NDTV

Sun, 31 Mar 2019

Concerns over debris left by ASAT missile before ISRO's April 1 launch

When the PSLV is launched from Sriharikota, it will have to traverse through debris belt left behind by the anti-satellite (ASAT) missile test

By Pallava Bagla

Highlights

1. When PSLV is launched, it will have to traverse through the debris belt
2. On its part, before any launch, the ISRO does look out for space debris
3. India's anti-missile test has created a debris pile of some 300 pieces

New Delhi: Will India's recent test of the anti-satellite (ASAT) missile endanger the launch of the Polar Satellite Launch Vehicle tomorrow? The anti-satellite weapon launched as part of Mission Shakti created a new debris pile some 300 kilometres above the Earth.

When the PSLV is launched from Sriharikota, it will have to traverse through that debris belt where there would be a risk of collision.

Using a new rocket part of the ballistic missile defence system on March 27, India shot down the over-700 kilogram MicroSAT-R satellite at an altitude of 300 kilometres, creating a debris pile of some 300 pieces.

The whole operation was completed in three minutes after the killer missile was launched from Dr Abdul Kalam Island off the coast of Odisha by scientists of the Defence Research and Development Organisation or DRDO.

The big question that needs some introspection as the Indian Space Research Organisation (ISRO) gets ready for the PSLV launch is - what are the risks from this new debris that India itself has created? And does ISRO have a plan to mitigate this new threat?

Experts say that at 300 kilometres, the very high speed collision of two man-made objects would generate a lot of space debris and they would certainly come in the way of future launches at least for the next several weeks.

India is launching a satellite tomorrow, six days after the orbital collision. This too is another satellite belonging to the DRDO. Thus, there are concerns of whether the DRDO, by carrying out Mission Shakti, has endangered its own satellite called EMISAT.

"Yes, theoretically, that is right. But you should understand that today in space, millions of debris are floating around. Every satellite launch leaves anything between 100-150 fragments, they could be small bolts, they could be heat shields, they could be anything," VK Saraswat, former DRDO head and member of the government think tank NITI Aayog told NDTV.

"These fragments keep floating around because as soon as you get out of atmosphere, nothing comes back; it always remains there and keeps on revolving because it is at the same speed of the satellite. So when they keep revolving they have a tendency to come in the way of other objects that are going to be propelled. That is why internationally there is a programme today to remove debris as much as possible and India is a signatory to that," he said.

"Launching an anti-satellite missile does not create even 50 per cent of what we are doing while launching a large satellite, so it is not that we are going to increase by... suppose we have created 10 or 50 or 60 debris elements, one lakh or one million have become that much extra," Mr Saraswat said.

On its part, before any launch, the ISRO does look out for space debris and on this occasion it would be more vigilant. "Collision avoidance is a standard procedure and on this launch at Sriharikota we will be extra cautious," said Vivek Singh, ISRO assistant scientific secretary.

On several occasions when ISRO's collision avoidance team has detected a threat of debris coming in the path of the rocket as it lifts off from Sriharikota, the launch has been postponed by a few minutes to ensure that the vehicle gets a clear path.

To track space debris, recently ISRO put in place a special multi-object tracking radar at Sriharikota. In addition, Indian space scientists depend on public domain information on space debris and situational awareness made available by the American armed forces.

Under normal circumstances, using these sophisticated radars the ISRO monitors space debris over the space port and on this occasion, sources say they are going to take abundant precautions.

https://www.ndtv.com/india-news/concerns-over-debris-left-by-asat-missile-before-isros-april-1-launch-2015366

THE ASIAN AGE

Sun, 31 March 2019

Star wars an Indian reality?

