

समाचार पत्रों से चयित अंश Newspapers Clippings

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नीति बदली, दशा बदलनी बाकी

मुकेश केजरीवाल, नई दिल्ली

देश की रक्षा ऐसा जिम्मा है जिसे पूरा करने के लिए आपको हर वक्त अधिकतम तैयारी रखनी ही होती है। यहाँ वह क्षेत्र है जहाँ आप रातों-रात बदलाव नहीं ला सकते। यहाँ किसी भी अहम खरीद की प्रक्रिया बहुत लंबी होती है। मोदी सरकार के दो साल के दौरान रक्षा खरीद को ज्यादा सक्रिय और पारदर्शी बनाने की कोशिश साफ दिखाई देती है। इसी तरह पहली बार गंभीरता से भारत के निजी रक्षा उद्योग को बढ़ावा देने की पहल होती दिख रही है। दशकों से लटके पेंशन (ओआरओपी) के मामले पर कदम उठा कर सैनिकों का मनोबल बढ़ाने की कोशिश भी हुई है। लेकिन साथ ही यह भी सच है कि दो साल बीतने के बाद भी सैन्य उपकरणों और हथियारों की उपलब्धता को ले कर सक्रियता ऐसी नहीं जिस पर संतुष्ट हुआ जा सके।

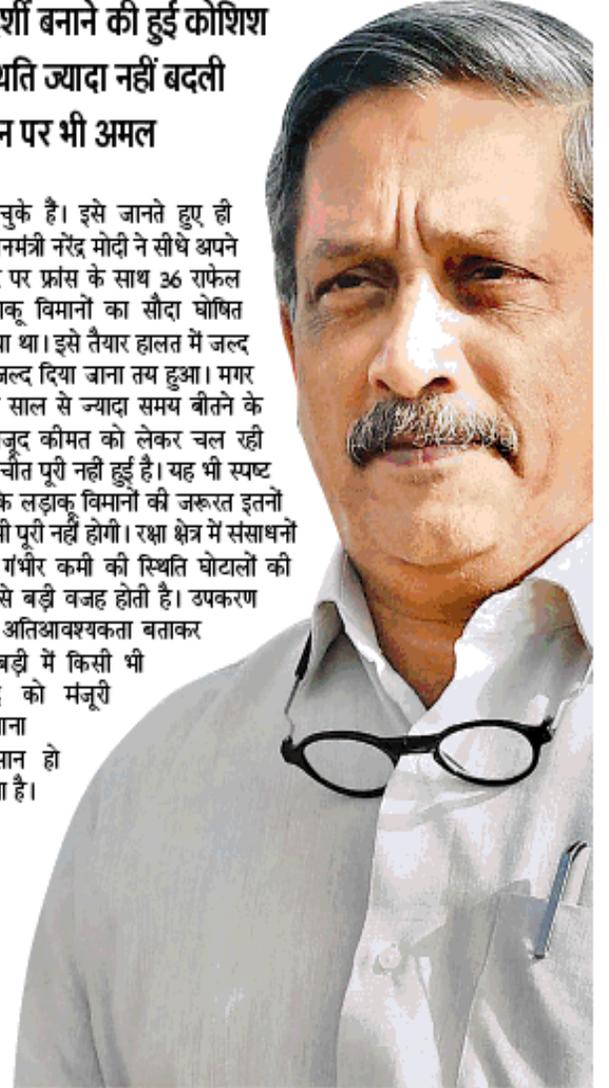
इस सरकार ने पिछले दिनों नई रक्षा खरीद प्रक्रिया (डीपीपी) घोषित कर न सिर्फ देश की सामरिक खरीद की प्रक्रिया को ज्यादा पारदर्शी और तेज रफतार बनाने की बल्कि रक्षा उद्योग संबंधी नीति को भी नई दिशा देने की कोशिश की है। वितीय अधिकारियों को विकेंद्रित किया गया है। साथ ही हर सौदे में सप्लायर के सबसे सस्ता होने की अनिवार्यता को खत्म किया गया है। दुनिया के सबसे बड़े हथियार आयातक के टप्पे को हटाने और रक्षा क्षेत्र में भारत के उद्योग जगत को भी व्यवस्थित रूप में बढ़ावा

- रक्षा खरीद को ज्यादा तेज और पारदर्शी बनाने की हुई कोशिश
- सैन्य उपकरणों की उपलब्धता पर स्थिति ज्यादा नहीं बदली
- पूर्व सैनिकों के लिए वन रैंक वन पेंशन पर भी अमल

देने की कोशिश भी इसमें है। लेकिन प्रधानमंत्री के 'मेक इन इंडिया' को इस भारी-भरकम क्षेत्र में उतारने की इस पहल में निजी कंपनियाँ तभी बढ़-चढ़ कर हिस्सा लेंगी जब वे प्रविष्य को लेकर आश्वस्त हों। उन्हें यह यकीन हो कि सरकार प्रोत्साहन भी देगी। भारत में ऐसे मामलों के साथ जितनी राजनीतिक संवेदनशीलता जुड़ी है, उसे देखकर इन नीतियों को लेकर हमेशा संदेह बना रहता है।

रक्षा खरीद में सिर्फ ईमानदारी और पारदर्शिता ही सब कुछ नहीं है। जरूरत के मुताबिक अगर साजो-सामान उपलब्ध नहीं हुए तो इस बात का कोई मतलब नहीं कि आपने कितनी ईमानदारी से काम किया, कितनी अच्छी नीतियाँ तैयार कर लीं और सौदे की रकम कम करवाने के लिए कितने प्रयास किए। पिछले साल अमेरिका के साथ 22 अपाचे अटैक हेलीकॉप्टर और 15 चिनूक हेवीलिफ्ट हेलीकॉप्टर का महत्वपूर्ण सौदा तय हुआ है। इस सौदे की खास बात यह रही है कि इसमें अमेरिकी कंपनी यह हेलीकॉप्टर उन्हीं दर पर देने को तैयार हो गई है जो वर्ष 2013 में तय हुए थे। लेकिन ऐसी बहुत-सी जरूरतों को लेकर स्थिति अब भी नहीं बदली है। वायु सेना के लड़ाकू बेड़े लगातार घटते हुए तय जरूरत से बेहद कम

हो चुके है। इसे जानते हुए ही प्रधानमंत्री नरेंद्र मोदी ने सीधे अपने स्तर पर फ्रांस के साथ 36 राफेल लड़ाकू विमानों का सौदा घोषित किया था। इसे तैयार हालत में जल्द से जल्द दिया जाना तय हुआ। मगर एक साल से ज्यादा समय बीतने के बावजूद कीमत को लेकर चल रही बातचीत पूरी नहीं हुई है। यह भी स्पष्ट है कि लड़ाकू विमानों की जरूरत इतनी से भी पूरी नहीं होगी। रक्षा क्षेत्र में संसाधनों की गंभीर कमी की स्थिति घोटालों की सबसे बड़ी वजह होती है। उपकरण की अतिआवश्यकता बताकर हड़बड़ी में किसी भी सौदे को मंजूरी दिलाना आसान हो जाता है।



चुनौतियाँ

- फ्रांस के साथ राफेल लड़ाकू विमानों के सौदे को जल्द अंतिम रूप देना
- सैन्य उपकरणों और हथियारों की उपलब्धता को लेकर सक्रियता जरूरी
- वायु सेना की जरूरतों को ध्यान में रखते हुए अन्य विमान के लिए सौदा
- बुलेटप्रूफ जैकेट से लेकर अन्य साजो-सामान की कमी दूर करना
- रक्षा क्षेत्र में निजी उद्योग के लिए अनुकूल माहौल तैयार करना
- लंबे समय से लटकी पड़ी स्वदेशी परियोजनाओं को पूरा करवाना

The LCA's 33-year journey far from tejas

By Dinesh Kumar

The Tejas LCA, India's indigenously developed light combat aircraft, which continues to be under development for the last three decades, is a compromised aircraft and has only 35 per cent indigenous components. The induction schedule has been revised several times from the initial 1995 deadline.

