Firepower 2030:
Arm of Decision

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Introduction

Firepower, as per the *Oxford Dictiona*ry, is the capacity to destroy: measured by the number and size of guns available. Ever since the advent of war, it has quintessentially comprised two ingredients: firepower and manoeuvre. Both complement each other and synergise to defeat the enemy. To effectively manoeuvre, space is a necessity. However, in a nuclear backdrop, this gets restricted. Accordingly, the predominant role remains that of firepower. In the current battlefield milleu, firepower plays a predominant role in a full spectrum conflict. Modern technological advancement and the revolution in military affairs (RMA) have necessitated a transformation in strategic thinking with a paradigm shift in the conduct of operations. As a result, the world over, military doctrines, force structures and weapon systems are under constant review. The current environment focusses on precise standoff strikes in a network-centric arena. Firepower presently is undertaken from land, sea, air and sub-surface. Firepower entails the process of surveillance, reconnaissance, target acquisition, degradation followed by post strike damage assessment (PSDA) and destruction. Victory in any future conflict in the 21st century will be generated through the asymmetries of firepower.

Elements of Firepower

Firepower, as stated, may be delivered from land, sea, air, sub-surface and, in the future, it is probable, from outer space as well as. The platforms are small arms, guns, mortars, rockets of artillery, aircraft, missiles, unmanned combat aerial

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vehicles (UCAVs), helicopters, submarines and, possibly, stations in outer space. The ammunition which is the payload is the most important element of firepower. This could be high explosive, smoke, illuminating, armour piercing. high explosive squash head, fuel air explosive, sensor fused, incendiary, propaganda, nuclear, chemical and biological. Ammunition has other classifications based on its targeting requirements like cluster and, precision. All these elements assist suitably in decimating the target by a series of fire assaults which pave the way for mopping up by assaulting forces, Fire assaults launched by the artillery during Operation Vijay in Kargil in 1999 bear a semblance of operations being undertaken after pulverisation of objectives by the guns and mortars, thereby facilitating capture by the infantry. Firepower across the board in the short- and long-term would be an essential parameter to maintain deterrence and dissuasion.

Evolution of Technology and Challenges

The development of technology has made firepower more devastating in its application. The tank made its appearance at the end of World War I. World War II witnessed mechanised columns, air power, V-2 rockets and the catastrophic effect of nuclear bombs at Hiroshima and Nagasaki. The effect of firepower resulted in terminating World War II. The Vietnam War saw the introduction of smart bombs whose precision resulted in knocking down of the famous Thanh Hoa Bridge, south of Hanoi. The unmanned aerial vehicles (UAVs) of the Israelis made their presence felt during the Lebanon conflict in 1982, paralysing the Syrian air defence and directing Israeli artillery on to Syrian guns and weapon emplacements. The Gulf Wars commenced with the massive employment of cruise missiles. Firepower was used to decimate, dislocate and destroy the Iraqi forces. Carbon powder was utilised as a payload to paralyse the entire electrical grid of Iraq. Thereafter, mechanised columns had to deal with the demoralised remnants, leading to easy capture, with practically no casualties. The present Afghan conflict has seen the usage of heavy doses of firepower with the employment of ultra light howitzers, mounted gun systems, thermobaric bombs and UCAVs. The UCAVs comprised mainly Predators which took off from their bases in Tampa (Florida, USA)

flew all the way to the Afghanistan-Pakistan (Af-Pak) region, loitered over designated areas to undertake specific searches of militant hideouts and finally engaged targets with pinpoint accuracy with their onboard missiles causing devastating casualties to the militants. Thus, the evolution of firepower has been caused by the development of technology which has been occurring with phenomenal speed. The fields of development include metallurgy, electronics, ship construction, aerospace, nuclear, biological, chemical and other explosive technology.