With the successful test, India became the fourth country in the world with a demonstrated A-SAT capability

A-SATs (Anti-Satellite Weapons) are aimed at destroying or disabling space assets, whether military or civilian, offensive or defensive, according to a document of the United Nations Institute for Disarmament Research (UNIDIR). They are generally of two types: kinetic and non-kinetic

By S Chandrashekar, Rajaram Nagappa Ans N Ramani

On March 27, 2019 at about 11.10 AM IST a DRDO developed missile directly intercepted and destroyed an Indian satellite in Low Earth Orbit. The target of the test, the Microsat-R satellite, had been launched earlier on the PSLV C44 mission into a 275 km Sun Synchronous Orbit on the 24th of January 2019. The test occurred when the satellite was almost directly over DRDO'S Missile Test Range on Abdul Kalam Island from where the interceptor missile was launched. The test was very carefully planned to minimize the debris and may have required at least a year for execution. With the successful test, India became the fourth country in the world with a demonstrated A-SAT capability.

This development signifies a major shift in India's approach towards the military uses of space. Though India has had the building blocks of A-SAT technology for quite some time, India's space efforts were largely focused on civilian uses. This flexing of its space prowess after a prolonged period of ambivalence indicates that India will now use its space capabilities more proactively to protect its interests as an emerging power on the world stage. India seems to have woken up to the fact that the space domain can no longer be ignored in the fighting and deterrence of modern information-based wars. The growing US China rivalry especially in the Indo Pacific region has a significant space component. Space capabilities of these countries are direct contributors to their war fighting strategies and military doctrines. The A-SAT test suggests that India has recognized the spillover effects that this competition would have on the region and is prepared to use its space assets to negate and nullify them.

While the test was an unqualified technical success, does India possess all the capabilities to fight and win or deter a modern information based war using its space capabilities? A critical appraisal reveals many gaps in India's use of space based assets as a part of its military strategy.

One of the major requirements of an aspiring space power is Space Situational Awareness (SSA). Translated into simple English this means that India should be aware of all the satellites, debris and other objects that are in orbit around the earth. Any action that India needs to take is critically dependent on this knowledge. While India can track satellites that transmit radio signals, its capabilities to track objects that do not radiate signals is limited. For example it appears that India was unaware of the Chinese A-SAT test in 2007 for quite some time after the event. Ground based long-range radars, optical and laser ranging telescopes as well as space based sensors are needed to redress this balance. While some enhancements to SSA capabilities have taken place, India still has a long way to go.

The second major requirement for an aspiring space power is C4ISR assets in space. C4ISR stands for Command, Control, Communi cations, Computers, Intelligence, Surveillance and Reconnaissance. This term refers to the satellite based networked constellation of Electronic Intelligence (ELINT), optical and radar satellites that are linked with different Communications satellites to provide real time information to military units across a large geographic space. China has about 35 to 40 working Yaogan Reconnaissance satellites linked to a large number of Telecom and Data relay satellites in Geostationary Orbit that provide it with this capability. The US too has several dedicated networks that provide it with real time information over any geographic space. Though India has very successful civilian remote sensing and satellite communications programmes it lacks the capacities to build and launch a large number of C4ISR satellites. It also does not have an ELINT capability that is needed to cue other remote sensing satellites for tracking a moving target on the high seas.

In addition to SSA and C4ISR assets India also requires a number of other types of satellites. Navigation services, weather services as well as data relay services are all needed. Though capacities and capabilities exist they need to be augmented significantly to meet the expectations and needs of a modern space based military force. These requirements would need an approximately ten fold increase in satellite and launch vehicle building capacities. The support infrastructure and industrial capacities would also need to increase correspondingly. The creation of an Indian space industry that can build satellites, launchers and provide other products and services would also need significant augmentation. Technological changes have fundamentally altered the nature and character of modern war. The advent of nuclear weapons linked nuclear and conventional war. After the launch of Sputnik space also became linked to nuclear and conventional war. The nuclear, space, conventional and cyber domains of war are now inextricably linked with each other. Information is the glue that binds them together with space based information playing a critical role. These developments pose new challenges in the way military forces have to be organized, trained and deployed.