In Sanskrit, tejas, the name given to India's indigenously developed light combat aircraft (LCA), means brilliance. On May 17, Chief of Air Staff Air Chief Marshal Arup Raha announced that the Indian Air Force (IAF) would induct its first squadron of Tejas in July, while giving the thumbs up after flying its trainer version. Much as this news may seem to be “brilliant”, the fact is that this hugely delayed aircraft is yet to get its final operational clearance which is currently rescheduled for December this year. Worse, the Tejas Mark-I (Mk-I) is a heavily compromised aircraft with significantly reduced operational capability. Besides, the IAF's first Tejas squadron will comprise a mere four aircraft, that is one-fourth the normal size of a fighter squadron, which will be only high on symbolism and undoubtedly far from tejas (brilliant).

The LCA's long journey began over three decades ago in 1983 when the government sanctioned the project followed by the constituting of the Aeronautical Development Agency (ADA) in June 1984. In October 1985, the IAF issued its list of requirements needed in the aircraft with a demand for 240 LCAs, including 20 trainers to be inducted by 1994. The LCA was supposed to replace the ageing Soviet-origin MiG-21s, the mainstay of the IAF, which were then scheduled to be phased out in the 1990s.

Incidentally, the LCA was conceived just as the IAF was retiring India's first indigenously developed fighter — the Hindustan Fighter (HF)-24, also known as Marut. The government then did not consider it worthy to upgrade and develop further variants of the HF-24 which had been conceived in 1955, designed by a reputed German aeronautical engineer (Kurt Tank), first test flown in 1961 and which later saw action in the 1971 Indo-Pak war. Instead, this aerodynamically well-designed single-seat twin-engine but under-powered ground attack aircraft was retired in 1985. The ADA thus started from scratch.

The LCA, as is the case with all major defence research and development projects, is a mind-boggling case study of delays, slippages, compromise and mismanagement (despite some hard work) that continues till date. There are two other disconcerting realities about the Tejas. First, the aircraft is far from indigenous, with only 35 per cent made in India and 65 per cent components sourced from overseas (mostly American and Israeli), making it an import-dependent aircraft. In fact, every major component starting from the engine and flight-control system to armaments is of foreign origin.

Second, the Tejas Mk-I has significant shortfalls, with 53 waivers and concessions. These shortfalls include lower engine thrust, higher weight, limited fuel capacity in the absence of drop tanks, markedly deficient self-protection jammers which limit its electronic warfare capability and the absence of Radar Warning Receivers and Counter Measures Dispensing System to name a few. Neither are there any certified trainer aircraft to train pilots. This has reduced the aircraft's operational capability and survivability, thereby limiting its operational utilisation. Although these shortcomings are expected to be overcome in the Mk-II version currently scheduled to be completed by December 2018, it could, however, take longer to complete considering the track record.

Consider the following: The LCA's first flight was originally scheduled for 1991, only to be revised to 1996, 1999 and 2000, before being first test flown in January 2001. Similarly, the induction schedule

has been revised several times from the initial 1995 to 2003, 2005, 2008, 2010, 2012 and now 2018 (for the Mk-II), by when 35 years would have elapsed. In the meantime, owing to the inordinate delay in the development of the LCA, the government has already spent Rs 20,000 crore for upgrading 125 Soviet-origin MiG-21 Bis and 62 MiG-29 fighters, 61 British-origin Jaguar strike aircraft and the French Mirage-2000 even as the IAF's squadron strength has fallen from the sanctioned 42 to 33, with all MiG-23, MiG-25 and several MiG-21 squadrons having been retired.

There are several reasons behind the delay of the LCA. Apart from a period of post-May 1998 nuclear test sanctions, among the most notable has been India's inability to develop several key components which has necessitated design changes and purchases from overseas. This includes the failure to develop the Kaveri engine (started in 1989 with unending deadline revision to 1996, 2003, 2005, 2009, 2012 and currently unknown along with a cost escalation from the original Rs 383 crore to Rs 2,839 crore as of December 2009). This has necessitated a design modification each in the Mk-I variant for the American General Electric F-404 engine and in Mk-II for the F-414 engine.

The ADA was unable to develop the Multi-Mode Radar for tracking multiple targets (original deadline December 1997, with a deal for co-development with Israel finally signed in June 2009), the Flight Control System Actuators (currently American), Radome (British) and the Multi-Functional Display System (Israeli), among several other critical items. The IAF too ended up causing a delay of over seven years because it wanted changes in the armament: the Israeli R 73E close combat missile instead of the R-60; integration of the Israeli Derby and Python-5 beyond visual range missile; addition of the Russian 500 kg M-62 bombs; and a Counter Measures Dispensing System. Some of these features and armaments are yet to be incorporated in the Mk-I.

One hopes that the Tejas will not meet the same fate as that of the import-dependent "indigenous" Arjun tank which was conceived over four decades ago in 1974. Only 124 of the Arjun Mk-I are in service, while the Army still awaits the Mk-II. Clearly, the ADA with its 152 work centres engaged in developing the LCA needs to put in more tejas (brilliance) in developing the Tejas.

The Pioneer
25 May, 2016

The Reluctance of a Can-Be Great Power

When will the day come when independent, democratic and economically robust India learns to punch above its weight in matters of strategic security and defence preparedness? Governments have come and gone

Last week, two back-to-back book discussions on war and hard power passed off routinely when they ought to have attracted higher political and public interest and attention: After all, it is never too late to review past strategic errors and oversight which have cost India dear by allowing China into making India a military and economic laggard. The release of Air Vice Marshal Arjun Subramaniam's outstanding history of *India's Wars 1947-1971* was a landmark event, as the book is the first collective account of wars penned by a serving Air Force officer whose version was cleared by Government censors. The book is all the more striking because the official account of India's wars has been suppressed since independence by Governments led by the Congress, the BJP and the Third Front. The ruling NDA Government was expected to unlock the dark secrets of political and military failures but has chosen to maintain the veil of secrecy. Fortunately the BJP's MJ Akbar, the keynote speaker, made a candid observation: "Military history has not been made public because the political class is as afraid of its failures as it is of the military's successes."

The lack of knowledge and experience of defence and strategic security among the Indian political class was due partly to Whitehall retaining both as its exclusive preserve. Worse was its transforming civilian political control into bureaucratic control of the military without any accountability or responsibility. Jawaharlal Nehru's idealism coupled with Mahatma Gandhi's pacifism in a milieu of

missing strategic culture turned the British empire's greatest Army into a reactive and defensive force. The strategic mistakes of not preventing China's occupation of Tibet, proactively attempting to resolve the inherited disputed McMahon Line, and prematurely terminating the war in Kashmir by taking it to the UN, are still extracting a high cost.

