CHINA'S ASAT TEST: IMPLICATIONS AND OPTIONS

K.K. NAIR

A military about-turn is a fairly tough albeit brisk manoeuvre. China demonstrated a classic turn at 22:26 hrs GMT on January 11, 2007, by abruptly reversing its two decade plus vociferous public stand on peaceful uses of outer space and quietly conducting an anti-satellite (ASAT) test in space. The test sent a variety of messages to nations across the globe and was greeted by general pandemonium and consternation. India's response was an uncharacteristic silence. Whether the silence was studied and deliberate or confused is not clear. What is amply clear is the fact that it took us entirely by surprise. The national media woke up over a week after the test and even now the issue doesn't get the attention it deserves. It is in the above context that a brief attempt to examine the ASAT test, assess its implications, response options and legal position in an Indian context is undertaken as below.

IMPLICATIONS OF THE TEST

China's ASAT was launched from or near the Xichang Space Centre to intercept and destroy an ageing Chinese FY-1C (FengYun/Wind and Cloud) weather satellite at an altitude of around 955-966 km. The type of ASAT vehicle used is yet to be conclusively identified. Most speculation rests around the vehicle being either a DF-21 (Dong Feng/East Wind) IRBM (intermediate-range ballistic missile) or a modified version of the DF-21 referred to variously as the KT-1 (Kaitouzhe/Pioneer) or KT-2. Apart from the type of ASAT, what is of

Wing Commander **K.K. Nair** is a Research Fellow at the Centre for Air Power Studies, New Delhi.

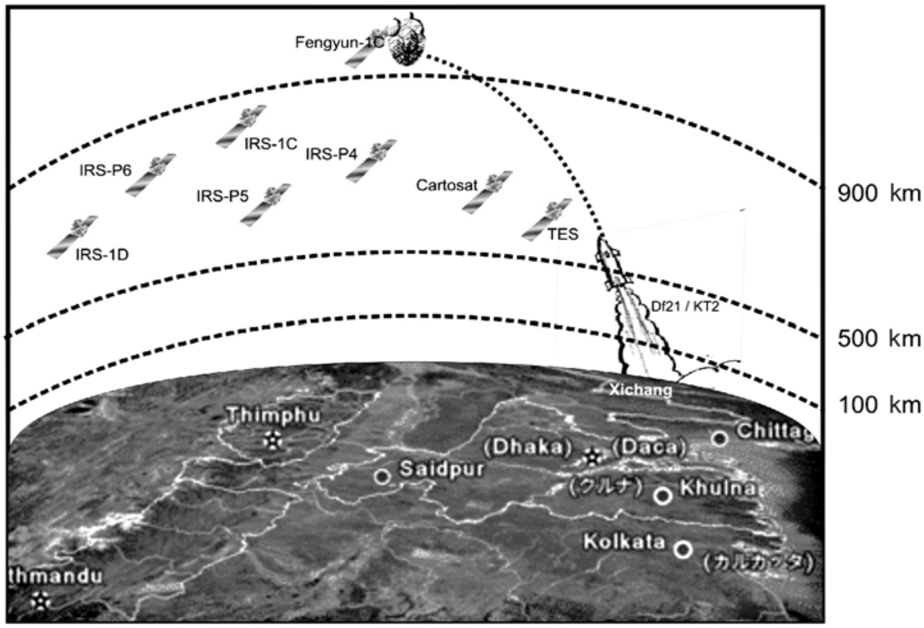
The obvious implication is that China has the capability to selectively destroy any or all of our observation satellites in low earth orbit (LEO).

significance in our context is the altitude of the target satellite. The target satellite was intercepted at an altitude of around 955-966 km, an altitude consistent with the operational altitudes of most earth observation and imagery intelligence satellites, including ours. As a matter of fact, ours are at a lower altitude compared to the FY-1C. Out of our 16 satellites in orbit, all seven of the IRS series are at altitudes between 600-900 km. This also includes India's one and only military satellite, the technological experiment satellite (TES). The obvious implication is that China has the capability to selectively destroy any or all of our observation satellites in low earth orbit (LEO). The less obvious implication is that China has also demonstrated the potential to target our satellites at higher geo-synchronous earth orbit (GEO) altitudes also.

Satellites in GEO, at around 36,000 km, cannot be attacked directly from earth and would need to be targeted from LEO. ASAT vehicles reaching up to LEO can be mated with larger boosters to attack satellites in GEO. China's ASAT test at LEO conclusively demonstrates its potential to target our INSAT series of communication satellites in GEO also. The threat obviously is not confined to satellites in LEO, but applies also to those in GEO.