The US has been a pioneer in such organizational and institution building. Its current plan to set up a Space Force shows US determination to retain its dominant position in the world power order. China has recently re-organized its military into theatre commands who exercise control over the traditional services in their respective theatres. The elevation of the Rocket Forces into a separate service emphasizes the role of missile precision strike in its Anti Access Area Denial Strategy. The creation of a Strategic Support Force (SSF) to deal with space, cyber and electronic warfare that cuts across all theatres reinforces the role of information especially space based information in the fighting and winning of modern wars. This restructuring of their military forces has gone hand in hand with significant increases in technological and industrial capabilities and capacities. With 849 and 284 working satellites (a large number of which are military satellites) as of the end of 2018, the US and China are well placed to deal with the challenges posed by the emerging world order.

Whilst India can bridge the gaps in technologies, products and capacities with some effort, the more challenging aspect to deal with, is the re-organization of the armed forces to fight and win or deter an information based war. Individual silos like the Army, Navy or Air Force have to be combined together into a flexible joint force that can be suitably configured to deal with any situation. These organizational and institutional bottlenecks more than any technological or capacity gap is possibly the

biggest challenge confronting the country. The acceptance of the fact within military and political circles that the nature of war has changed and that we need to change as well is critical for achieving such a transformation.

Will the successful A-SAT test lead to such an outcome? Can India emulate the US and China by integrating its space and other military capabilities into a modern force that can fight and win an information-based war in its region. This more than any technological achievement such as an A-SAT or BMD test will determine whether Indian aspirations to become a major power on the world stage will become a reality.

(S.Chandrashekar, Rajaram Nagappa & N. Ramani are faculty at the International Strategic and Security Studies Programme, National Institute of Advanced Studies, Bengaluru)

https://www.asianage.com/360-degree/310319/star-wars-an-indian-reality.html

THE ASIAN AGE

Sun, 31 March 2019

‘Let’s have an international SSA alliance’

In view of India's international acceptability, there is a case for the country to take the initiative to establish a global SSA network

By Dr Ajay Lele

The anti-satellite missile test, carried out successfully by Defence Research and Development (DRDO) on March 27, has brought to the fore issues such as the need for an extensive network of space surveillance sensors, and facilities to acquire Space Situational Awareness (SSA) which countries like Russia, Japan, and China hold. Russia is in charge of International Scientific Optical Network (ISON) which provides global coverage. Such networks consist of phased array radars and optical telescopes that are geographically spread, mainly throughout the northern hemisphere. All these equipment together give some idea about what is happening in the outer space based on their observations. Systems like multi-facing radars which were originally designed to track and warn against incoming intercontinental ballistic missiles are also getting used. The SSN also consists of other radars and some optical telescopes. As compared to radars, which are mainly used for tracking LEO objects, ground-based telescopes are inexpensive and are used to track objects in the geosynchronous belt. India, too, has independent tracking networks in C-Band (for GEO missions) and S-Band (for LEO and launch vehicle tracking). However, all these systems have limited utility. The US agency has catalogued various debris, and attempt to trace their movement regularly. However, their infrastructure has much limitations and just cannot manage to track every piece of junk.

In view of India's international acceptability, there is a case for the country to take the initiative to establish a global SSA network. Such a network should consist of geographically disbursed network of optical telescopes and radars. No single country would be able to develop such facilities. Finanical issues would be an important aspect in such a project.

But more important, global cooperation must be forged between various nations in order to put radars and systems on their soil. Essentially, it going to a challenge for diplomacy. India has some experience in establishing global programmes like the International Solar Alliance (ISA). Now, as India has established itself as major space power through the A-SAT test, the time is opportune for India to take a global initiative like developing an International SSA Alliance.

https://www.asianage.com/360-degree/310319/lets-have-an-international-ssa-alliance.html

hindustantimes

Sun, 31 March 2019

US knew about India's Mission Shakti but didn't spy on ASAT test: Pentagon

Aircraft Spots, which monitors military air movements, had said that a US Air Force's reconnaissance aircraft from its base in Diego Garcia went "for a mission in the Bay of Bengal to monitor India's anti-satellite missile test"

Washington: The Pentagon has strongly denied the reports that the US spied on India's anti-satellite (ASAT) missile test by sending a reconnaissance aircraft from its base in Diego Garcia in the Indian Ocean to monitor the development.