The central question AVM Subramaniam asked about the strategic content of the wars was lost in the tactical details of war fighting. Except the 1971 war, where a synergised politico-military and diplomatic strategy underscored the 13-day lightning campaign, in other wars the strategic thinking was conspicuously absent. Reason: Since the political and military defeat in the high Himalayas, a passive and reactive mentality had taken root. Witness the unrequited parliamentary resolutions on Kashmir and the 1962 debacle focus on recapturing every inch of lost ground leading to defence fortifications around ditch-cum-bund and canal obstacles. Even 45 years after the great 1971 victory, the conventionally superior Indian military is flummoxed by Pakistan's wily employment of cross-border terrorism under a nuclear shadow, virtually paralysing a military response after the attack on Parliament and Mumbai. For the under-utilisation of the military are three reasons: Lack of political will, absence of higher political and military direction, failure to build a military edge with a killer instinct. On the other hand, India has flaunted strategic autonomy, eschewing military alliances and calibrated use of force. Strategic restraint and strategic patience are proclaimed as virtues.

The second book is Bharat Karnad's *Why India is Not a Great Power (Yet)*. Karnad is at his audacious, provocative and unconventional best and, therefore, the book is fun debating. He says there is no national interest, no national security strategy and no joint military doctrine document. The nub of his argument is that India lacks the software of hard power and is hobbled by resources: Small and inconsistent defence budgets, nascent military industry and rudimentary defence research and development. By contrast, India's space and nuclear programmes are world-class. By February 1964, India's secret nuclear programme had reached a nuclear weapons threshold, but Nehru dithered and did not test. Last week, the US State Department declassified a report noting that India had weapons grade plutonium to go nuclear.

Karnad argues that sequencing the rise of India as a great power through first becoming an economic power followed by developing military power is not tenable, as hard power must accrue in sync with soft power. The Chinese in their Four Modernisations had relegated defence modernisation to the fourth place — and, therefore, the yawning military capability gap with the US. In 1991, Finance Minister Manmohan Singh, while launching the economic liberalisation programme, had told the three Services they would have to make do with smaller budgets till the GDP growth rate took off. The consequences of that decision were felt during the Kargil war, when defence inventories for fighting even two divisions dried up. But for the SOS to Israel and South Africa, many more lives would have been lost on the Kargil heights.

Does India wish to be a great power, leave alone why it is not one yet? The US is keen to help India in becoming a great power in its own right. During UPA2, Congress president Sonia Gandhi and Prime Minister Singh literally shied away from the poser of India's great power status at a *Hindustan Times* summit. That the question was ducked by both tells us something: Great power status brings rights and responsibilities; India wants to be recognised as a great power but is unwilling to fulfil the accompanying responsibility.

Is the BJP-led NDA Government any different? In its first avatar, little was done to enhance the Military Order of Battle after the attack on Parliament. But it did cosy up to the US supporting ballistic missile defence, providing logistic assistance in Afghanistan and escorting US ships across Malacca Straits. After the nuclear tests, the Next Steps to Strategic Partnership with the US were completed by the Vajpayee Government culminating in the ten-year Defence Framework Agreement and the India-US Civil Nuclear deal with the UPA regimes. Then Defence Minister AK Antony was rather suspicious of the US. The Defence Intelligence Sharing Agreement of 2003 lapsed in 2008 and has not

been renewed. Similarly, the Defence Foundational Agreements have been languishing for more than a decade.

The Modi regime, despite having excellent relations with the Obama Administration, has failed to figure out how to leverage and optimise US defence technology support to upgrade its military capability. This week's US House Amendment enhancing defence and security cooperation with India could be a game-changer if New Delhi stops flip-flopping on its policy of balancing China. According to any yardstick, India is an under-achiever, when after independence; it was punching above its weight. Karnad's lament is that India is not a military Great Power, it under-utilises military strength, is outwitted by China, and if China can do it, why can't India. It has to get strategic to be a great power.

The Economic Times
25 May, 2016

Israeli Spyder Frontrunner for Army's Air Defence Needs

By Manu Pubby

Facing Compliance Issues Competitors from Sweden and Russia unable to perform during technical trials

The Israeli Spyder system has emerged as the frontrunner for an Army requirement for a fast reaction air defence cover against enemy aircraft and unmanned aerial vehicles. The Army's short-range surface-to-air missile (SRSAM) programme, which was started in 2011, is nearing final selection that will lead to a contract valued at over ₹18,000 crore.



Sources have told ET that the Spyder system -manufactured by Rafael Advanced Systems -is the frontrunner as its competitors from Sweden and Russia were not able to perform during technical trials carried out by the Indian Army that were concluded last year.

With both Rosoboronexport (Russia) and SAAB (Sweden) facing compliance issues, the Spyder missile system could go ahead for the next stage of procurement which is the opening of the price bid. The Spyder has already been ordered by the Indian Air Force and has been inducted to protect sensitive air fields along the border.

The Army's SRSAM project has, however, gone through several delays and hiccups and has been running for over five years now. The Army has separately ordered the Indian-made Akash SAM systems as well but these will be tasked mainly with protection of static or defensive units as they have limited mobility as well as a larger reaction time to an incoming attack.

While there is a push for additional Akash units for the Army from its public sector manufacturers, the SRSAM project is under a 'global buy' clause that would bring in work for the Indian private industry. The offsets involved in the project itself are valued at close to `6,000 crore, which would be invested into joint ventures and production facilities in India. The Army requires at least two regiments of SRSAM that would include as many as 1,800 missiles. It also requires the winning company to transfer technology to India to manufacture the system.

The Economic Times
25 May, 2016

Army's Short Range SAM System

What is a SAM?

It is a surface-to-air missile system that acts like a shield against attacks from the air.

The system shoots out missiles that take down any threats like incoming air craft, helicopters or UAVs.

1. Why the Indian Army needs the system?

The Army needs an agile SAM system that can be deployed quickly and transported easily .

The Indian Army needs the system to protect its vital resources, such as advancing tank columns, against enemy air attack.

2. Where can the Short Range SAM System be used?

It can be used either at static formations like area head quarters, or troop bases, or with moving Army columns. The Short Range SAM System is needed for both the eastern and western borders.

3. Why is SPYDER at the forefront?

Since 2011, the Army has been trying to procure an SR SAM system.

The Israeli Spyder has already been ordered by the Indian Air Force for protection and now, in the technical trials, it has performed better than the Russian and Swedish competitors.

4. Is there any such indigenous system?

The Army has the Akash system for a similar role, but it will be used mostly for static units. It needs a more agile, faster reaction system to protect troops advancing during a war.

The Economic Times
25 May, 2016

Army Vows to Hit Back at Manipur Militants

The Army has vowed to hit back hard at the militants who carried out an ambush that killed six Assam Rifles personnel in Manipur's Chandel district on Sunday. "In counter-insurgency operation it is a matter of initiative and opportunity. They have been able to get this opportunity but it is not long before we hit back and we will hit back very hard, "Lt Gen Abhay Krishna, General Officer Commanding of 3 Corps, said. The Army and Assam Rifles are running a combing operation to trace the militants in the deep jungles near Indo-Myanmar border.

