the mechanized tanks, carrier aviation, submarines and strategic bombing have had a tremendous impact on military concepts and warfare. The induction of the atomic weapons in 1945 led to another military revolution. In considering past RMAs, it is important to remember that independent technologies or innovations are themselves not responsible for bringing about RMAs.<sup>3</sup> The development of the tank did not produce an RMA. Only when the tank was wedded to supporting technologies (i.e., radios), organizational changes (combined arms formations and tactical air support), new operational concepts (air superiority and deep, knife-like thrusts), and command changes (mission-oriented tactics) did the 1940 German blitzkrieg mark an RMA.<sup>3</sup> That means only the technology alone cannot bring a Revolution in Military Affairs. It is the other factors, like, organizational changes and operational concepts or strategies along with technology will bring the RMA.

##### Evolution of Current RMA

According to Andrew Marshall, director of the Office of Net Assessments in the Office of the Secretary of Defense of US, "a Revolution in Military Affairs (RMA) is a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military

4. Andrew Marshall, 'Revolution in Military Affairs: A Primer', US DoD's Office of Net Assessment at <<http://infowarrior.org>>.

5. Singh Sandeep, Major, Impact of IT on RMA in Indian Context', a dissertation paper, Defence Services Staff College, Wellington, India, 2002.

170

doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations.<sup>7,8</sup> In recent history, the new technologies and processes of waging war like IW, network-centric warfare (NCW), integrated Command and Control (C4ISR), System of Systems have led to a major RMA. This is likely to broaden the parameters of thinking about National Security. The countries of the world are now on the brink of a major revolution on how they (will) conduct national security affairs. The ramifications of the RMA need to be understood not only by military officers but also by both military and civil strategy planners. The military has to contend with the 5th dimension of warfare, information, in addition to land, sea, air and space. Such an RMA is now occurring, and those who understand it and take advantage of it will enjoy decisive advantage in future battlefields.

#### INTERREL. HIP BETWEEN IT, IW AND RMA

##### IT and the Current RMA

In order to understand the interrelationship between IT and RMA, it is important to understand the various new information tools of the current RMA, which is powered by IT. The IT related to military affairs includes "Collection, Analysis, and Communication".<sup>7</sup> The mastery over the satellite technology has enabled the man to obtain information from any part of the world to a resolution up to 3 cm. All the information gathered in the real timeframe can be processed through computers which today are capable of processing three trillion functions per second. In military affairs the important thing is the application of processing/analysis for discrimination of information. This integration of satellite and computer technology has greatly enhanced and facilitated the command and control and reduced the time and space dimension to an extent that it is now real time information gathering, processing and dissemination.

##### Various Information Tools and the Present RMA.

Some analysts believe that information is the single, all-pervasive and dominant element in the present RMA. In his paper on the subject Collin Gray explores the hypothesis that the entire revolution is IW warfare.<sup>9</sup> He talks of the "I-War RMA" and notes that RMA is the process of transforming the character of war

6. Jeffrey McKittrick, James Blackwell, Fred Littlepage, George Kraus, Richard Blanchfield and Dale Hill, The Revolution in Military Affairs, chapter 3.

7. Sharjeel Rizeen, Revolution in Military Affairs, published in internet at <http://www.defencejournal.com/2009/09/military.htm>, accessed on 17.05.08

8. Ben Mathews and John Trudnick, Managing the Revolution in Military Affairs, published by PALGRAVE, Houndmills, New York, in 2001, p.59

by conduct of IW to precisely direct firepower simultaneously throughout a theatre of operations to impose systematic shock from which the enemy will not be able to recover. Due to development in IT, RMA is giving rise to these tools and processes of waging war. Some of these are discussed below.