Apart from the above which relate to the 'hard-kill' method of destroying satellites, China is also known to be sufficiently proficient in the 'soft-kill' method. Soft-kill deals with the use of lasers, high power microwaves, etc to damage, degrade or jam satellites and their links temporarily or permanently. Any laser for ASAT application must deliver at least 1 KW on target for 1 second dwell time to cause any significant damage; perhaps a lower power would do if the target is only the optical/IR (infra-red) sensor. To deliver this power on target through atmospheric absorption and distortions is normally not an easy job. Albeit, the same is very doable in China's case considering that since 1980, under its national 863 programme, China has been developing laser technologies with potential ASAT capabilities like free electron laser (FEL) and chemical

Fig.1: China's ASAT Test



oxygen iodine laser (COIL). As a matter of fact, prior to the ASAT test, in August 2006, China had reportedly "illuminated" an American satellite with a ground-based laser. Laser ASATs are an increasingly attractive concept since they afford the flexibility of damaging or degrading an adversary's satellite temporarily or permanently and also because in some cases, an adversary might not be able to detect and pin-point the cause of damage.

Thus, China's test has actually served to confirm long standing suspicions of its ASAT capabilities. The fact that a debris littering impact instead of a near-miss to warn potential adversaries was undertaken displays China's utter disregard for interests other than its own. As time progresses, the debris cloud would become bigger and disperse further. While India's military satellite is at a much lower altitude of 500-600 km and may not be affected, our civil satellites like the IRS P-6 with higher apogees at around 875 km would most certainly be affected. Further, in more general terms, in case of a conflict, crisis or contingency, with all of one military satellite, the impact on the military may not be incapacitating, but what would be crippled irrevocably would be

In case of a conflict, crisis or contingency, with all of one military satellite, the impact on the military may not be incapacitating, but what would be crippled irrevocably would be national morale and economic development afforded by our civilian satellites.

national morale and economic development afforded by our civilian satellites.

BALLISTIC BROUHAHA

Following the test, certain quarters have claimed that the tests were a predictable reaction to Chinese concerns regarding the US' ballistic missile defence (BMD) overdrive and space programmes, aimed at ensuring its global military reach and deterrence. Regardless of the merits and demerits of the pretext for the ASAT launch, the fact is that the test demonstrated China's capability to target US vulnerabilities and obtain an asymmetric advantage. The US' primary indices of power are its military and economic strength, both of which are heavily dependent on satellites and the same can now be threatened. China's "shot across the bow" would have a telling impact on US capabilities. With the bow out of commission, and a quiver full of observation, navigation satellites enabling global reach as well as BMD assets envisaged for defence against attacks from anywhere on the globe would not be of much operational use. The US' global military reach as well as global defence and deterrence capability enabled by space could be severely challenged, if not curtailed during conflicts or crises.

While China continues to be decades away from possessing any credible BMD capability, it has now the demonstrated capability to severely degrade the US' BMD capability. ASAT weapons of the type it tested may not be effective against incoming missiles, but can certainly degrade effectively the components of the BMD system. They could target the space-based sensors and tracking systems which effectively are the spine of the BMD concept. For example, the space-based infra-red system-low (SBIRS-low) envisaged at having 24 satellites in LEO to enable detection and tracking of missiles launched could be targeted and rendered dysfunctional.

The ASAT test demonstrated the potential to punch fatal holes in an already leaking ''BMD umbrella'' concept.

Thus, the ASAT test demonstrated the potential to punch fatal holes in an already leaking ''BMD umbrella'' concept. At the exo-atmospheric levels of over 100 km (62 nautical miles – nm), the ASAT test punched holes into the concept, and at the endo-atmospheric levels of below 100 km, the unstoppable barrage of Katyusha rockets during the Hezbollah-Israel conflict drilled holes into the concept. The BMD umbrella concept continues to be enormously desirable, but whether it is presently (or even in the near future) viable and vital to national defence is a moot question. It is in the above context that India's much hyped ''successful BMD test'' and claims of a "big step" in developing a viable BMD need closer rethink, examination, and perhaps some course corrections.