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Modernisation of firepower during the full spectrum conflict by 2030 has peculiar challenges. In as much as the technological challenges are concerned, they relate to characteristics needed for platforms, munitions and surveillance and target acquisition equipment. With regard to the platform, it relates to enhanced range, autonomous capability, high rate of fire, automatic laying system, ability to shoot and scoot and also being capable of handling nuclear munitions. The scope for ammunition is to reach a maximum range and have a greater variety by combining with dual purpose, improved, converted munitions. In addition, there is a need of ammunition which has a higher degree of precision; this could constitute trajectory corrected ammunition, terminally guided (or designated) and sensor fused munitions. While guns could cover ranges which would be in the tactical space, we would need rockets to cover the operational battle space and missiles to cover the strategic space. With the battle ranging to strategic space, there is a requirement of surveillance and target acquisition equipment to provide surveillance for these ranges. In this, we would consider UAVs and aerostats for long range surveillance which at some point of time could be supplemented by lower orbiting satellites. For the contact battle, we would need battlefield surveillance radars (BFSRs), weapon locating radars (WLRs), sound ranging system and long range reconnaissance and observation system (LORROS). Further, there would be need for modern survey equipment which would comprise electronic thedolites, Inertial Navigation System (INS), Differential Global Positioning System (DGPS) and laser range finders (LRFs). In keeping with these technologies, equipment needs to be correctly profiled to meet our needs in operations. This is true of ships, aircraft, helicopters, artillery guns,

rockets and missiles. Land systems in particular need to be profiled based on terrain on which they are to be employed and the operational role of the formation to which they are affiliated. Based on the terrain and role, there would be need for multifarious equipment which in the case of the artillery would be the 52 calibre towed gun, self-propelled (SP) tracked, SP wheeled, mounted gun system (MGS), ultra light howitzer (ULH), mortars, rockets and cruise missiles. In the case of land warfare, gun systems would be in close support, and there would be a need to reinforce them with air, attack helicopters, rockets and missiles.

Firepower Technology and Application: The Current Context

The current battlefield environment is network-centric with real-time connectivity among the seeker, the command elements and the destroyer. These strategic, operational and tactical fires would be directed against state and non-state actors. Technology permits precise engagements due to accurate targeting data provided by command, control, communications, computers, information, surveillance and reconnaissance (C4ISR). Firepower is lethal and precise. During the Gulf War, the smartness of the munitions was demonstrated by the number of rounds used against a target. During World War II, about 1.6 million rounds were required to kill one soldier against 10 in the Gulf War; 70 percent of the 28,000 bombs that were dropped during the Gulf Wars were smart bombs, leading to a situation where everything that could be seen could be hit, and what was hit was destroyed. Apart from air, attack helicopters, guns, mortars and rockets, the emphasis was on UCAVs using precision guided munitions (PGMs) and cruise missiles. In conjunction with firepower, electronic warfare is essential for degrading information warfare capabilities. Further, stealth technology would assist our ships, aircraft and missiles to reach the designated targets. The application of firepower in the current set-up would entail: shaping of the battlefield, non-linearity and simultaneity of operations, firepower and manoeuvre, tri-Services synergy, enhancing the tempo and degradation, leading to a favourable firepower situation. In the 21st century, victory will be earned by asymmetries of firepower. To establish a favourable firepower situation, there would be a requirement to establish a degree of dominance in the intended area of operations. Further, it would be time specific. This would permit unhindered employment of own forces. The implications would be asymmetry with regard to enemy firepower means at all stages of operations and degradation of enemy

delivery means and other contributory means to firepower like communication, ammunition, logistics set-up, surveillance and target acquisition means. Further, this would be practicable with the availability of real-time battlefield transparency with a link between the sensor and the shooter as also an efficient ammunition system.

Firepower Technology and Application by 2030

Prolific growth of technology is likely to take place by 2030 and this would have a profound impact on firepower and its application. At the outset, the range of aircraft would be drastically enhanced by mid-air refuelling and that of artillery guns by the use of velocity enhanced long range projectile (VLAP) and vulcano ammunition. Further, aircraft from the aircraft carrier task group would be able to undertake missions on essential objectives. It is also assumed that every warship would be equipped with cruise missiles; numerous targets based on their importance could be engaged on land and sea. Precision would be paramount in engagement of targets. There would be a requirement of surgical strikes, with warheads possessing a circular error of probability (CEP) of less than 5 metres (m) to ensure minimum collateral damage. Precision has to be attained through initial, mid-course and terminal guidance of projectiles, rockets and missiles. Presently, precision is based on the Inertial Navigation System (INS), with the Global Positioning System (GPS) or the Russian Navigation System GLONASS in the loop. The accuracies obtained from GPS or GLONASS are commercial accuracies which do not permit precision to a warhead without terminal guidance or designation. To obtain higher accuracies, there would be a need to acquire precision codes for GPS and GLONASS. These would require possibly inter-governmental agreements which would compromise our entire communication set-up. Obviously, we are left with no other option but to create our own miniature navigation system with our own group of satellites that would ensure precision data to steer our warheads to precise locations. There would be a requirement of miniaturising our platforms and ammunition by nano technology. Our areas of conflict would be in the mountains. Carriage of weapons and ammunition poses a major problem in mountainous areas. Nano technology assists in miniaturising weapon systems, surveillance systems and ammunition. The final journey of the space shuttle Atlantis launched a miniature satellite which was extremely small and could perform effectively.