a. **IW.** There are a number of definitions of IW, but most commonly used one is as follows "Actions taken to achieve information superiority in support of national military strategy by affecting adversary information and information systems while leveraging and protecting our information and information systems." The intent is to control, manipulate, deny information, influence decisions, and degrade or ultimately destroy adversary systems while guarding friendly systems against such action. However, IW does not exist as a separate technique of waging war, but there are several distinct forms of IW, each laying claim to a larger concept.

b. **Network Centric Warfare.** Network Centric Warfare (NCW) is an emerging theory of war in the information age. It is also a concept that at the highest level constitutes the military's response to the Information Age.<sup>9</sup> The armed forces of the world are facing a paradoxical situation where they need to fulfill their tasks with decreased resources and decreased manpower. This necessitates working smartly and looking for force multipliers. The compelling logic for the shift in strategy from platform-centric warfare to network-centric warfare is the opportunity for the armed forces to link their heterogeneous computing lines more effectively and provide increased value for their components. A soldier will now have real-time battlefield awareness, which will enable him to complete his task quickly and efficiently.

c. **C4ISR.** Today the advent of new forms of communication and imaging technology, incorporated into systems such as "smart" weaponry and digitised battlefield networks, have led to the rethinking of war making and strategy conceptualisation over the ages. These new methods have improved the battlefield awareness of our commanders and soldiers. Command, Control, Communication, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) has enabled the integration of these new inputs. The resultant information superiority fundamentally changes the way operations are conducted.<sup>10</sup> The use of C4ISR system has enabled the use of sophisticated weapons like "smart bombs" and precision guided munitions (PGMs) which are extremely accurate and reduce

9. The Implementations of Network Centric Warfare, Office of the Force Transformation, Department Of Defence (DoD), USA, January 2005, accessed in [http://www.joint.org.uk/dm/resources/ncw/implementation\\_of\\_NCW.pdf](http://www.joint.org.uk/dm/resources/ncw/implementation_of_NCW.pdf) on 20.06.08

10. <http://www.chinfo.navy.mil/navpubs/cn04066w/c4i-4e.html>, accessed on 24.04.08

civilian casualties. C4ISR has also led to the expansion of space and the compression of time on the battlefield. The use of these technologies in war led to far greater compression of time than before and signs of a new RMA have emerged.<sup>11</sup>

d. **System of Systems Approach.** In order to further streamline the complex business of warfare, Admiral William Owens, former Vice Chairman of the Joint Chiefs of Staff of the US has introduced the concept of "System of Systems".<sup>12</sup> The System of Systems Approach focuses on the integration of three sets of technologies that relate to precision strikes, communications and sensors on the battlefield.<sup>13</sup> This approach is pegged on the application of IT to warfare with a view to integrate and network existing and emerging technologies that can look, shoot and communicate. System of Systems, in short is integrating the technical advances of ISR, C4I and precision force technology into a command and control platform at the national level.

e. **Jointmanship.** All future operations may not be joint, but having a standard architecture for all three services enables merging of architectures if and when the need arises. Merging of architectures is important so that information from any of the sources can be used to deliver maximum firepower on the enemy. In tomorrow's battlefield, loosely knitted joint organisations put into place just prior to battle will not be successful.

#### IMPLICATIONS ON DOCTRINE, ORGANIZATION AND TRAINING

Whatever else the RMA is about, its primary emphasis is on the enhancement of military capability. The first priority must always be to defeat the enemy, but a more subtle and durable concern should be to change ideas and dogma. For joint forces to fight effectively, communication and coordination between horizontal and vertical battlefield supporting units, tri-service elements of the battle force and integrated source of other national force is a *sin qua non* for the effective operational deployment of RMA weapon technologies. All these encircle the impact on three important issues for militaries; doctrine, organisation of forces and training, which are discussed in subsequent paragraph.