COMPARING THE CHINESE AND INDIAN TESTS

To begin with, India woke up late to the ASAT test and even a month later, reactions are at best muted or as put by a scribe "characterised by a confused silence."[1] As a matter of fact, certain sections in the media have attempted to belittle China's achievement and tried to hype India's "exo-atmospheric" BMD test of November 27 to a status almost at par with the US' BMD capability[2]. The underlying perception, hence, gaining currency is that China's ASAT test is no big deal, and by June 2007, India's anti-ballistic missile (ABM) capabilities would give it an advantage against regional rivals like Pakistan and China. The above is not correct at present and may not be so for at least a decade. At the same time, India's test is also no mean achievement but significant differences exist between China's ASAT and India's BMD test. Both the tests also aim at two different concepts and, hence, considerable differences exist at both operational and technological levels. The larger differences have been enumerated as below.

1. Quoting from S.S. Yadav, "Assessing Impact of China's Anti-Satellite Test on Indian Strategic Interests," *India Daily*, February 8, 2007.
2. See Vivek Raghuvanshi, "India Plans 2nd ABM Test in June," *Defense News*, January 29, 2007. As per the article, "DRDO sources said New Delhi intends to announce by June that its anti-ballistic-missile defenses are on par with those of the United States."

- Firstly, a difference of more than 800 km of altitude distinctly distinguishes China's ASAT test from India's "exo-atmospheric BMD test" at 50 km. While no clear-cut demarcation of atmosphere and space exists, in common parlance the Karman limit below 62 nm (or 100 km) is considered as ''endo-atmosphere'' and beyond 100 km as ''exo-atmosphere.'' Thus, while the Chinese intercepted their target in outer space or exo-atmosphere at over 900 km, the Defence Research and Development Organisation's (DRDO's) test at 50 km intercepted its target well within the atmosphere or endo-atmosphere at best. An entirely different set of laws of physics as well as technology apply in both cases. The mechanics of targetting orbiting satellites in outer space are patently different and more technologically challenging than intercepting missiles within the atmosphere.
- The next significant difference is the speed of intercept. In the case of China, the targeted vehicle in LEO had enormously high speeds of 7-8 km per second[3], whereas India intercepted its Prithvi missile travelling at a speed of barely 500 metres per second. To put the entire affair of high speed interception in perspective, it would be interesting to note that a bullet fired from a 9 mm pistol travels at a speed of 300 metres per second. Hitting a bullet with a bullet is no mean task, by extension, intercepting a missile travelling at 500 metres per second is also no mean achievement and interception of a satellite orbiting at 7,000-8,000 metres per second with a kinetic-energy ASAT is certainly an achievement.
- In addition, there exist significant differences in technology for conducting ABM tests in the exo-atmosphere. The interceptor vehicle would need an escape velocity of at least 11.2 km per second to escape the earth's gravitational force in addition to the other significant challenges of near real-time orbital surveillance, tracking, accurate homing and interception of targets in outer space or the exo-atmosphere.

In view of the foregoing, India's determination for ABM defence "even if it costs billions of dollars and international criticism"[4] needs a rethink. While BMD capabilities akin to the US' are certainly desirable, it might neither be affordable

3. Unlike in the atmosphere, the speed of a satellite in outer space is determined by its altitude and orbit. Satellites in LEO like the FengYun, our IRS series, etc orbit at typically high speeds of 7-8km per second.
4. Raghuvanshi, quoting an Indian Defence Ministry official in n.2.

nor prudent for India to spend billions of dollars on an untested concept with immature and unproven technology. Secondly, international criticism of the ABM concept is related to destruction of targets in space and consequent debris, space weaponisation concerns. India's stance (and, in particular the Indian Space Research Organisation's – ISRO's) on peaceful uses of space has served it well and, hence, inviting unwanted criticism with projects having uncertain results would not serve much purpose. The above is not to suggest dropping the entire ABM effort mid-way, but to undertake an interdependent balanced approach to the entire effort to bolster DRDO's prevailing isolated endeavour.

ASSESSING PAKISTAN'S BM AND ASAT CAPABILITIES

Nevertheless, a discussion on the subject would be incomplete without due consideration to Pakistan's capabilities and, hence, the same are briefly examined. China's proliferation of BM technology to Pakistan is well established. Pakistan's testing of BMs has acquired a predictable regularity in the last few months. For instance, since November 2006, every month has been witness to one or two consecutive BM tests by Pakistan for reasons best known to them[5]. In view of the same, a broad assessment of the capabilities of Pakistan's BM has been undertaken as below.