It, however, said the United States was aware about India's first test-fire of an anti-satellite missile.

"No US assets were spying on India. In fact, the US continues to expand its enduring partnership with India, resulting in enhanced interoperability and stronger economic ties," US Defense Department spokesperson Lt Col David W Eastburn told PTI.

Aircraft Spots, which monitors military air movements, had said that a US Air Force's reconnaissance aircraft from its base in Diego Garcia went "for a mission in the Bay of Bengal to monitor India's anti-satellite missile test".

This was interpreted by many that the US spied on Indian ASAT test.

"I don't think that it implies coordination between India and the US," astronomer Jonathan McDowell from the prestigious Harvard-Smithsonian Center for Astrophysics told PTI on the Aircraft Spots report.

"This implies that the US intelligence community were aware of the test in advance because to some extent they're spying on India," he alleged.

"Everybody spies on their friends as well as their enemies. That's the way the world works these days. It would be surprising if the US were not detecting or observing the launch site and aware of activities preparing for the test. So one assumes that they knew it was coming," he claimed.

McDowell, who is a staff member at the Chandra X-ray Center and author and editor of Jonathan's Space Report, an e-mail-distributed newsletter documenting satellite launches, said he has not looked into the issue of the aircraft, but it is certainly not surprising that the US would fly a sensor aircraft to try and observe the test.

The Pentagon, however, strongly denied the spying allegation.

"It's a relationship so strong that no topic is off limits," Eastburn said.

"Both nations enjoy shared principles regarding our respect of sovereignty, free and fair trade, adherence to international norms, and peaceful resolution of disputes," he said.

Air Force Space Command Commander Lt Gen David D Thompson told lawmakers Thursday that the US was aware that India's ASAT test was coming.

"First of all, we knew it was coming because of flight bans that India had announced and information they published previously. The launch occurred at 1.39 AM EST," he told members of the powerful Senate Armed Services Subcommittee on Strategic Forces during a Congressional hearing.

"First of all, it was detected, characterised and reported by Air Force Missile Warning systems and Airmen at Buckley AFB. Immediately after the test (it struck the target vehicle), the Joint Space Ops Center and USAF 18 Space control Squadron began collecting information about the breakup of the vehicle," Thompson said.

Prime Minister Narendra Modi had on Wednesday announced that India successfully test-fired an anti-satellite missile by shooting down a live satellite, describing it as a rare achievement that puts the country in an exclusive club of space super powers.

The test made India the fourth country in the world after the US, Russia and China to acquire the strategic capability to shoot down enemy satellites.

https://www.hindustantimes.com/world-news/us-knew-about-india-s-mission-shakti-but-didn-t-spy-on-asat-test-pentagon/story-CeznLJO0C5ntCmKacVab2M.html

THE ASIAN AGE

Sun, 31 Mar 2019

A-SAT: Amid Modi brag, some key policy queries

The March 27 test does not square up with this position but represents a holistic turnaround

By Manish Tiwari

On March 27, 2019, Prime Minister Narendra Modi made a rather dramatic address to the nation. He announced that India had deployed an anti-satellite kinetic kill vehicle to neutralise a low earth orbit (LEO) satellite at an altitude of 300 kilometres.