11. Ajay Singh, "Time: The New Dimension in War", Joint Forces Quarterly, (Washington D.C. National Defense University, Winter 1995-96), p. 59

12. Tim Benbow, The Magic Bullet? Understanding the Revolution in Military Affairs, published by Chrysalis Books Group, London W 10 6SP, p. 80

13. Elot A. Cohen, "American View of the Revolution in Military Affairs," Advanced Technology and Future Warfare, November 28, 1996, p.3

warfare, every soldier in the battlefield will be a system who would be linked with the command and control system to forward real time scenario to the commander to make decisions. This demands highest considerations of training of every individual in the system. It also demands to have a separate "Information Operations (IO)" branch in Army, Navy and the Air Force, distinct from the "Signals" and "Communications" branch. Training in Information Operations should be introduced at the military academy level. It is also imperative to introduce compulsory computer training for all cadets in the academy. More officers from the fighting arms of the armed forces should be made to do BSc/B Techs and officers from the engineering and signal branches will have to do specialist courses in IW.

#### EXISTING SITUATION OF BANGLADESH TO ADDRESS RMA ISSUES

According to defence analysts, system integration skills, capable science organization and creative software skills will determine the future of countries wishing to prosecute RMA successfully. Future defence operations are going to be based on multiple networks of Army, Navy and Air Force systems, where IT is going to be used in unprecedented ways. But this is the most neglected aspects of the Bangladesh Armed Forces. In comparison to our neighbour, Bangladesh has done little to address the RMA issues.

A lot of improvement has been made in IT in civil sector of Bangladesh in the last few years, but this has not impacted on the defence sector. Bangladesh has got a very comprehensive Information and Communication Technology (ICT) policy which provides guidelines for the development of the ICT sector in Bangladesh. The policy encompasses the broad guidelines in the fields of data/information processing, transmission and communications by means of computer and telecommunication techniques and the use of these modern tools for organizational/personal information processing in all sectors of the economy and society.<sup>16</sup> This policy also does not address the use of IT in national security perspective.

IT can work in the Armed Forces as a force multiplier, provided it can be exploited in right perspective but the Bangladesh Armed Forces do not have any institutional or organizational setup to address the issue of IT or IW. Our draft Joint Warfare Doctrine also does not address the IT and IW issues. We do not have any

16. Information and Communication Technology (ICT) policy of Bangladesh at <http://www.sdnb.org/bd/nauses/IT-computer/itpolicy-bd-2002.htm>, accessed on 27.08.09

IT Task Force or IW Dte/Wings/Cells either in the Armed Forces Division or in any of the services headquarters for the development of IT and IW capabilities in our defence forces. We also do not have any defence industry or laboratory to produce electronic equipment or to do research on IT/IW. Such an industry or laboratory could have played a major role in induction of RMA and could have influenced the organization in a revolutionary way. However, there are some minor developments in the IW scenario in Bangladesh Armed Forces that can be noted.

#### SUGGESTED CHANGES ON DOCTRINE, ORGANIZATION AND TRAINING: BANGLADESH PERSPECTIVE

Due to some reasons or other, the Bangladesh Armed Forces has not given much focus on the development of IT and therefore, RMA has been neglected in its defence. The main reason for this neglect is the lack of integrating defence resources, agencies and non-availability of security strategies. Budgetary constraint is another factor which has delayed the modernization of the armed forces. However, the RMA provides a framework within which the Bangladesh Armed Forces can undertake and implement new ways of conducting the defence of the country. In the succeeding paragraphs certain core capabilities will be discussed that need to be addressed to face upcoming challenges.

##### Doctrine

**National Security Concept.** Till today, our national security concept has been centralized within the domain of the defence force. It is considered that the national security is the primary concern only of the man in uniform. But the concept of national security has changed. Now, the responsibility of national security must lie with every citizen of the country and must not merely be restricted to the man in uniform. So, this issue should be addressed by all levels of the society.