India had to stave off Red Dragon to ink port agreement with Iran

By Sachin Parashar

Chinese Firms Were Eager To Invest There

India's commercial contract with Iran for development of Chabahar port has come not a moment too soon for the government. Notwithstanding its presence at Pakistan's Gwadar, where it has developed and acquired operational control of a port, China has also looked to invest in the development of Chabahar port.

WHAT MAKES THE CHABAHAR DEAL HOT

<p>Gives India strategic heft in region; helps it bypass Pakistan & build closer ties with Iran and Afghanistan</p>	<p>Offsets China's growing influence and reach in the region. China is heavily invested in developing Gwadar Port in Pakistan, of equal significance, some 100-odd km west of Chabahar as the crow flies</p>	<p>Chabahar Port route helps connect India with energy-rich Azerbaijan, Turkmenistan & other central Asian nations</p> <p>This route is 40% shorter, 30% less expensive than trade via the Red Sea-Suez Canal-Mediterranean route</p>	<p>WHAT INDIA MAY INVEST IN CHABAHAR</p> <ul style="list-style-type: none"> ▶ India will invest \$85m to build a container terminal & a multi-purpose cargo terminal ▶ On May 6, 2015, Union minister Nitin Gadkari signed MoU with Iran to complete this by Dec 2016 ▶ Iran wants Chabahar to be the third major hub for its petrochemical industries ▶ Indian private & public sector entities projected investment worth \$22b in the free trade zone area ▶ Chemicals, petrochem, steel, fertilizer are major sectors, besides Indian railways likely to invest
<p>Closer ties with Iran will allow Delhi to secure cheaper energy imports</p>			

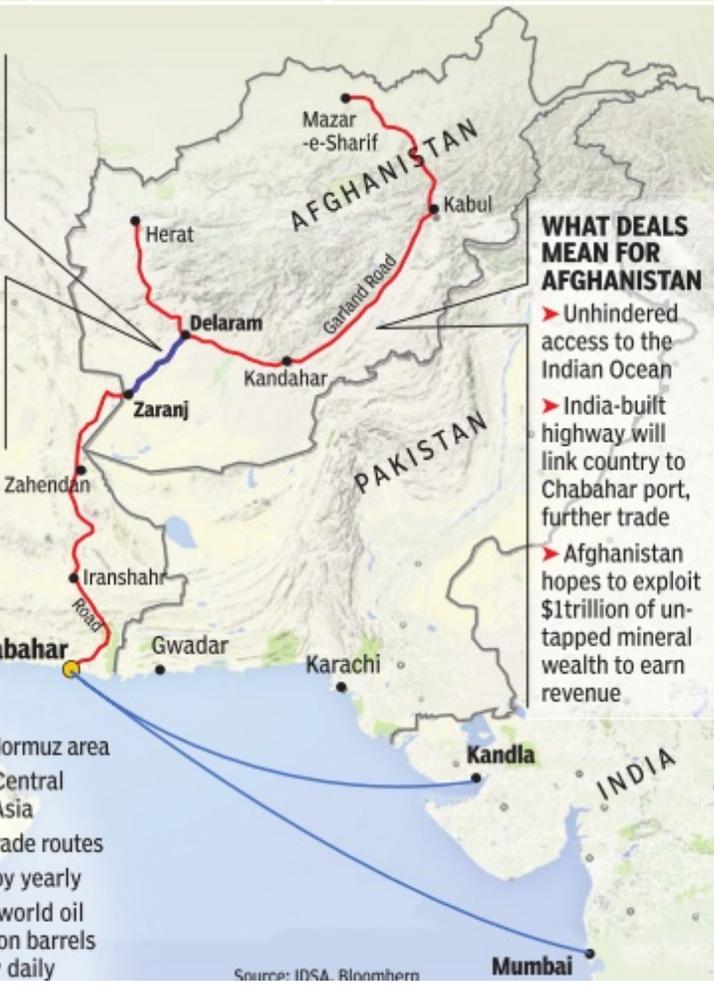
RUN-UP TO THE DEAL

In 2009, India built a **218 km long** (@\$100m) link road from **Delaram** in western Afghanistan to **Zaranj** on the Iran-Afghan border to **link up with Chabahar port**

Zaranj-Delaram highway connects with the 2,200 km two-lane metalled road network, known as the **Garland Road** that connects major cities in the country

WHY CHABAHAR IS CRUCIAL

- ▶ Sits at mouth of Strait of Hormuz area
- ▶ Connects three regions: Central Asia, South Asia and West Asia
- ▶ Junction of shipping, oil trade routes
- ▶ About 100,000 ships sail by yearly
- ▶ Region holds two-thirds world oil reserves; estimated 17 billion barrels of crude oil passes this way daily



WHAT DEALS MEAN FOR AFGHANISTAN

- ▶ Unhindered access to the Indian Ocean
- ▶ India-built highway will link country to Chabahar port, further trade
- ▶ Afghanistan hopes to exploit \$1trillion of untapped mineral wealth to earn revenue

WHY CHABAHAR IS CRUCIAL

- ▶ **Pakistan has been reluctant to allow Indian goods to pass overland through its territory**
- ▶ The project did not take off over US sanctions against Iran, but India has gone ahead now following lifting of the sanctions

Only last month, a Chinese consortium visited the Chabahar free trade zone and expressed interest in developing the port and also building an industrial town there. The head of the Chinese consortium

which visited Chabahar was quoted as having said that Chinese companies were eager to invest in the strategically located port and free trade zone.

This followed the visit by Chinese President Xi Jinping to Iran in January this year when the two countries mentioned in their joint statement development of ports as one of the areas where they could have tangible cooperation.

The inter-governmental MoU signed by union minister Nitin Gadkari last year for developing Chabahar was also seen as India's response to the interest shown in the Iranian port by China Harbour Engineering Company which runs the Gwadar port in Pakistan.

India had to move quickly in the past few months not just to sign the contract between IPGPL (India Ports Global Private Limited) and Iranian firm Arya Banader but also a confirmation statement between EXIM Bank and Central Bank of Iran confirming availability of credit up to Rs 3000 crore for the import of steel rails and implementation of India's Chabahar port commitment. According to Indian officials, the contract envisages India's investment and participation in the first phase of Chabahar port which involves development of two terminals and five berths with multi-cargo capacity. The contract also comes with specific timelines for its implementation.

India's desperation to seal the contract, in fact, also stemmed from Iran's own conduct in the past few months with Tehran seemingly playing both ends for a while. Even after India had signed the MoU for developing Chabahar last year, Iran's ambassador to India Gholamreza Ansari had warned that New Delhi needed to look at benefiting from business opportunities in Iran, once the international sanctions on Tehran were lifted, and not waste time in "cheap negotiations".

The Sistan and Baluchestan governor, Ali Osat Hashemi, hosted another Chinese delegation at Chabahar in October 2015 and announced that Iran would be glad to work with Beijing and provide it with lucrative business opportunities as it had always stood by Iran. He had said he would discuss investment possibilities in Chabahar with both China and Pakistan.

Any sizeable presence of the Chinese in Chabahar will be resented by India even as Beijing's presence grows elsewhere in Iran. Unlike India, Iran has welcomed China's Maritime Silk Road initiative and, compared to its annual trade volume of \$9 billion with India, Iran's trade with China stands at \$52 billion. According to many in the government, Chabahar is also important for India to break free from is often described as its strategic encirclement by China which not only controls the Gwadar port but has also restored its presence in Colombo and Hambantota in Sri Lanka.