The satellite in question was ostensibly the Microsat-R. It was launched on January 24, 2019. The Microsat-R weighs 740 kg and was in a 268-km-by-289-km orbit. Elaborating on its specifications, Gunter's Space Page states, "Microsat-R is an small Indian satellite built for the Indian military by the Defence Research and Development Organisation (DRDO), likely as a target satellite for A-Sat testing. The satellite has a launch mass of 740 kg and orbits the earth at a height of 274 km. Reportedly, it was built by a handful of DRDO laboratories, not by the Indian Space Research Organisation (ISRO). The satellite was destroyed in an A-Sat test on March 27, 2019 (confirmation pending)."

The fact that the test was conducted slam bang in the middle of an election and the manner in which the Prime Minister chose to address the nation raised a lot of eyebrows because the current NDA/BJP dispensation is not chary of using the national security paradigm as a political prop. As an aside in the minutes leading up to the Prime Minister's address there was both tittering and trepidation on social media with people asking whether they should run to the bank or the bunker. The references were obviously to the disastrous demonetisation proclamation by the Prime Minister on November 8, 2016, and the recent standoff between India and Pakistan post the Pulwama suicide bombing.

It is important to put the A-Sat test in perspective. India started developing a ballistic missile defence capacity 20 years ago - in 1999. An anti-satellite weapon is a part of that capacity. In 2011, India tested its interception capability by neutralising an incoming missile at an altitude of 16 km. Academics tracking the progress of the programme are of the considered opinion that between 2011 and now there have been six tests - five of them successful and one unsuccessful. The significant thing about these tests was that each time the altitude of the test kept increasing from the previous one by a height of 16 km.

It, therefore, would be completely incorrect to believe that this kinetic kill capacity emerged out of the blue on March 27 or, for that matter, the technology demonstration had been recessed by the previous UPA government. It was a simple case of a calibrated and graduated mastery over a complex technological process.

What, though, was a first was the manner in which the Prime Minister sought to take ownership of a two-decade-old programme in poll season by spinning it off as a personal achievement rather than a national one that spanned the tenures of several successive governments.

Also, there are deeper issues of space theology at play. The test represents a reversal of India's position with regard to militarisation and weaponisation of outer space.

As late as April 4, 2018, India had told the Conference of Disarmament in Geneva that it "believes that outer space should be an ever-expanding frontier of cooperative endeavour rather than an area of conflict. India, as a space-faring nation with wide-ranging interests in outer space activities, remained opposed to the weaponisation of outer space and support(s) collective efforts to strengthen the safety and security of space-based assets". The March 27 test does not square up with this position but represents a holistic turnaround.

V.K. Saraswat, head of DRDO, in 2012, had explained India's diffidence, if not aversion, to an anti-satellite test, saying: "We will not do a physical test [actual destruction of a satellite] because of the risk of space debris affecting other satellites." The fact that he has turned his earlier position on its head by now stating that the previous UPA government did not accord permission to carry out the test is logic-defying. Incidentally, the former national security advisor, Shiv Shankar Menon, has publicly contradicted Mr Saraswat. He said, "This is the first I have ever heard of it. Saraswat never asked me for permission for an A-Sat test." He added that while Mr Saraswat made an informal presentation, he did not seek any sanction or approval.

The more serious concern, meanwhile, is that there has not been enough public discussion about India's policy towards outer space as there was when we decided not to sign the Comprehensive Test Ban Treaty in 1996, or separate our civil and military nuclear programmes, as a condition precedent to the Indo-US nuclear deal. Should India go down the same path as the United States, China and Russia with regard to engaging and neutralisation of space assets? This is a question that India has not seriously asked itself. Only the US and China have piloted tests of anti-satellite systems against live targets in the recent past. In 2007, China was at the receiving end of pervasive international censure for neutralising a satellite at an altitude of over 800 km in low earth orbit. The test generated more than 2,000 pieces of debris, hundreds of which will remain in orbit for years to come.

In 2008, the US validated an anti-satellite competence when a US Navy Ticonderoga-class cruiser, USS Lake Erie, launched a Standard Missile-3 interceptor. The test revealed the similarities between ballistic missile defence interception technologies and those required to destroy satellites. Russia is evolving a new anti-satellite system known as the PL19, or Nudol. That weapon is yet to be verified against a live satellite target.