**National Information Strategy.** Our neighbours and other countries of this region have gone far ahead of us in terms of developing IT infrastructure and IW capabilities. It will possibly be too late for us if we do not start to give due importance in this sector, but we must do so in terms of a national system and not in isolation. In other words, it is necessary for us to take a holistic view of the information revolution and to devise a "National Information Strategy (NIS)". This strategy should be jointly formulated by representatives of the armed forces, bureaucrats, police, paramilitary, intelligence, IT industry and scientists. There should be a National Apex Body to monitor, evaluate, control and guide all the IT and IW related activities at the national level.

**Creation of a National Security Net.** The National Council for Security Affairs (NCSA)/ National Security Council (NCA) should be the advisory forum for security affairs for the whole nation. This forum needs mechanism to fuse and access information both vertically and laterally. A security intranet could meet the needs of an information mesh with levels of security, access and redundancy incorporated in it. The national security net should be linked with important offices like, the PM's Office, important ministries, the intelligence agencies, defence services, paramilitary forces, defence industries and other important organisations. Besides, it would provide a forum for composing differences on perceptions; furthering development and recommendations of a coherent and unified policy, and for centralising activities to support national interests.

**Doctrine for the Armed Forces.** The draft Joint Warfare Doctrine (JWD) has not taken care of IT and IW aspects. A close look at the technological developments taking place in this region is essential to prepare us for the variety of warfare tools that would be employed against us in the future conflicts. The information revolution taking place in various armed forces compels us to think about the possible IW threats during peace and war time. As such, JWD and respective services doctrine should address all these issues.

**Jointmanship.** The age-old concept "Join where we can, single where we must" is no more an effective concept. In future battlefields, information sharing from a common platform will be a must to deliver effective firepower on the enemy. All future operations may not be joint but a standard architecture for all three services will be a requirement for effective operation of any service. In tomorrow's battlefield, loosely knitted joint organisations put into place just prior to battle will not be successful.

**Unity of Command.** Any future war will be joint in nature and unity of command is essential for effectiveness of any joint operation. In the Gulf War, the unity of command and the minimum requirement for coordination between many agencies allowed the coalition to fight a well-organized, coordinated campaign. The high-tech systems significantly eased the command and control functions of a lone headquarters. The advent of modern data transfer systems should allow us to focus its efforts better by combining all three services with the Joint Command Center (JCC) or Armed Forces Division (AFD).

**Systems Integration.** The role of IT in defence is now widely recognized as a force multiplier provided it is evolved, proliferated and absorbed from the right perspective. The induction of RMA in Bangladesh will require development of IT capabilities at the national level and their application and absorption in the defence forces. IT absorption in the armed forces will play a major role in supporting the induction of RMA and will influence the organization in revolutionary ways. As

#### Implications on Doctrine

Information Technology has an integral connectivity with all national sectors including the military. The lessons learnt from the Gulf War have led the US Armed Forces to go for radical changes due to the increasing use of the frontiers of information technology such as computers and satellites. The Tofflerian theory of 'three waves of warfare' give further impetus to the idea that war would be fought on different plane altogether involving exploitation of the new information spectrum.<sup>14</sup> The U.S. Army has adapted itself to these changes through a process of change called Force XXI, the efforts of which are evident on three axes: digitization, force development, and redesign of the future Army.<sup>15</sup> This change has led the USA to modify its doctrines of wars.

##### Implications on Military Organizational Structure

An effective organisation of the armed forces is very important in order to derive the maximum benefit of the RMA. Alvin Toffler has noted recently that in the information age, "as the winning of wars will rely on military quality, not quantity, the military will shrink in size." The military may have to restructure its ranks with fewer layers of staff officers needed to process orders between a General and his men on the ground. The Chinese defence analyst Xu Changjie writes in "Military Revolution Gives Impetus to Evolution in Command": "The revolution of IT has increasingly changed with each passing day, the battleground structure, operational modes and concepts of time and space while dealing blows to the traditional 'centralised' and 'tier-by-tier' command structure". He recommends a traditional vertical and tiered command structure be converted into a networked command structure and the centralized command system be converted into a dispersed type command. The US Quadrennial Review talks about reduction in personnel, restructuring the reserve component of the army, reducing size of the fleet of the Navy etc. It will also accelerate its Force XXI modernisation plan, which will revolutionise combat capability by enhancing battlefield awareness through modern information technology. While it is not necessary to copy all that is being done, we need to innovate and develop our "own way" of restructuring.