From the above rough estimates, it is apparent that extremely short ballistic missile early warning (BMEW) of the order of around seven minutes in the case of short range missiles like the Hatf-2 to twelve minutes in the case of long range missiles like the Hatf-6 would be available in which to take action to counter the threat of BM attacks. Secondly, the maximum apogees of beyond 700 km possible in the case of the longer range missiles also enable an incidental ASAT capability to Pakistan. Pakistan does not have the requisite levels of technological prowess for orbital surveillance, tracking, insertion and homing of the KE-ASAT onto satellites like the Chinese have displayed.

Nonetheless, it certainly possesses the capability to launch nuclear ASAT payloads with its medium range ballistic missiles (MRBMs.) Nuclear-ASATs

5. Pakistan tested the Hatf-5 and Hatf-4 on November 16 and 29, 2006, respectively. It followed it up a few weeks later with a Hatf-3 test on December 9, 2006 and a Shaheen-2 test on February 22, 2007. This was followed by another Hatf-2 test on March 2, 2007.

Table 1 : Estimating Pakistan's Capabilities

Name of Missile/ Original Version	Range/Class	Range Angle υ (rad)	Ballistic Phase Flt Time (Sec)[6]	Total Flt Time (Sec)	Max Apogee (km)
Hatf-2/ French Rocket (Dauphin)	500 km/SRBM	0.078	318	438	247
Hatf-3, (Ghaznavi) /Scud	290 km/SRBM	0.047	247	367	145
Hatf-4, (Shaheen-1) /M-11	750 km/SRBM	0.117	390	510	370
Hatf-5, (Ghauri) /Nodong-1	1500 km/MRBM	0.235	553	673	744
Hatf-5A(Ghauri-2) /Nodong-2	1800 km/MRBM	0.282	605	725	898
Hatf-6 (Shaheen-2) /M-18	2000 km/MRBM	0.313	638	758	997

would not need the same levels of advanced satellite surveillance that KE and other ASAT systems demand and, at the same time, could significantly damage satellites not hardened to withstand the radiation and electromagnetic pulse generated by nuclear blasts. On the other hand, the Outer Space Treaty (OST), 1967, bans nuclear weapons in space and such weapons would damage every satellite as well as the general environment and, hence, do not serve much practical purpose. All said and done, the capability does exist and the same may be used as a weapon of last resort. Hence, it would be essential to explore measures to contain, and attempt to prevail in spite of, the capability.

EXAMINING THE OPTIONS

Prevailing circumstances demand utilisation of the entire aerospace medium for

6. Flight time is for a flat earth approximation and derived as a function of distance and velocity. Total flight time has been approximated as 120 seconds, including 60 seconds of boost and 60 seconds for reentry.

an elementary ABM capability which would draw on the expertise, resources and assets, of the ISRO, the Indian Air Force (IAF) and DRDO and, at the same time, would neither be a drain on the public exchequer nor violate existing legislation on the use of outer space.

A balanced approach to the exploitation and distribution of resources available in the endo and exo-atmosphere would be essential for protection of national assets as well as for conventional military force enhancement. With regards to security and protection of national assets from threats using the realm of air and space, the technology and investment for a comprehensive and all effective BMD system would continue to elude us for decades in the near future also. Hence, it would be imperative to obtain a near-term solution which would suffice for the present and on which incremental progressions could be carried out in the future. The point is, a patchwork umbrella would be better than no umbrella and the patches could be worked and improved upon towards obtaining the envisaged leak-proof capability.

Exploiting the Aerospace Dimension for ABM Defence in the Near-Term

To begin with, a comprehensive aerospace surveillance capability is the bedrock of any capability for defending against threats from the vertical dimension. The prevailing system aimed at air space management as well as detection and tracking of only airborne threats like aircraft is clearly inadequate for threats of the new millennium. Aerospace threats of the new millennium range from passenger aircraft being rammed into buildings to high speed manoeuvring missiles to ASATs launched from ground and airborne platforms. A composite aerospace picture to enable detection and tracking of the wide variety of threats from the vertical dimension and consequently enable evasion or interception would be essential. Such an endeavour would