Finally, did the A-Sat test carried out by India go against the grain of the Outer Space Treaty of 1967 to which we are a party? An article of the treaty states: "The States Parties to this Treaty… Recognising the common interests of all humankind in the progress of the exploration and use of outer space, agree to the following: State Parties to the Treaty shall carry on activities in the exploration of space and use of outer space… in the interest of maintaining international peace and security."

Whether an A-SAT does that or not is a question that does not require a knowledge of rocket science to answer. It would, however, be only fair to add that the US, former Soviet Union and China have been the original offenders in this regard and in that order.

https://www.asianage.com/opinion/columnists/300319/a-sat-amid-modi-brag-some-key-policy-queries.html

THE ASIAN AGE

Sun, 31 Mar 2019

Next step, a soft kill capability

I don't see an immediate shift towards militarisation of space or the possibility of a space war, says Avinash Chander

On the significance (technological) of A-SAT test?

The capability to detect such a small object (measuring about a metre) in space in fraction of a second and to estimate the trajectory of the satellite and destroy it within a couple of minutes exemplifies the level of expertise we have achieved in DRDO.

On the way forward?

A lot more needs to be done in the domain of space like deploying sensors which help identify the threat and whether it is in the form of a civilian or military satellite, and take a decision on whether to jam the satellite, incapacitate its systems or destroy it as we did on Wednesday. We must also develop soft kill strategies like jamming with a high energy source like lasers from ground-based or airborne systems like an airship. All sorts of options are available but we must demonstrate that we are capable of meeting the threats. Most important, we must have an integrated defence response mechanism in place to review readiness of our defence systems at regular intervals, and take appropriate decisions on the method to be adopted to ward off the threat, either employing soft kill techniques or rendering the satellite inoperable.

On whether you put forward a proposal to the UPA government to conduct the test as you succeeded Dr V.K. Saraswat?

We continued our work on development of the interceptor missile and told the government that we could demonstrate the technology whenever required. We did not come up with a formal proposal to fire an interceptor missile at a satellite.

On the likelihood of deployment of weapons in space?

I don't see an immediate shift towards militarisation of space or the possibility of a space war. But it's better to have a deterrent so that no one attempts misadventurous activities, and that's the main reason why DRDO carried out the A-SAT test.

https://www.asianage.com/360-degree/310319/next-step-a-soft-kill-capability.html

indiaglitz

Sat, 30 Mar 2019

Anti satellite Mission Shakti Simplified

A highly confidential mission recently boldened India's name in the global defence map, when a missile made us the space elite. Than getting caught in the spiral of science, we have you covered on Mission Shakti, in 6 simple questions.

What?

By definition, a missile is a weapon with a detonating warhead, aimed at causing explosion at the target, which could be animate or inanimate. In practice, missiles are almost always aimed at disabling a moving target. The ballistic satellite in question is a weapon equipped to target and intercept an orbiting satellite in LEO (Low Earth Orbit) at a distance of 300kms (arguably more) from Earth's surface.

Who?

India is 4th at the finish line. USA had their first such test done as early as sixty years ago in 1958, closely followed by the USSR in 1964. China joined the elite peer in 2007, amid criticism and speculation. Russia thrusted up again, but a new type this time in 2018. Now on March 26th 2019, India has successfully tested Anti Satellite Missile, acronymed ASAT.

When?

At DRDO (Defence Research and Development Organization), this idea had made it to preliminary concept design in 2011, and was ready to be tested as of 2018. The missile finds its use in wartime space combat.

Where?

The BMD (Ballistic Missile Defence) satellite was launched from APJ Abdul Kalam island off Odisha, on 26th March.

How?