##### Implications on Training

Most current generation cyber warriors are self-taught. A nation's armed forces need to conduct customised courses covering all aspects of the RMA. In future

14. Alvin and Heidi Toffler, War and Anti War: Survival at the Dawn of the 21st Century, New York, Warner Books, 1993, Pp. 79-103

15. Joao Vieira 2020, <http://www.dtic.mil/jv/2020>, accessed on 28.04.08.

such, the defence IT structure should be integrated with the national IT infrastructure to exploit for maximum benefit.

**Development of Indigenous Technologies.** Indigenous development in IT and IW systems is the ultimate answer. Constantly buying upgraded technology will bleed our economy. Most importantly, it will pose a great threat to the information security. To overcome this problem, it is necessary to develop indigenous technology including software development for the sake of national security. For initial development, we may contact friendly countries and then switch over to own technology.

**Information Security and Encryption.** IT market is dominated by civilians and therefore, the military has to satisfy most of its needs with off-the-shelf products. Doing system integration by relying solely on imported software is a security threat. Hence we have to depend on indigenously developed products to protect our networks and the traffic that passes through them.

**Research and Development (R&D).** It is necessary for us to enhance our R&D in the fields of communication, systems software, management and decision support systems, network management, simulation, war gaming, non-lethal weapons technologies, information security and cryptography. The issue should be harmonized with defence R&D, joint doctrines, force structure plans, maintenance philosophies and affordability with the new paradigm of war. It can be mentioned that the US allocates approximately 30 percent of its budget for R&D and acquisition to digitisation of the battlefield.

##### Organization

**Highly Synthesized Command Organizations.** Future fighting formations will mean more combined services and better integration of the army, navy, and the air force. The future campaigns will not only require multi-service systems, but all combat units need to be cooperative. The complexity of operational forces determine that the command structure must meet the requirement of integrating the operations of many services. Synthesized command organization with various combat arms, shared information, and compatible communication will certainly emerge, along with development of command theory involving integrated operations.

**Information Warfare Directorate/Committee.** All three services of Bangladesh Armed Forces are looking into IT and IW issues from different perspective. But this issue demands a combined and harmonized effort. As such, it is necessary to have IW Directorate at respective Services Headquarters with the same structure to develop IW capabilities and address IT and IW issues in a synchronized approach. An Information Warfare Committee (IWC) also needs to

be formed at the Armed Forces Division (AFD) as the apex body for monitoring IT and IW related activities of the armed forces. This committee will also make necessary liaison with National Apex Body for integrating national IT resources for the development of IT and IW capabilities of armed forces and to address any other national security issues. There may also be an IW Directorate at AFD to provide necessary directives for development and consolidation of IW capabilities in all three services.

#### Training

**Human Resource Development.** Human resource development is the prime concern for IW. Talented personnel from information science and technology need to be graduated for dealing with IW. Senior command personnel also need to have sufficient knowledge of IT to deal with IW.

**Training of Specialized Group.** Training of a specialized group of personnel will be required to understand the subject, to man IW cells in different locations and to make appropriate plan for its development. Specialist IW officers would be tasked to manage IW resources in the armed forces and over see its integration with National/Defence Information Infrastructure.

**Induction of IT Professionals.** A small group of IT professional may be hired/inducted in the armed forces initially for specialized IW tasks, software development projects and maintenance of networks etc, if required.

**Involvement of the Civil Sector.** To improve understanding on IW, the armed forces need to have close interaction with the civil sector and exploit the expertise of professionals. Officers of armed forces need to be trained in IT, for which they need interaction with various professional agencies. Interaction with private management firms, international banks and stock exchanges needs to be undertaken to learn how they manage computer security and deal with information overload, and other information related issues.