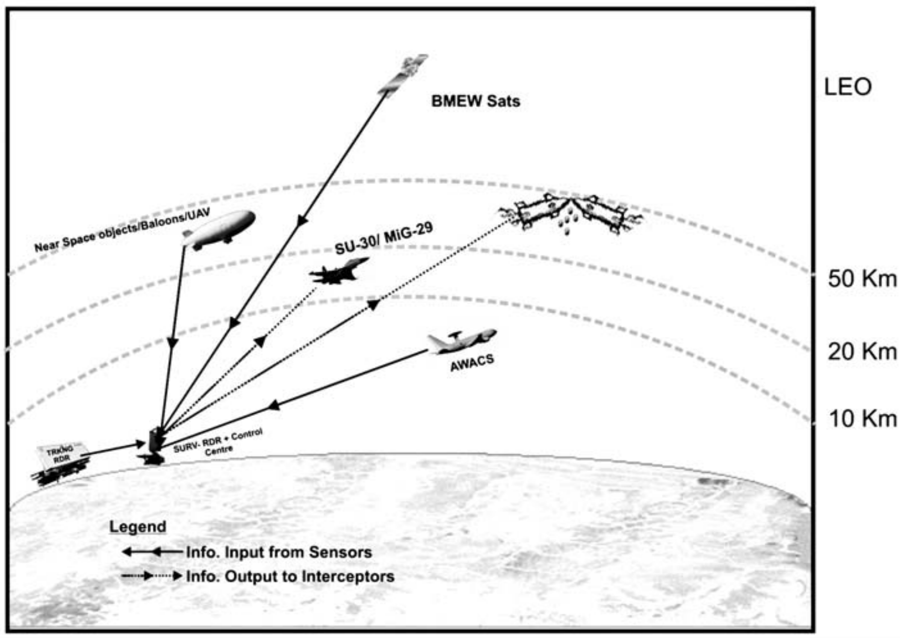
Aerospace threats of the new millennium range from passenger aircraft being rammed into buildings to high speed manoeuvring missiles to ASATs launched from ground and airborne platforms.

demand a cooperative approach wherein information from a variety of ground, air and space-based sensors would be made available. Such a picture could be obtained by fusing the information made available by sensors of the IAF and ISRO. For example, in addition to the information fed in by Green Pine tracking radars, information from sensors of the IAF like its ST-68 radars as well as modern surveillance platforms like the airborne warning and control system (AWACS) and BMEW satellites could also feed missile launch, detection and tracking information. The entire information could then be utilised for evasion or for interception of targets and launch pads with aircraft or missiles, etc, as the case may be. Conceptually, within the endo-atmospheric limits, interception of targets and launch pads by missiles and aircraft could be conducted with the available information.

Unlike the unproven and untested BMD concept, versions of the above concept had been operationally validated during the US' Operation Desert Storm over a decade ago. During the above operation, interception of tactical ballistic missiles was enabled by a combination of inputs from three BMEW satellites, AWACS and ground-based radars. The DSP satellites detected Scud missile launches within two minutes of a missile leaving its launcher, providing up to five minutes of warning time out of a total of seven minutes from launch to warhead impact. Additionally, the typical requirement of AWACS to detect small targets against cluttered background provided the incidental capability to detect missile launches. BMEW satellites, AWACS aircraft and air force radars could detect and pass on information on missile launches to fighter aircraft to destroy the launchers and their launch sites. The broad concept has been depicted pictorially in Fig.2.

In our case, radars of the IAF like the ST-68, THD-1955, etc have a certain amount of capability to track missiles, AWACS are on the anvil and since our BM threat is contiguous, a couple of BMEW satellites would suffice for detection and tracking of the BM. A satellite placed in GEO typically covers up to 35-40 per cent of the earth and the same would suffice in the near-term for persistent coverage of BM launch in our area of interest. A second satellite to cater for redundancy, greater accuracy of detection, cloud cover, etc could

Fig 2: The Aerospace Defence Concept



follow later on. BMEW satellites would almost immediately detect BMs on launch,[7] the enormous IR signature would also be detected by sensors on AWACS and the same could be picked up, compared and tracked by ground sensors like the aforementioned conventional surveillance radars spread across our borders as well as missile acquisition radars like the Green Pine. Overall, the challenges of defeating a BM attack within a short period of up to seven or twelve minutes would be enormous, but incremental refinements could be made to obtain a credible early warning for affecting an interception or mitigating a disaster. A multiple detection and tracking system on a variety of ground, air and space-based sensors would be accompanied by a variety of coordination and inter-operability challenges, but the system could undergo refinements over a period of time for optimal results.