Accordingly, in two decades, we would have miniaturised aircraft, ships, tanks, guns, mortars, rockets and missiles. In addition, there would

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be enhancement of the ranges of rockets and ballistic missiles. Currently, our Grad (extended range) ranges 40 km, the PINAKA 37 km and the Smerch 90 km. Our indigenous rockets would extend (possibly the PINAKA Mark II) to 60 km and the Smerch would have a lighter system capable of reaching 120 km. All these rocket systems would be capable of operating in high altitude areas, thereby enhancing our capabilities in the mountains. Currently, the ballistic missiles available are the Prahar, Prithvi and Agni. While the Prithvi and Agni are strategic missiles with nuclear payloads, the Prahar is a single stage missile fuelled by solid propellants and hits targets at a maximum range of 150 km. This uses conventional warheads and is, therefore, suitable for the intermediate and depth battle areas. The missile has yet to be trial evaluated for the armed forces. The Prithvi ranges up to 350 km and has a naval version, the Dhanush. The Sagarika (K-15) is a submarine launched ballistic missile (SLBM) which has a range of 700 km. There is a school of thought which advocates that the Prithvi should also be fired with conventional warheads to optimise its usage. This is being debated due to the response from the adversary once the missile is launched. The Agni currently has three variants and a range up to 3,500 km. The Agni V is likely to be tested in December 2011 and would have a range up to 5,000 km. By 2030, it is expected that there would be intercontinental ballistic missiles (ICBMs) with ranges of 10,000 km having multiple independent reentry vehicle (MIRV) capability to engage multiple targets as a part of our inventory. The BrahMos is a supersonic cruise missile with a range of 290 km. The missile is precise and by 2030, it would reach hypersonic speed to ensure it can avoid being intercepted. The BrahMos, by its precision, would destroy pinpoint targets, thereby proving to be an excellent system for surgical strikes.

Surveillance forms an essential component of firepower in a network-centric environment. Sensors deployed in satellites in outer space would be able to provide us all weather surveillance by day and night. Apart from this, UAVs would operate with solar batteries, thereby enhancing their endurance to almost two weeks. UCAVs would be more agile and be able to undertake surgical strikes with pinpoint accuracy. With ballistic missile

defence becoming active our supersonic cruise missiles would have to attain hypersonic speeds with scramjet technology. In addition, while defences against ballistic missiles have been developed, the coming decades would witness research and development of counter cruise missile technology. This would entail possible deployment of surveillance equipment in outer space and hypersonic missiles to destroy the incoming weapon system. Considerable research is being undertaken on direct energy weapons. These could be based on heat or electro-magnetic induction. They could destroy satellites and be placed in UCAVs to take on incoming missiles. While the advanced countries have already developed missiles having MIRV, our country would definitely acquire this technology possibly in a decade. The development of non-lethal firepower in terms of gases that temporarily make people unconscious or blind the enemy would be developed for usage in sub-conventional warfare in our internal areas.

Technology, with grit and determination, accompanied by good actionable intelligence would enable precise firepower to decimate sub-conventional targets.