The Hindu
25 May, 2016

President praises diaspora for improving Sino-Indian ties

President Pranab Mukherjee, who on Tuesday began a four-day visit to China, appreciated the work of the Indian diaspora here in developing Sino-Indian ties.

He was addressing a contingent of Indian citizens, persons of Indian origin and non-resident Indians at a reception organised here, the capital of southern China's Guangdong province.

The President said that the work of the diaspora, many of whom are engaged in various economic sectors, "has added new dimensions to the already expanding relations between India and China" and termed them "unofficial ambassadors" of the country. He prefaced his remarks by greeting Indian citizens as representatives of "a multi-party democratic system."

'Cardinal principle' - Mr. Mukherjee also said that the cardinal principle guiding India China relations has been the recognition that bilateral differences need to be reduced and ways to expand areas of agreement multiplied.

Both countries, he added, had managed to do so substantially — especially since the global financial crisis that was triggered in 2008 — by engaging each other in bilateral and multilateral fora.

Institutions such as G20 have seen greater engagement by India and China and these have been beneficial overall, the President said.

Recalling that India had welcomed China's inclusion in the World Trade Organisation in 1995, he said New Delhi had always welcomed engagement with Beijing in multi-lateral institutions.

Nuclear Suppliers Group - Mr. Mukherjee's visit to China — the first in his present capacity — comes at a time when Beijing has reiterated that India's inclusion in the Nuclear Suppliers Group is contingent upon the country signing the Nuclear Non-proliferation Treaty.

The Indian Express
25 May, 2016

Rafale deal: France rejects bank guarantee, awaits India's reply

The initial French offer for the 36 fighters made by Dassault Aviation was for around Euro 10.5 billion, following which the Indian side asked for a 30 per cent cut.

INDIA IS yet to respond, either verbally or in writing, to a letter sent to Defence Minister Manohar Parrikar on April 1 by his French counterpart Jean-Yves Le Drian, who made what is said to be the "best offer" his country can make in a government-to-government deal for 36 Rafale fighter jets, sources told The Indian Express.

The initial French offer for the 36 fighters made by Dassault Aviation was for around Euro 10.5 billion, following which the Indian side asked for a 30 per cent cut. The latest offer, made in the French minister's letter, is of around Euro 7.8 billion, said sources.

Days before the letter was sent, the French side had rejected an Indian request for a sovereign guarantee or a bank guarantee for the deal, and instead offered to provide a "comfort letter" from their prime minister.

As reported by The Indian Express on March 14, the law ministry had raised objections over France's refusal to provide any bank guarantees. Asked about Le Drian's letter, the defence ministry said it does not comment on ongoing negotiations between two governments.

Sources said there was "a significant difference" between the two offers. The original offer included a ten-year product support period, which has been brought down to five years, they said. The latest figure also does not include the cost of setting up infrastructure at two airbases for two Rafale squadrons, said sources.

The Pioneer
25 May, 2016

Torpedo Deal for Scorpene Scrapped

The Defence Ministry has scrapped a Rs 1,700-crore proposed deal for procuring torpedos from Finmeccanica for Scorpene submarines now under construction at Mazagon Docks Limited (MDL), Mumbai. The deal was put on hold in 2014 by the then UPA Government in the wake of AgustaWestland VVIP helicopter deal controversy. Finmeccanica, the Italian conglomerate is the parent company of AgustaWestland. The Government is likely to float a fresh global tender or request for proposal (RFP) to procure torpedos.

Disclosing this here on Tuesday, sources said Black Shark torpedo, manufactured by Whitehead Alenia Sistemi Subacquel(WASS), a subsidiary of Finmeccanica, emerged as the lowest bidder and

negotiations began in 2013 for fitting 98 torpedos on to six Scorpene submarines. Incidentally, the first submarine christened INS Kalvari is now undergoing final trials and expected to join service in September.

When asked how the Government proposed to maintain operational preparedness of the submarines in the absence of torpedos, Defence Minister Manohar Parrikar told a reputed national daily that “I will make the Scorpene functional. Don’t worry about it.”

Replying to another question whether the Government will go for ‘Make in India’ option, the Minister said there are other companies who can supply it. He, however, refrained from giving further details and said these issues could not be disclosed due to security reasons.

Given the urgency of the project, sources said fresh RFP will take time and the Ministry may go for Government to Government deal. This process entails that the foreign made torpedo finally selected will be backed by that Government instead of the vendor.

Germany’s Atlas Elektronik had emerged as the second lowest bidder and sources said at the time of technical trials there were some differences between the German manufacturers and the French firm building the Scorpene submarines in collaboration with MDL.

“However, it seems that the differences have been resolved now,” sources said adding that either a fresh tender could be placed or the Government may go in for direct purchase. If the issue is not resolved fast, the Navy would be inducting the first Scorpene submarine without its main anti-ship attack system.

The Times of India
25 May, 2016

Agusta chopper scam sinks torpedo deal

By Rajat Pandit

India will finally induct INS Kalvari, its first new conventional submarine in 16 years, by this December. But it will be a metal shark without proper teeth as the government has scrapped the long-pending Rs 1,200 crore proposal to buy heavyweight torpedoes from a subsidiary of Italian conglomerate Finmeccanica to arm the six new Scorpene submarines. Sources said defence minister Manohar Parrikar has directed officials to urgently look for “an alternative” to the ‘Black Shark’ torpedoes manufactured by Finmeccanica subsidiary Whitehead Alenia Sistemi Subacquel. The Navy was hopeful that a “special exception” would be made on the ground of “critical operational necessity” for the Black Shark torpedoes.

Global tender to be floated for torpedo

The Navy feels since Finmeccanica subsidiary Whitehead Alenia Sistemi Subacquel had emerged the winner over the Seahake torpedoes of German Atlas Elektronik GmbH in the selection process several years ago, the government will make a “special exception” to it. But amid the ongoing slugfest between BJP and Congress over the VVIP chopper scam, which revolves around Finmeccanica and its UK-based subsidiary AgustaWestland, Parrikar has directed “closure” of the procurement case for 98 Black Shark torpedoes. “The process will begin afresh, with a global tender being floated. Another option is to go in for a government-to-government deal to fast-track the acquisition,” said a source.

Heavyweight torpedoes are the primary stealth weapons of diesel-electric submarines to take out enemy warships and submarines, even though they also have some anti-ship or land attack missiles.

The Black Shark torpedoes were to arm the six French-origin Scorpene submarines being constructed at Mazagon Docks for Rs 23,652 crore. The project has been plagued by cost escalations and a delay of over four years, with the first Scorpene in the shape of INS Kalvari now likely to be commissioned by November-December. The other five will follow at nine-month intervals till 2020.

As reported by TOI earlier, INS Kalvari began its sea trials on May 1. After extensive dive, noise and other tests, it will be inducted with only the tube-launched SM-39 Exocet anti-ship missiles. It will have to wait for its main weapon to maintain stealth till the government procures the requisite heavyweight torpedoes.

Under the existing “partial ban“ imposed on Finmeccanica and its subsidiaries since August 2014, no fresh deal can be inked with the Italian conglomerate but ongoing contracts are allowed to continue.

Under this graded ban, all acquisition cases where Finmeccanica firms were declared as the L-1 (lowest bidder) after competition -like in the case of the Black Shark torpedoes -were to be kept on hold.“From being on hold, the project has now been scrapped, “said a source.