Broadly assuming an ambitious scenario of BM launch detection and cueing

7. During Desert-Storm, the US' DSP satellites reportedly were capable of "identifying the likely target within 120 seconds of a Scud leaving its mobile launcher." Ref "Scud Warning," *Aviation Week & Space Technology*, January 21, 1991, pp. 60-61.

by BMEW satellites within 30 seconds, detection and augmentation of data by AWACS and other ground-based sensors in another 30 seconds, and transmission of data to control centres within the next 120 seconds, one is left with 187 seconds to decide, allocate and affect an interception in the case of short range tactical BMs like the Hatf-3. Hence, the obvious implication would be that response options for such short warning time would have to be either pre-determined or inherent and automatic in the ABM system.

Apprehensions of an accidental nuclear exchange due to an automatic response system would be largely unfounded in view of India's stated ''no first use" nuclear doctrine. Nevertheless, the possibility of averting an adversary's first as well as second nuclear strike would be more credible. By extension, a greater deterrence capability would accrue. The above would not contain the BM threat altogether, but would endow a formidable capability in the near-term. Defences against the Katyusha variety of rockets would continue to be a problem and could at best be met with a reciprocal barrage of missiles.

However, at the exo-atmospheric levels, the scenario is more promising. With regards the exo-atmosphere, the information on launch of vehicles carrying ASAT systems could be relayed to own satellites for undertaking evasive measures. In the near-term, critical information on launch of ASAT vehicles from the ground or air to enable manoeuvre and evasion measures to secure own satellites would suffice to counter China's ASAT capability. There exists a huge gap between technology demonstration tests and actual intercepts. The ASAT test was basically a deliberately designed collision of non-manoeuvring targets on known positions. Intercepting a target on an arbitrary orbit would be a much more technologically challenging and difficult proposition. The difficulty levels would multiply in the case of a target able to manoeuvre and evade the ASAT. Thus, China's ASAT capability could be effectively countered by manoeuvring own satellite out of the ASAT's path, provided timely information is available. Hence, in the foreseeable future, aiming at the capability to obtain information on ASAT launches and undertake evasive measures, while at the same time, attempting to destroy the launchers, whether ground or air-based, would be more prudent.

The imperatives of destroying airborne ASAT launch platforms would assume enormous significance in the near future in view of China's increasing interest and proficiency in developing air launched ASATs. China's planned development of *"airborne carrier* rockets" to enable mobile, flexible and fast launch of mini-satellites[8] would make it imperative to possess the ability to intercept the highly mobile and flexible airborne platforms prior to ASAT launch.

The imperatives of destroying airborne ASAT launch platforms would assume enormous significance in the near future in view of China's increasing interest and proficiency in developing air launched ASATs.

On the other hand, attempting to intercept ASAT vehicles in outer space would not only be beyond the scope of available technologies for a long while but would also amount to adding on to the debris in space and inviting international opprobrium, criticism, sanctions, etc. It would also conflict with India's stand on peaceful uses of outer space. India's needs for securing its assets in space and on earth as well as for conventional military force enhancement could be fulfilled within the scope of prevailing legalities and legislation on peaceful uses of outer space and, hence, it would be prudent to build capabilities within the same.

MILITARY USE OF SPACE WITHIN SCOPE OF EXISTING LEGISLATION

The term "peaceful uses" has not been legally defined in international law or any other space related treaty in vogue and constitutes a legal gray area till date. During the 13th session of the United Nations General Assembly, 1958, the term was used as an antonym to military and the common understanding was to avoid any military use whatsoever. However, by 1959, the US changed its legal position and interpreted it as meaning "non-aggressive" rather than "non-military". Accordingly, all military uses of space were permitted and lawful as long as they were non-aggressive. While the Soviets initially contested the interpretation, by 1960, they also adopted the same

8. For details on the development of airborne carrier rockets, see Ministry of Science and Technology of the People's Republic of China, Science and Technology Newsletter No. 366, dated May 10, 2004, at http://www.most.gov. cn/eng/newsletters/2004/t20041130_17766.htm

interpretation and the rest of the globe too accepted the interpretation. The prevailing interpretation, hence, is that non-aggressive military uses are peaceful. No nation has contested the interpretation till date and the same is in vogue.

Space-based systems aimed at military force enhancement like navigation, observation, communication, etc have no direct destructive capability, and, hence, are classified as non-aggressive. Most satellites enabling military force enhancement have no capability to interfere, damage, degrade or destroy, hence, are largely of a non-military nature. Civil and even commercial satellites enable military force enhancement in terms of communication, observation, etc. The above explains the legal non-military status accorded to navigation, observation, communication satellites, etc aimed at military force enhancement.