**Software Development.** The Armed Forces should be equipped with their own developed software for professional as well as for security reasons. Dependence on other countries will not only hinder our technological advancement but may lead to a breach of security. There are many high skilled software development firms in Bangladesh, who can develop software for our armed forces and also can train our personnel to handle those software.

28. RAND Research Review, 'Information Warfare: A Two Edged Sword'. RAND Home Page at <http://www.rand.org>, accessed on 15.05.08.
29. Revolution in Military Affairs-From Wikipedia, the free encyclopedia at [http://www.en.wikipedia.org/wiki/Revolution\\_in\\_Military\\_Affairs](http://www.en.wikipedia.org/wiki/Revolution_in_Military_Affairs), accessed on 23.02.08.
30. Revolution in Military Affairs-Source Watch at [http://www.sourcewatch.org/index.php?title=Revolution\\_in\\_military\\_affairs](http://www.sourcewatch.org/index.php?title=Revolution_in_military_affairs), accessed on 16.04.08.
31. RMA and C'I, IWS-Information Warfare Site, at <http://www.iwar.org.uk/rma/>, accessed on 23.02.08.
32. Rizwan Sharjeel, Revolution in Military Affairs at <http://www.defencejournal.com/2000/sep/military.htm>, accessed on 17.05.08.
33. Robbin F Laired and Holger H Mey, Revolution in Military Affairs: Allied Perspective, retrieved from the site [http://www.dtic.mil/doctrine/jel/jfq\\_pubs/jfq0905.pdf](http://www.dtic.mil/doctrine/jel/jfq_pubs/jfq0905.pdf), accessed on 16.04.08
34. Steven Metz and James Kievit, Strategy and the Revolution in Military Affairs: From Theory to Policy, published in June 27, 1995, retrieved from the site <http://www.google.com.au/search?hl=en&q=Revolution+in+ Military+ Affairs & meta>, accessed on 19.03.08.
35. The RMA Debate sponsored by The Project on Defence Alternatives at <http://www.comw.org/rma/>, accessed on 23.02.08.
36. Thierry Gongora, Harald Von Riekhoff, Toward a Revolution in Military Affairs: Defense and Security at the Dawn of the Twenty-First Century, retrieved from the site <http://www.google.com.au/search?hl=en&q=Revolution+in+Military+Affairs&meta=>, accessed on 19.03.08.
37. The Implementations of Network Centric Warfare, Office of the Force Transformation, Department Of Defence (DoD), USA, January 2005, accessed in <http://www.iwar.org.uk/rma/resources/ncw/implementation-of-NCW.pdf> on 20.06.08.
38. The Revolution in Military Affairs and Joint Vision 2010 at <http://www.dod.mil/excecse/ad98/chap13.html>, accessed on 16.04.08
39. Wens A William, JROC: Harnessing The Revolution in Military Affairs, retrieved from the site [http://www.dtic.mil/doctrine/jel/jfq\\_pubs/jfq0905.pdf](http://www.dtic.mil/doctrine/jel/jfq_pubs/jfq0905.pdf), accessed on 16.04.08
40. 3-Information Warfare.HTML document, accessed in internet on 12.07.08.

#### CONCLUSION

The IT and its recent development have an integral connectivity with all national sectors including the military. Military need to work with other government agencies to develop information architecture which will be integrated in the national security paradigm. This necessitates a changed agenda in Armed Forces doctrine, which ultimately must be commensurate with the national security doctrine. Again, the technological revolution has guided the armed forces towards qualitative development rather than quantitative expansion, which advocates that the military to shrink in size. In future warfare, every soldier in the battlefield will be a system who would be linked with the command and control system to forward real time scenario to the commander to make decision. This recommends a change from the existing vertical and tiered structure into a networked command structure.