The advancements in technology by 2030 would enhance the effect of firepower exponentially. The aim would be to attack by firepower in all stages of the battle so as to achieve favourable conditions for the decisive defeat of the enemy. Firepower would be gainfully used against non-state actors in a sub- conventional conflict and against adversaries in a conventional war. Firepower in sub-conventional conflicts would have to be moderated based on the proportion of force needed to be applied to avoid collateral damage. Precision would be needed to ensure that targets are correctly addressed and thereafter destroyed. Actionable intelligence is extremely important in discerning a target and thereafter engaging it in real-time to achieve decisive results. Weapons used could vary from the use of aircraft, attack helicopters, cruise missiles, ballistic missiles, guns with terminally guided ammunition, UCAVs, rocket launchers and small arms with holographic sights. Firepower on such occasions would have to be delivered with a high degree of accuracy by day and night. Operations will be undertaken by teams that should be able to exploit the technical capabilities of the weapon and ammunition. Special forces, equipped with blue tooth communications , light weight laser designators, third generation image intensifying night vision equipment

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along with light weight thermal image integrated operating equipment with the capability to direct fire from aircraft, UCAVs and artillery guns would be able to handle targets effectively in such conflicts. Technology, with grit and determination, accompanied by good actionable intelligence would enable precise firepower to decimate sub-conventional targets.

Firepower will continue to play a predominant role in conventional conflicts against a nuclear backdrop in 2030. Territorial disputes, particularly in Asia, could result in inter-state disputes, leading to war. In such scenarios, the role of all fire assets would have to be applied judiciously at critical points to physically and psychologically degrade the cohesion of the enemy with the ultimate aim of breaking his will to fight. Firepower will be applied on the strategic plane, operational plane and tactical plane. On the strategic plane, the aim would be to target the enemy's war waging potential. By speedy mobilisation, the aim would be to prevent the enemy's build-up to maintain favourable force ratios. This would be achieved by engagement of economic centres, infrastructure, military and industrial bases. In addition, his means of mobilisation and strategic reserves would be engaged by firepower. On the operational plane, firepower will impose unfavourable force correlation by attacking the enemy's centre of gravity. Further, his freedom of action in the tactical battle area would be curtailed by degrading his command and control network. In addition, asymmetry in firepower would enable the attacker to degrade enemy artillery and his other fire assets. At the tactical level, firepower would be primarily focussed on the destruction of enemy defences, troops in the open and field fortifications. Thereafter, application would be on command and control, firepower delivery means, reserves and counter-attack forces. Optimisation of firepower would be achieved by judicious application of air, attack helicopters, guns, mortars, rockets and electronic warfare assets against the enemy in contact or where contact is imminent. Overall, firepower in 2030 would pulverise the enemy on the objective, thereby facilitating ease of capture.

Indian Perspective

India has border disputes with China and Pakistan. Pakistan is the best friend of China and together they are constantly testing India's capability

in launching operations in the event of a two-front war. A reality check will reveal that while Pakistan is busy with internal problems, the Chinese are day by day enhancing their comprehensive national power. Our present force levels neither deter Pakistan nor dissuade China. While both our adversaries are rapidly modernising their forces, we are adopting a deliberate process for procurement under the Defence Procurement Policy (DPP) 2011. Be it aircraft, UAVs, attack helicopters, guns, rockets, missiles, nuclear weapons, chemical weapons or biological weapons, China and Pakistan are jointly collaborating and modernising their inventory. We have border disputes with both these countries and the chances of a conflict exist. Presently, Pakistan is undertaking a sub-conventional conflict against us, localised in the state of Jammu and Kashmir. China covertly supports the insurgent groups in the northeast and has been aggressive about her claims regarding Arunachal Pradesh. While all the three countries possess nuclear weapons, the conflict in Kargil in 1999 proved that a limited war in mountainous terrain is possible. Viewing the disputed areas as also the claims made by the three countries, it is likely that a war, if it breaks out, it would be in the mountains. Further, with stabilised borders, the chances of the war spilling over to the plains are unlikely. However, wars do not follow predictions. Accordingly, there is a need to have adequate forces to deter Pakistan from undertaking a conflict in the plains. Manoeuvre in the mountains will be restricted by terrain. In the plains, deep strikes will be restricted by Pakistan's nuclear red lines. Vertical envelopment even by 2030 will be difficult in the mountains and would be limited to possibly medium artillery ranges in the plains. In such a scenario, victory will be attained through asymmetry of firepower. Be it the Gulf Wars, the Kargil conflict or the present conflict in Afghanistan, ascendancy of firepower was required to pulverise objectives and break the enemy's will to fight, thereby paving the way for victory.