Based on the principles of non-aggression, ever since the first Sputnik was launched in 1957, the entire spectrum of dedicated military satellites aimed at military force enhancement was already in place within less than a decade. Towards the end of the decade, in 1967, by the time the OST was inked, both the Soviets and Americans had already developed ASAT capabilities for attempting to control the realm of space. The above explains why the OST in no way bans non-nuclear ASATs or anti-missile capabilities in spite of their aggressive nature. Thus, militarisation of space had occurred within the first decade of the Sputnik being launched.

Most of the legal framework, hence, attempts to restrict the weaponisation of space, which implies the placement of destructive capabilities, or application of military force from space or using the realm of space for military war-fighting, etc. Global weaponisation concerns have become more vociferous following the US' withdrawal from the ABM Treaty and embarking on endeavours like the transformational flight plan which aims at a whole range of products for space warfare ranging from air launched ASAT missiles to air and spaceborne lasers, hypervelocity rod bundles, etc. The law, hence, is circumvented by developing the aforementioned space weaponry which can neither be classified as nuclear weapons nor weapons of mass destruction (WMD) and yet is equally or perhaps, more potent.

VIEWING MILITARY UTILITY OF SPACE IN OUR CONTEXT

In our unique context, the aim is to use space for protection of our assets as well as conventional military force enhancement and not for military force application from the realm of space or for military manoeuvres in space or space-based war-fighting. Article 51 of the UN Charter codifies the right of self-defence in case of aggression and, hence, legalises the use of military force for self-defence against hostile action. Under the aegis of the above, self-defence measures like aerospace surveillance which have ''no direct destructive capability'' and yet enable a certain level of self-defence could be undertaken. The above would in no way militate against our established stance of peaceful uses of outer space and yet would be in sharp contrast to China which develops and employs ASATs, lasers, etc with ''direct destructive capability,'' thereby, causing debris and leading to '' space weaponisation''. Secondly, no treaty or legislation bans the use of navigational, communication, observation and other satellites aimed at enabling optimal utilisation of military force or "force-enhancement."

In our unique context, the aim is to use space for protection of our assets as well as conventional military force enhancement and not for military force application from the realm of space or for military manoeuvres in space or space-based war-fighting.

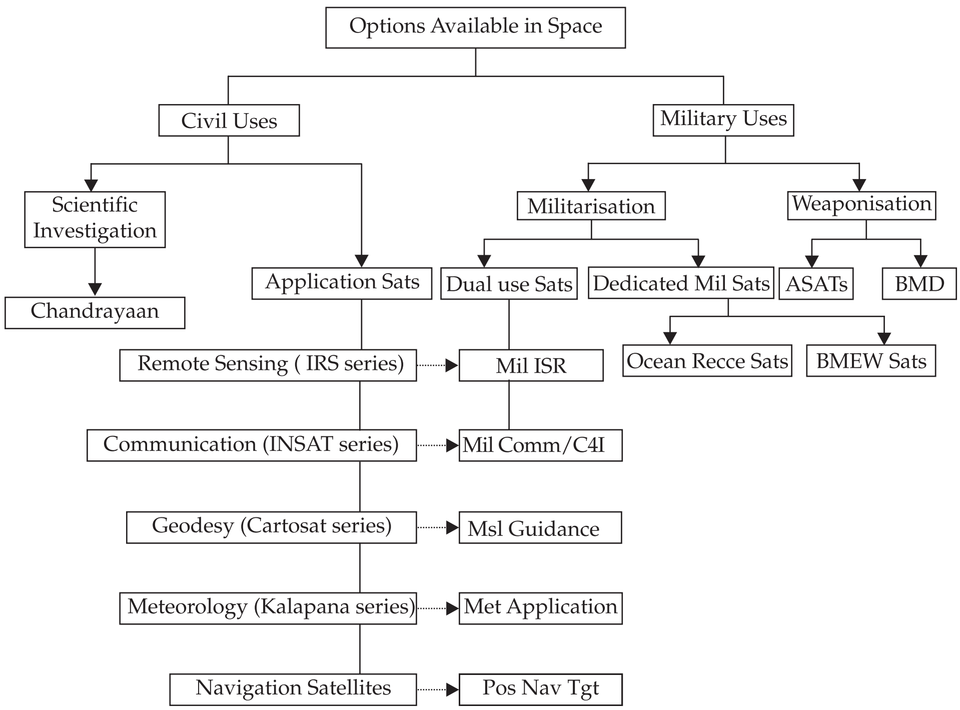
Thus, our envisaged military utility of space would in no manner violate existing space legislation and would be a continuation of our policy of peaceful use of space. As a matter of fact, the above suggested approach would enable us to fulfill our requirements without any question of stepping outside the realm of prevailing legislation on space.