Till now, the Bangladesh Armed Forces has not paid much focus on the development of IT and therefore, RMA has been a neglected chapter in the armed forces. The reason behind this might be the lack of acceptability of the technological development due to our poor knowledge in IT, lack of conceptual fundamentals, inability to integrate defence resources and agencies for organizational benefits and also non-availability of security strategies. Considering the technological development of other countries in this region, we need to prepare ourselves to face the variety of warfare tools that might be employed against us in the future conflicts. The information revolution in various armed forces compels us to think all possible IW threats during peace and war time, which need to be addressed well by our armed forces.

Our security concept is centralized within the domain of defence force. But due to the emergence of RMA, the concept of national security has changed, which is now the responsibility of every citizen of the country. As such, it is necessary to take a holistic view of the information revolution and to devise a "National Information Strategy (NIS)" jointly formulated by representatives of all the relevant sectors. There should be a National Apex Body to monitor, evaluate, control and guide all the IT and IW related activities at the national level. The Bangladesh Armed Forces also should start with the formation of IW Directorate in the Armed Forces Division and in all three services to address IT and IW issues for adaptation of RMA. An information warfare committee also needs to be formed at the Armed Forces Division (AFD) as the apex body for monitoring IT and IW related activities of the armed forces and which can make necessary liaison with the National Apex Body for integrating national IT resources for the development of IT and IW capabilities of the armed forces. Such a body will also be able to address other national security issues. A National Security Net should also be established enabling important government offices to have a mechanism to fuse and access information for decision making for the security affairs for the whole nation.

#### Author

Wing Commander Md Alamgir Hossain was commissioned in Bangladesh Air Force on 31 December 1984 in Engg Branch. He has done Master in Business Administration (MBA) from the Institute of Business Administration (IBA), Dhaka University and Master in Defence Studies (MDS) from National University. He has also done a Post Graduate Studies Course in Modern Chinese Language and Literature from Beijing Language and Culture University, Beijing, China. During his service career, he has served in all the operational bases of Bangladesh Air Force and also in Air Headquarters in various command and staff appointments. He was Officer-in-Charge of Aircraft Engineering Squadron in all four BAF Bases. He has also served as Deputy Director Aircraft Engineering, Deputy Director Ground Engineering and Officer Commanding Central Quality Control Unit (CQCU) at Air Headquarters. At present, he is serving as Officer Commanding, Maintenance Wing, BAF Base Zahurul Haque, Chittagong. Besides many articles published in different journals, he has three books of poetry published during "Bangla Academy Book Fair". He is married and father of a daughter and a son.

#### BIBLIOGRAPHY

##### Books

1. Alvin and Toffler Heidi, "War and Anti War: Survival at the Dawn of the 21<sup>st</sup> Century" New York, Warner Books, 1993.
2. Benbow Tim, The Magic Bullet? Understanding The 'Revolution in Military Affairs', Brassey's, London W10 6SP.
3. Matthews Ron and Treddenick John, Managing the Revolution in Military Affairs, PALGRAVE Houndmills, Newyork, N.Y.10010, ISBN 0-333-78189-9.
4. Warden A.John, "The Future of Air Power in the Aftermath of the Gulf War" Maxwell Air Force Base, Air University Press.

##### Journal/Articles/Paper

5. Cohen A. Eliot, "American View of the Revolution in Military Affairs," Advanced Technology and Future Warfare, November 28, 1996.
6. Hassin S. Ahmed, The Revolution in Military Affairs Outside the West, published in Journal of International Affairs, Vol. 51, No. 2 (Winter 1998).
7. Joshi Akshay, A Holistic View of the Revolution in Military Affairs (RMA), published in Strategic Analysis: A Monthly Journal of the IDSA, February 1999 (Vol. XXII, No. 11).
8. Singh Ajai, 'Information Warfare: Reshaping Traditional Perceptions', published in Strategic Analysis, March 1998.
9. Singh Ajai, 'RMA - 4 Dimensional Warfare', published in Strategic Analysis, April 1998.
10. Singh Ajay, "Time: The New Dimension in War", published in Joint Forces Quarterly, (Washington D.C: National Defense University, Winter 1995-96).
11. Singh Sandeep, Major, Impact of IT on RMA in Indian Context, a dissertation paper, Defence Services Staff College, Wellington, India, 2002.