The Times of India
25 May, 2016

US Senate panel blocks \$300m aid to Pakistan

Ties between Washington and Islamabad Hit an All-Time Low Blockade to Stay till Defence Secy Certifies Action against Haqqanis

A US Senate panel has approved a legislation which blocks \$300 million US military aid to Pakistan unless the defence secretary certifies to the Congress that Islamabad is taking “demonstrable“ steps against the Haqqani terror network. The Senate Armed Services Committee -which renewed blockage of \$300 million coalition support fund to Pakistan subject to action against the Haqqani network when it passed the National Defence Authorisation Act (NDAA)-2017 last week -has, however, argued in favour of continuing security assistance to Pakistan.

“In recognition of the critical importance of the bilateral US-Pakistan relationship and the need for enhanced security and stability in Pakistan, the committee recommends a provision that would provide the secretary of defence the authority to reimburse Pakistan up to \$800 million in fiscal year 2017 for certain activities that enhance the security situation in the northwest regions of Pakistan and along the Afghanistan-Pakistan border,“ it said in a report.

“The provision would also make \$300 million of this amount contingent upon a certification from the secretary of defence that Pakistan is taking demonstrable steps against the Haqqani Network in Pakistan,“ the report said. Senate version of the NDAA differed with that of the House on many issues, including Pakistan. While the House version of the bill, which was passed last week, calls for blocking \$450 million of the \$900 million US aid to Pakistan in coalition support fund, the Senate version has reduced both the figures to \$300 million and \$800 million, respectively . NDAA 2016, which ends on September 30 this year, makes it mandatory for the defence secretary to certify that Islamabad is taking action against the Haqqani network for the release of last \$300 million of the coalition support fund to Pakistan.

Justifying drone strike against int'l law: Pak minister

Pakistan interior minister Chaudhry Nisar Ali Khan said on Tuesday that a US drone strike targeting Afghan Taliban leader Mullah Akhtar Mansour while he was on Pakistani soil was not legal. “For the US government to say that whoever is a threat to them will be targeted wherever they are, that is against international law,“ Khan said. US President Barack Obama said on Monday that Mansour had been killed in the drone attack, but Khan said on Tuesday that DNA tests were necessary to determine the identity of the badly charred body. ---©Reuters

Locky Ransom virus attacks 150 PCs in Maharashtra Mantralay

The Locky Ransom virus that has created havoc around the world has locked 150 computers in the revenue and public works departments of Mantralay. Though the information technology (IT) department with the help of experts has managed to control the virus, the threat still persists, as the Mantralay's computers are not completely secure.

The IT department has at present locked mailing sites like Gmail, Yahoo and Rediff to avoid external mailing through which the virus can hit the system again. "We are allowing only the official government mails so that the other computers remain safe. Also, we have upgraded the systems with three types of anti-virus software to make it more protected. Unfortunately, the Locky virus comes with an extension that has military encryption, which no one has been able to de-code so far in the world. But the damage is not huge which would have been the case if the virus was not detected in time," principal secretary of IT department Vijaykumar Gautam told this newspaper on Tuesday. He has been working on war footing for over a week to stop the damage to other computers and servers.

The Locky virus, when it enters a computer, locks the entire system and sends a message to the user to pay some amount in the form of bitcoins. It is used worldwide to harass big institutions for ransom hence the name Locky Ransom, the secretary said.

The virus was first detected earlier this year. Computer security firm Symantec, on its official blog, said it often comes disguised as an invoice.

The virus entered the Mantralay system around May 11 or 12 but was detected last Friday. The IT department suspected that it might have entered through spam mails that an user did not check properly and opened, or through a pen drive. The 150 systems in the Revenue and Public Works Departments got locked due to the virus.

Within 24 hours, the IT department managed to check its spread, and the government sought help from experts to avoid further damage. "Anti-spoofing block has been created to stop cloning of the official email ids that can confuse the user. The virus that entered the system must have come through email whose sender was not carefully checked," Mr Gautam said. Taking further strict measures, the secretary said that the IT department is going to lock the uploading and downloading of videos as it creates an opening for viruses.

The systems that have got locked due to virus are still under repair. "We have strong data back up so lost files can be retrieved," he added.

Let's Mooc

In a bid to support the Skill India and Sarva Shiksha Abhiyan movements, aisectmoocs.com has been launched as India's largest free online open learning platform. This Massive Open Online Course (MOOC) portal, launched by the Bhopal-based education group AISECT, will offer over 2,000 courses including school courses, skill courses and higher education courses. All courses on aisectmoocs.com will be free of cost.

For this initiative, AISECT has partnered with Ireland-based Alison, which is the global leader in free online certified skills training for the workplace with seven million registered learners and 800,000 graduates worldwide. All 750 plus diploma and certificate level Alison courses will be offered through the AISECT MOOC portal. Additionally, AISECT will offer courses on school curriculum as well as courses on higher education subjects. Initially, the course curriculum will be available in English and

Hindi but more regional language content will be added to the MOOC platform over the next few months.

Aisectmoocs.com offers a range of short-term courses in areas like digital literacy and IT skills, health literacy, financial and economic literacy, languages, personal development and soft skills, business and enterprise skills, beauty and wellness, retail, electronics, etc. The duration of the courses ranges from three hours to six months and students get an online certificate on successful completion of the course.

The Hindu
25 May, 2016

Solar storms may have seeded life

A young violent sun could have provided the energy to generate complex molecules, says NASA

Solar storms four billion years ago may have provided the crucial energy needed to warm Earth and seed life despite the Sun's faintness, new research has revealed.

Some four billion years ago, the sun shone with only about three-quarters the brightness we see today, but its surface roiled with giant eruptions spewing enormous amounts of solar material and radiation out into space. The eruptions also may have furnished the energy needed to turn simple molecules into the complex molecules such as RNA and DNA that were necessary for life, said NASA researchers.

"Back then, Earth received only about 70 per cent of the energy from the Sun than it does today," said Vladimir Airapetian, solar scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

That means Earth should have been an icy ball. "Instead, geological evidence says it was a warm globe with liquid water. We call this the 'Faint Young Sun Paradox'. Our new research shows that solar storms could have been central to warming Earth," he added.

Understanding what conditions were necessary for life on our planet helps us both trace the origins of life on Earth and guide the search for life on other planets.

A faint star

Until now, however, fully mapping Earth's evolution has been hindered by the simple fact that the young Sun wasn't luminous enough to warm Earth.

Scientists are able to piece together the history of the Sun by searching for similar stars in our galaxy. By placing these sun-like stars in order according to their age, the stars appear as a functional timeline of how our own Sun evolved.

It is from this kind of data that scientists know the Sun was fainter four billion years ago. Such studies also show that young stars frequently produce powerful flares — giant bursts of light and radiation — similar to the flares we see on our own Sun today.

Such flares are often accompanied by huge clouds of solar material, called coronal mass ejections or CMEs which erupt out into space. NASA's Kepler mission has found stars that resemble our Sun about a few million years after its birth.

Numerous 'superflares'

The Kepler data showed many examples of what are called "superflares" — enormous explosions so rare today that we only experience them once every 100 years or so. Yet the Kepler data also show these youngsters producing as many as 10 superflares a day.

While our Sun still produces flares and CMEs, they are not so frequent or intense. What's more, Earth today has a strong magnetic field that helps keep the bulk of the energy from such space weather from reaching Earth, the authors said. The research was published in the journal *Nature Geoscience*.