Fig.3 would enable better comprehension of the militarisation and weaponisation aspects of space.

THE LEGAL POSITION OF CHINA'S ASAT TEST

As evident from Fig.3, China's ASAT test amounts to weaponisation of outer space and by no stretch of the imagination can constitute a ''peaceful use of outer

Fig. 3



space.'' Nonetheless, China's ASAT test has capitalised on the prevailing lacunae in outer space laws. Apart from international outrage caused by the debris, the test validated the fact that prevailing laws and legalities with respect to outer space are in need of dire reform. Most aspects ranging from the delimitation of outer space to the definitional issues surrounding "peaceful uses of outer space" are yet to be resolved in some acceptable manner. As a matter of fact, capitalising on the prevailing lacunae has become the norm rather than the exception. The Chinese have apparently capitalised on the legal lacunae of Article 4 of the OST-1967 which states that "...States party to the treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction......"

Thus, since the Chinese have neither used a nuclear weapon nor any other weapon of mass destruction, in strictly legal terms, the test violates no existing legislation. Secondly, the Chinese have destroyed their own Feng Yun satellite and, hence, cannot be charged under Article 7 of the OST which states that "...States are internationally liable for damage to another state (and its citizens) caused by its space objects..." Since no international property (space assets belonging to other nations) has as yet been damaged by the test, it cannot be charged under the same. The liability convention would apply in case of damage to property of other nations. The Chinese, in this case have destroyed their own property (to start with), but any other space assets getting damaged or degraded due to the consequent debris would cause the Chinese to be held accountable for their actions.

Nevertheless, the Chinese can be held accountable for not having fulfilled the provisions of Article 9 of the OST. Article 9 states that "States must conduct international consultations before proceeding with activities that would cause potentially harmful interference with activities of other parties....." In this case, the Chinese Academy of Launch Vehicle Technology (CALT) is responsible for the manufacture and design of launch vehicles and ballistic missiles. All space launch and tracking is controlled by the General Armaments Department (GAD) of the People's Liberation Army (PLA) and FY satellites are a product of China's Central Meteorological Bureau and the Shanghai Academy of Space Technology (SAST). All in all, the entire interception and destruction is a deliberate Chinese state endeavour. China is not known to have conducted any international consultation prior to the ASAT test which littered debris with enough potential to harm the activities of other parties with assets at the same or contiguous altitudes. Secondly, the premise that China underestimated the impact of harmful debris littering LEO is not plausible in view of the fact that in an earlier instance, on October 4, 1990, the upper stage of China's Long March 4A carrying a FY1-2 weather satellite had exploded, littering debris around the altitude of 880-895 km. Of

The Chinese can be held accountable for not having fulfilled the provisions of Article 9 of the OST.

the 84 pieces of debris catalogued on account of the above, up to 68 continue in orbit[9]. Thereafter, in 1995, China had joined the Inter Agency Space Debris Coordination Committee and, hence, the possibility of China having underestimated the impact and effect of the test is remote.

CONCLUSION

In view of the foregoing, it is now imperative that we take measures to secure our interests within the realm of our capabilities and legalities in vogue. The fact that we were blissfully unaware of China's ASAT test until the general pandemonium makes the matter even more serious. While a comprehensive ABM system would continue to elude us for a few more decades, a scaled down and yet effective system could be explored, and with due refinements, would serve our purpose. At the same time, it would be essential to develop capabilities within the scope of technologies, finances as well as legalities applicable to our unique context.

It is now imperative that we take measures to secure our interests within the realm of our capabilities and legalities in vogue.

To begin with, the recommendations of the 7th report of the Parliamentary Standing Committee on Defence presented to the 13th Lok Sabha on December 18, 2000, as well as the 14th report may be acted upon to track and protect our assets in space by forming an agency like the standing committee's recommended Aerospace Command under the Indian Air Force. Such an agency would be essential for undertaking comprehensive aerospace surveillance and for enabling development of a comprehensive framework for protection against the ever-increasing multitude of threats from air and space.

9. Debris figures sourced from NASA's Orbital Debris Programme Offices 13th Edition on "History of On-orbit Satellite Fragmentation," May 2004, p. 27, Table2.1