##### Internet

12. Bates Gill and Lonnie Henley, China and the Revolution in Military Affairs, retrieved from the site <http://www.fas.org/tuke/guide/china/doctrine/chinamma.pdf>, on 16.04.08.
13. Carl von Clausewitz, General, On War, translated by Colonel JJ Graham, produced by Charles Keller and David Widger, published in internet <http://www.gutenberg.org/files/1946/1946-h/1946-h.htm>, accessed on 13.04.08.

14. Command and Control Warfare from Department of Defence (DoD), USA at <http://usmilitary.about.com/od/glossary/terms/cjg/comconwarfare.htm>, accessed on 17.05.08.
15. CRS report for congress, revolution in military affairs? competing concepts, organizational responses, outstanding issues summary at <http://www.au.af.mil/au/awc/awcgate/crs/95-1170.htm>, accessed on 16.04.08.
16. Harley A. Jeffrey, Lieutenant Commander, U.S. Navy, 'Information Technology and the Revolution of Gravity' at <<http://art4w97.html>>, accessed on 17.05.08.
17. <http://www.chinfo.navy.mil/navpalib/cnch/86/wc4isr.html>, accessed on 24.04.08.
18. Information and Communication Technology (ICT) policy of Bangladesh at <http://www.sdnbd.org/sdi/issues/IT-computer/itpolicy-bd-2002.htm>, accessed on 27.08.09.
19. Information Warfare-Wikipedia at [http://en.wikipedia.org/wiki/Information\\_warfare](http://en.wikipedia.org/wiki/Information_warfare), accessed on 20.03.08.
20. Jeffrey McKittrick, Blackwell James, Littlepage Fred, Kraus George, Blanchfield Richard and Hill Dale, Battlefield of the Future, The Revolution in Military Affairs, at <http://www.airpower.maxwell.af.mil/airchronicles/battle/chp3.html>, accessed on 24.02.08.
21. Joint Vision 2020. <http://www.dtic.mil/jv2020>, accessed on 28.04.08.
22. Kak Kapil, Revolution in Military Affairs - An Appraisal, at [http://www.ciaonet.org/olj/sa/sa\\_apr00kak01.html](http://www.ciaonet.org/olj/sa/sa_apr00kak01.html), accessed on 16.04.08.
23. Krepinevich, Andrew, Cavalry to computer; the pattern of military revolutions, published in internet at [http://findarticles.com/p/articles/mi\\_m2751/is\\_n37/ai\\_16315042](http://findarticles.com/p/articles/mi_m2751/is_n37/ai_16315042), accessed on 17.04.08.
24. Leonard G. Litton, Maj, USAF, The Information-Based RMA and the Principles of War, published in internet at <http://www.airpower.maxwell.af.mil/airchronicles/cc/Litton.html>, accessed on 24.04.08.
25. Marshall Andrew, 'Revolution in Military Affairs: A Primer'. US DoD's Office of Net Assessment at <<http://infowarrior.org>>, accessed on 27.04.08.
26. Owens William, The American Revolution in Military Affairs, retrieved from the site [http://www.dtic.mil/doctrine/jel/jfq\\_pubs/1010.pdf](http://www.dtic.mil/doctrine/jel/jfq_pubs/1010.pdf), on 16.4.08.
27. Ralph Peters, The Counterrevolution in Military Affairs, Volume 011, Issue 20, retrieved from internet at <http://www.weeklystandard.com/Content/Public/Articles/000/000/006/649qrsob.asp>, on 16.04.08.