Asymmetry in firepower during a two-front war would demand our modernisation process to be speeded up. As most of the operations would be Air-Land battles, we need to speed up our acquisition process. The Indian Air Force (IAF) is seriously considering increasing its sanctioned strength of combat aircraft from 39.5 squadrons to 42 squadrons. Presently, we are holding about 33 squadrons. In view of the Chinese deployment, the IAF plans to deploy four squadrons of Su-30 Mk I fighter by 2015. There are plans in the next 10 to 15 years to induct 350 fighter jet aircraft. Out of these, 126 would be medium range multi-role combat aircraft (MMRCA) to replace the MiG-

23 and MiG-27; 140 Tejas light combat aircraft (LCA); and 160 Su-30 Mk I to replace our MiG-21 and other fighters. With our Mirages upgraded and attack helicopters, with night sight incorporated, and cruise missile mounted on the Sukhois to engage targets on land, we would be able to provide asymmetry of firepower from the air. In as much as the army is concerned, the procurement of artillery guns needs to be expedited. While Pakistan has acquired the M 109 A5 howitzers from the USA, China has an array of artillery equipment with its second artillery capable of firing conventional missiles in massive strikes. Our artillery has acquired the Grad (extended range), PINAKA, Smerch and BrahMos which would cater for the intermediate and the depth battle, but there is a dire need to replace the existing 105 mm, 122mm and 130 mm guns and 120 mm and 160 mm mortars. It is reported that 155 mm, 52 calibre wheeled (self-propelled), and 155mm ultra light howitzers have completed trials and are being evaluated. Efforts must be made to expedite the procurement of the 155mm towed gun, 155 mm mounted gun system, 155 mm tracked (self-propelled), 120 mm long range mortar, sensor fused ammunition, Heron UAVs, loitering missiles and laser designators. All these are at various stages of procurement and they need to be speeded up. Further procurement must be expedited for the mountain version of the Smerch rockets and BrahMos missiles.

Asymmetry in firepower can be created by the use of PGMs. During Gulf War II, approximately 70 percent of the ammunition used comprised PGMs. Our current holding for the air force and army is extremely low and needs to be enhanced to 20 percent by 2020 and 50 percent by 2030. Further, firepower, to be orchestrated, needs to have a balanced organisation to fine tune the entire process. Each corps, be it in the strike, pivot or mountain, needs an artillery division to control firepower. The organisations of the artillery division has to be tailored to the operational requirements of the corps. Further, each division has to have a UCAV battery as a part of the artillery brigade.

By 2030, the Indian Navy would have possibly attained the status of a blue water navy. Possibly the third aircraft carrier would have been constructed indigenously and we would be able to simultaneously launch three aircraft carrier task forces with their full complement of warships for sea-denial and sea control. The navy, while undertaking maritime tasks, could provide firepower on land and in the air with the aid of its fighters, rotary UCAVs, cruise missiles, naval gunfire and submarine launched ballistic missiles which could be carrying sensitive nuclear, chemical or biological payloads. The navy would be an important partner

in tri-Service operations, particularly in out of area contingencies. Accordingly, all the Services have immense firepower capabilities which need to be synergised to optimise their employment. Asymmetries of firepower will be created by tri-Service integration.

Conclusion

Firepower in 2030 will be the predominant factor that would determine the fighting capability of a nation. Victory can be assured, only by building asymmetries of firepower. There would be a need to synergise firepower at a tri-Service level to pave the way for success. To overcome the challenges of technology, a triad needs to be formed among the user, the developer and the manufacturer. In the Indian perspective, the three Services must speed up the modernisation process. The present set-up of obsolete weaponry will be of little use in a two-front war. In a network-centric environment, there needs to be a real-time link among the sensor, the command elements and the shooter. It is extremely important that each divisional artillery brigade of the army has a battery of UCAVs. Precision would be necessary for all engagements by platforms. Our present holdings are extremely low. There is an urgent requirement to ensure that 50 percent of our ammunition should be PGMs by 2030. We must also develop rocket ammunition to enhance the range of the PINAKA to 60 km and the Smerch to 120 km. Further, our ballistic missiles must range 10,000 km with MIRV and the BrahMos cruise missiles must attain hypersonic speed. By 2030, the weapons in our inventory would be able to simultaneously engage targets in the depth, intermediate and contact battle. In order to exercise judicious control over all the platforms, there is a need to have an artillery division at the corps level to effectively execute joint fires. In all this, a sense of urgency must be felt by the Services and all the agencies, to expedite the procurement process and change organisations to revolutionise our firepower capabilities by 2030.