The Mission Shakti ASAT is a three-stage BMD satellite. By the guidance of radio signals (or, radar) from the ground station, the position of target satellite is determined. Upon launch, the ASAT travels to outer space. At the third stage, the guided missile locks its target, approaches and intercepts it, thereby causing the target satellite to fail communication with its corresponding ground station. The mission was tested on a now-defunct Indian satellite.

Why?

The existential question in the whole project is 'why'. War strategies a century ago could be termed primitive in comparison to the current warfare technology the world is equipped with. It is no more tooth and nail, sword and shield, guns and bombs. Like how navigation today is far more than a magnetic needle, war employs global positioning and satellite communication much more than normal imagination can quantify.

Controversies

With every progressive step, at least a dozen regressive remarks follow faithfully. When China test launched their ASAT, they were in headlines for the wrong reason - debris. However, space debris is most probably in the polar orbit (where, the Chinese ASAT was tested), due to the orbit's geometry. India has chosen the orbit with much more room, and has thus escaped this speculation; in fact, the satellite that blew up, is expected to burn out in Earth's atmosphere within 3 days from the attack. The USA has, however, come around subtly condemning the test, calling it a cause for "mess" in the space we all live. There are many other political and environmental critics, predominantly the former than the latter, who have brought their theories of why this test is unnecessary.

Indian defense is unwavered by such schools of thought. It has been publicly stated that testing ASAT is not a call for war; this is a test to gauge our capability and a ticket thereof to the elitist space club. On the lighter side, we just rid off a decommissioned satellite!

https://www.indiaglitz.com/india-anti-satellite-mission-shakti-simplified-news-232788

Sat, 30 March 2019

The Tejas Mark 2 fighter has been bulked up into medium fighter category

Repeated IAF demands for more capability likely to delay Mark2

By Ajai Shukla

The Tejas light combat aircraft (LCA), which was developed to replace the MiG-21/MiG-27 light fighters in the Indian Air Force (IAF), will not remain a light fighter much longer. Numerous additional capabilities demanded by the Indian Air Force (IAF) for the Tejas Mark 2, which is still on the drawing board, will increase the weight of the 14.5 tonne aircraft by three tonnes, into the 17.5 tonne medium fighter class.

"We now call the Tejas Mark 2 a medium weight fighter, or MWF", said a senior Tejas designer in a classified briefing in New Delhi on Friday, which Business Standard attended. Consequently, the Tejas Mark 2 is now being billed by the IAF as a replacement for the Mirage 2000 medium fighter, rather than the lightweight MiGs that are retiring soon.

Changes in defence equipment specifications demanded by the buyers – the army, navy and IAF – are partly responsible for endemic delays in developing indigenous weaponry. Hindustan Aeronautics Ltd (HAL) has cited the IAF's repeated changes in Tejas Mark 1 specifications as a reason for production delays.

However, this is probably the first time that user-driven changes are driving a weapons platform into an altogether different category.

The briefing explained that the transformation of the Tejas from a light to a medium fighter has taken place incrementally over the preceding decade. In 2009, the Tejas Mark 2 was sanctioned as a "re-engined" version of the Tejas Mark 1, with the current General Electric F-404IN engine replaced by a GE F-414 engine with higher thrust.

Tejas' changing goalposts

	Tejas Mark 1	Tejas Mk 2 (PDR-2014)	Tejas Mark 2 (2017)	Tejas Mark 2 (MWF-2018)
Engine	GE F-404	GE F-414	GE F-414	GE F-414
Length	--	500 mm longer	1000 mm longer	1,350 mm longer
All-Up Weight	13.5 tonnes	15 tonnes	16.5 tonnes	17.5 tonnes
Payload	3.5 tonnes	4.5 tonnes	5.5 tonnes	6.5 tonnes
Internal fuel	2,486 kg	2,672 kg	3,300 kg	3,300 kg

During the three years it took to buy the F-414 engine, the IAF kept demanding additional systems and improvements in the existing ones. By 2014, when the Tejas Mark 2's preliminary design review (PDR) was conducted, the aircraft fuselage design was stretched by half a metre and it became one-and-a-half tonnes heavier. Compared to the 3.5 tonnes of payload (mainly weapons and external fuel) envisioned in the initial design, the Tejas Mark 2 was now to carry 4.5 tonnes – one tonne more.