ISRO to test rocket that takes its fuel from air

“This technology aims to take oxygen from the atmosphere instead of carrying it all the way.”

After successfully testing a technology demonstrator of a reusable launch vehicle, Indian Space Research Organisation (ISRO) is planning to test an air-breathing propulsion system, which aims to capitalise on the oxygen in the atmosphere instead of liquefied oxygen while in flight.

“The mission to test the technology would be launched either in the last week of June or early July from Satish Dhawan Space Centre at Sriharikota. The mission would be on a sounding rocket,” K. Sivan, Director of the Thiruvananthapuram-based Vikram Sarabhai Space Centre told *The Hindu*.

Generally, vehicles used to launch satellites into space use combustion of propellants with oxidiser and fuel. Air breathing propulsion system aims at use oxygen present in the atmosphere up to 50 km from the earth’s surface to burn the fuel stored in the rocket.

Lower lift-off mass

“This system, when implemented, would help in reducing the lift-off mass of the vehicle since liquefied oxygen need not be carried on board the vehicle. This would also help increasing the efficiency of the rocket and also make it cost-effective,” Mr. Sivan said.

The new propulsion system, once mastered, would complement ISRO’s aim to develop a reusable launch vehicle, which would have longer flight duration. The system, involving the scramjet engine, would become crucial while sending up the spacecraft.

“This is like satellites making use of solar power. Likewise, this technology aims to take oxygen from the atmosphere instead of carrying it all the way,” he explained.

According to ISRO, the Dual Mode Ramjet (DMRJ), the ramjet-scramjet combination, “is currently under development, which will operate during the crucial Mach 3 to Mach 9 ascend flight of the launch vehicle.”

ISRO is now evolving and testing various technologies to bring down the cost of launch vehicles. The national space agency had earlier developed rockets that can send multiple satellites in a single mission.

ISRO’s new frontiers

With the successful launch on Monday of the first technology demonstrator of the indigenously made Reusable Launch Vehicle (RLV), the Indian Space Research Organisation (ISRO) has taken a baby step in building a vehicle that can be reused multiple times to launch satellites into orbit. The hypersonic flight, that lasted about 770 seconds from lift-off to splashdown in the Bay of Bengal, reached an altitude of about 65 km before re-entering the atmosphere at nearly five times the speed of sound. Many more such successful launches have to be undertaken before the RLV becomes a reusable launch system to put satellites into orbit. Some of the objectives of this week’s launch were to test the aero-thermodynamic characterisation of the vehicle with wings when it re-enters the atmosphere at hypersonic speed; the control and guidance system; the control system to land the vehicle at a specific location; and the hot structure, the basic body-carrying part of the vehicle with heat protecting tiles. The ultimate objective is to test the vehicle’s performance when it travels at a speed of Mach 25 using air-breathing propulsion. It will take 10 to 15 years, and several more launches, before ISRO readies a reusable launch vehicle for commercial use.

Building a fully and rapidly reusable launch vehicle will play a pivotal role in cutting down by as much as 80 per cent the cost of launching satellites into orbit. In fact, ISRO is already well-known for launching satellites at a far cheaper cost than other space agencies. Currently, the bulk of the launch cost comes from building the rocket, which can be used just once, as the rockets get burnt on re-entry into the atmosphere. No other space agency has reusable launch vehicles in operation, and ISRO has taken a lead in developing one. Learning from the mistakes of the U.S. National Aeronautics and Space Administration (NASA) in its space shuttle programme, ISRO will not use the same reusable vehicle to launch satellites and carry astronauts as it drastically reduces the payload capacity and thereby increases the cost per kg. ISRO will also use cutting-edge technology to shield the launch vehicle from intense heat to reduce, if not completely eliminate, refurbishment expenses. Getting this right would enable the vehicle to be reused within a very short span of time. If all works as per plan, ISRO should be able to break even after 25 to 50 launches, bringing down the cost of further launches on the same vehicle.

The Asian Age
25 May, 2016

Fresh satellites for Europe's Galileo sat-nav launched

Europe's Galileo sat-nav system, a rival to America's GPS, took a step closer to becoming operational with the launch on Tuesday of a fresh pair of satellites to join a dozen already in space.

Orbiters 13 and 14 blasted off on a Russian Soyuz rocket from Europe's spaceport in Kourou, French Guyana, at 0848 GMT as planned, according to a live broadcast by space firm Arianespace.

After a journey of nearly four hours, the pair should enter Earth orbit at an altitude of 23,522 kilometres.

"Up, up and away! An on-time liftoff for @Arianespace's medium-lift #Soyuz," the company tweeted.

Ultimately, the multi-billion-euro constellation is meant to comprise 30-odd satellites — the final number is yet to be determined — providing navigation and search-and-rescue services.

Another launch, this time of four orbiters on a single rocket, is expected to boost the constellation to 18 by year-end, allowing for Galileo to start providing usable signals.

More modern than the US Global Positioning System (GPS), Galileo's high-tech instruments should allow it to provide a more precise signal. But the project has been plagued by delays, technical glitches and budgetary difficulties.

The launch of the seventh and eighth orbiters in March last year was about three months late to allow engineers time to probe an August 2014 mishap which sent satellites five and six into a lopsided orbit.

That incident was blamed on frozen fuel pipes on the Soyuz rocket's fourth stage, called Fregat — a problem the European Space Agency (ESA) says has since been fixed. The first four, so-called In-Orbit Validation (IOV) satellites, were hoisted in 2011 and 2012.

In March 2013, the quartet managed to pinpoint their first-ever ground location with an accuracy of between 10-15 metres (32 to 49 feet).

However, the launch of satellites five and six — meant to have been the first fully operational Galileo constituents — was delayed by more than a year due to "technical difficulties".

This was followed by the mislaunch of orbiters seven and eight, which ESA says have since been nudged closer to their intended orbit, although their usefulness to the constellation has yet to be determined.

Another satellite dubbed IOV4, among the first four launched, has since developed antenna problems, according to ESA, but is still able to transmit on one frequency.

The space agency had initially hoped for early navigation services to be available from 2014.

Tuesday's launch, the seventh for Galileo, was a late addition to the schedule in a bid to speed up deployment of the project funded by the European Commission, the European Union's executive body.

The Economic Times
25 May, 2016

Lithium-air Batteries are coming soon

Scientists have discovered a new catalyst material which may lead to cellphone and car batteries that last five times longer than current ones. Kyeongjae Cho from University of Texas has found the catalyst materials for lithium-air batteries that jumpstart effort at expanding battery capacity. "Hopefully, this discovery will create momentum for further development," he said. Lithium-air batteries "breathe" oxygen from the air to power chemical reactions that release electricity, rather than storing an oxidiser internally like lithiumion batteries.

The Statesman
25 May, 2016

Going back and forth

By Tapan Kumar Maitra

The central purpose of mitosis is to separate two sets of daughter chromosomes and partition them into an equal number of newly-forming daughter cells. To understand the mechanisms that allow this to be accomplished, one needs to take a closer look at the microtubule-containing apparatus responsible for these events, which is called the mitotic spindle.