Meanwhile, the IAF and HAL conceived an interim fighter called the Tejas Mark 1A, with additional capabilities like an active electronically scanned array (AESA) radar and an advanced electronic warfare suite. By 2017, the IAF demanded all those capabilities and more in the Mark 2.

The 2017 Tejas Mark 2, therefore, became a full metre longer. With an all-up weight of 16.5 tonnes and a payload of 5.5 tonnes, it was already pushing the medium fighter border. The IAF also

demanded that it carry 3.3 tonnes of internal fuel, almost a tonne more than what was envisaged in 2009.

Last year, the Tejas Mark 2 transitioned fully from an LCA to a "medium weight fighter" (MWF). It will now be 1.35 metres longer and significantly broader than the original Mark 2, and will carry 6.5 tonnes of payload – more than double the original plan.

"The Tejas Mark 2 MWF is now required to have greater range and endurance. It will have 11 weapons stations, compared to the earlier seven stations and will carry weapons like the SCALP missile, and the Crystal Maze and SPICE-2000 guided bombs", said the Tejas designer.

An aviation analyst, speaking off the record, says these ambitious specifications would almost certainly delay the Tejas Mark 2 significantly, since the designers must effectively create a brand new aircraft by the target date of 2025. "The IAF has steadily moved the goalposts for the Tejas. This is only the latest example", says the analyst.

http://idrw.org/the-tejas-mark-2-fighter-has-been-bulked-up-into-medium-fighter-category/

STATE TIMES
THE BOLD VOICE OF J&K NOW IN DELHI

Sun, 31 Mar 2019

Govt initiated various schemes for benefit of womenfolk: Ruchi Chouhan Khan

Jammu: Deliberating in detail on women empowerment, women emancipation and rights of women in present era, the Director, Asian Roll Ball Federation, Ruchi Chouhan Khan said that the Government has initiated a number of schemes for benefit of womenfolk and highlighted various measures to avail benefit from aforesaid schemes. She was addressing a function organised by APJ Kalam Samiti International (APJKAI), as Chief Guest, at Trivandrum (Kerala). The function was held to present Women Achievement Award 2019 to Tessy Thosam.

The APJ Kalam Samiti International (APJKAI), with a separate wing to empower females and supported by ISRO, is in process to launch Dr APJ Kalam Samiti International Knowledge township and Dr Kalam Cancer Research Centre. The organisation has already hosted many National and International events and has the credential of inviting President of Maldives, Abdullah Yameen Abdul Gayoom in 2017; President of Ghana, Nana Akufo Addo in 2018, President of Mauritius, Paramasivum Pillay Barlen Vyapoory, besides many other Diplomats, Governors and CMs of various States in different events.

Tessy Thomas, the Director General of Aeronautical Systems and former Project Director for Agni-missile programme in Defence Research and Development Organisation (DRDO), is the first woman-scientist to head a missile project in India. She is known as the 'Missile Woman' of India. She joined DRDO in 1988 and was placed in the Department of design and development of new generation ballistic missile Agni. For Agni programme, she was appointed by Dr APJ Abdul Kalam. Tessy was associate project director of 3,000 Km range Agni-III project. She was the Project Director for mission Agni IV, which was successfully tested in 2011. Tessy was appointed as the Project Director for 5,000 Km range Agni-V in 2009. The missile was successfully tested on 19 April, 2012. She was appointed as Director-General, Aeronautical Systems of DRDO in 2018. Thomas has also received Lal Bahadur Shastri National award for her contributions in making India self-reliant in the field of missile technology.

http://news.statetimes.in/govt-initiated-various-schemes-for-benefit-of-womenfolk-ruchi-chouhan-khan/