First, let's address the process by which the spindles assemble and attach to the chromosomes. The fact that the tubulin sub-units of a microtubule all face in the same direction gives them an inherent polarity; that is, the two ends of each microtubule are chemically different. The end where microtubule assembly is initiated — located at the centrosome for spindle microtubules — is the minus (-) end while the end where most growth occurs, located away from the centrosome, is the plus (+) end. Microtubules are dynamic structures, in that tubulin sub-units are continually being added and subtracted from both ends. When more sub-units are being added than removed, the microtubule gets longer. In general, the plus end is the site favoured for the addition of tubulin sub-units and the minus end is favoured for sub-unit removal.

During late prophase, microtubule-forming activity speeds up dramatically and the initiation of new microtubules at the centrosomes increases. Once the nuclear envelope disintegrates at the beginning of prometaphase, contact between microtubules and chromosomal kinetochores becomes possible. When contact is made between a kinetochore and the plus end of a microtubule, they bind to each other and the microtubule is thereafter known as a kinetochore microtubule. This binding slows down the depolymerisation rate at the plus end of the microtubule, although polymerisation and depolymerisation can still occur there.

The plus ends of the microtubules are embedded in the two kinetochores. Each kinetochore is a plate-like, three-layered structure made of proteins attached to CEN sequences located in the centromere's DNA. Kinetochores of different species vary in size. In yeast, for example, they are small and bind only one spindle microtubule each, whereas the kinetochores of mammalian cells are much larger, each binding 30-40 microtubules.

Because the two kinetochores are located on opposite sides of a chromosome, they usually attach to microtubules coming from opposite poles of the cell. (The orientation of each chromosome is random; either kinetochore can end up facing either pole.) Meanwhile, the polar microtubules make direct contact with those coming from the opposite centrosome. When the plus-end regions of two

microtubules of opposite polarity start to overlap, cross-linking proteins bind them to each other. Like the cross-linking between kinetochores and kinetochore microtubules, the process stabilises the polar microtubules. Thus, one can picture a barrage of microtubules rapidly shooting out from each centrosome during late prophase and pro-metaphase. The ones that successfully hit a kinetochore or a microtubule of opposite polarity are stabilised while the others retreat by disassembling. It was once thought that the process by which microtubules find a kinetochore was entirely random but recent evidence suggests that signalling molecules may help guide microtubules toward the chromosomes.

When spindle microtubules first become attached to chromosomal kinetochores during early prometaphase, the chromosomes are randomly distributed throughout. The chromosomes then migrate toward the central region of the spindle through a series of agitated, back-and-forth motions generated by at least two different kinds of forces. First, the kinetochore microtubules exert a “pulling” force that moves the chromosomes toward the pole to which the microtubules are attached. That force can be demonstrated experimentally by using glass micro-needles to tear individual chromosomes away from the spindle. A chromosome that has been removed from the spindle remains motionless until new microtubules attach to its kinetochore, at which time the chromosome is drawn back into the spindle.

The second force tends to “push” chromosomes away if they approach either spindle pole. The existence of this pushing force has been demonstrated by studies in which a laser microbeam is used to break off one end of a chromosome. Once the broken chromosome fragment has been cut free from its associated centromere and kinetochore, the fragment tends to move away from the nearest spindle pole, even though it is no longer attached to it by microtubules. The nature of the pushing force that propels chromosomes in the absence of microtubule attachments has not yet been clearly identified.

The Statesman
25 May, 2016

Changing tack in pathogen pursuit

By S Ananthanarayanan

Resistant bacteria and the growth of “super bugs” could convert even a simple surgery into a high-risk procedure and common infections could become as dangerous as they were before the discovery of antibiotics. A study in the UK has estimated that by 2050 antibiotic-resistant bacteria could kill one person every three seconds and cost the world trillions of dollars in economic loss.

Apart from uncontrolled use of antibiotics, the higher human population and increased communications that help resistant strains to spread have led to exponential multiplication of new bacterial forms. The speed with which bacteria are able to evolve has begun to outstrip the capacity of pharmaceutical research to come up with new drugs. In the context, a method to quickly assemble antibiotic molecules from basic constituents, which has been described in the journal *Nature*, may be the answer to the grim prospect of bacteria becoming progressively immune.

Ian B Seiple, Ziyang Zhang, Pavol Jakubec, Audrey Langlois-Mercier, Peter M Wright, Daniel T Hog, Kazuo Yabu, Senkara Rao Allu, Takehiro Fukuzaki, Peter N Carlsen, Yoshiaki Kitamura, Xiang Zhou, Matthew L Condakes, Filip T Szczypiński, William D Green and Andrew G Myers, at Harvard University, Massachusetts, report in their paper that they have built over 300 different molecules with antibiotic activity, including some that are akin to the antibiotic erythromycin, starting from basic components. Some of the variations are even active against bacteria that are resistant to existing antibiotics, the paper says.

The era of antibiotics started with the identification of penicillin by Alexander Fleming in 1928. He noticed that bacterial cultures were killed or their growth impeded by an accidental scrap of a fungal growth, or mould. Fleming was then able to show that the mouldy material was effective against a number of bacteria. This explained the use of mouldy bread, for instance, to help wounds heal, but

isolating the active agent, which was called penicillin, was challenging. It was only after the efforts by Howard Florey and others in 1939 that penicillin could be used as a drug and research efforts during World War II led to methods of largescale production. A number of other penicillin-like antibacterial substances have since been discovered and antibiotics are now the mainstay of surgeons and physicians.

The way antibiotics act is that their complex molecular structure has portions that are able to attach to specific parts of the exterior of a bacterium, and hence to suppress its life processes or impede its action. Specific antibiotics are then able to deal with specific pathogens or a class of bacteria without serious effects on the body processes of the infected person. The actual antibiotic molecules, however, are too complex to fabricate and need to be formed by bacterial action or fermentation of complex, biological starting materials, a process known as semisynthesis. Modifications are still necessary for the substance to have the desired antibacterial effect, and these are carried out using chemical means.

The process is painstaking and involves first treating the molecule so that its major portions are protected, carrying out the change in the target portion and then uncovering the protected parts. Manufacture in quantity, after this, is again through biological processes.

Just as antibiotics need special structural features to be useful, bacteria are also sensitive to antibiotics on account of their own specific surface features. Hence, if a bacterium evolves, by chance mutation, to change those specific surface features, the strain of the bacterium could be as effective in causing disease as before, but immune to some antibiotics. This is the mechanism by which resistant strains of bacteria arise and indiscriminate use of antibiotics in low doses can result in the resistant proportion dominating the population.

Scientists then need to get busy trying to make changes in the structure of available antibiotics to restore effectiveness against the bacterium. This has generally been possible using sophisticated methods to identify the changes needed and then the complex chemical procedure. In this way, with many trials and experimentation, a new antibiotic to deal with the resistant strain can be developed from the previous version of the antibiotic.

With many rounds of such modification, however, and also rapid changes in the features of bacteria, this process has started getting more difficult or the changes required are not feasible. The rise in human population brings about a crowding of hosts and greater mobility of bacteria. International travel and trade also facilitates the transport of bacteria and a resistant strain is easily able to spread over a wide area and establish itself. The numbers of resistant strains of bacteria have thus started increasing. In 2013, the number of new cases of multi-drug-resistant tuberculosis reported was 480,000. Extensively drug-resistant tuberculosis, which needs longer and less effective treatment, has been identified in 100 countries. And the trend with many other infections and diseases is the same. The World Health Organisation has, hence, approved an emergency global plan to combat antibiotic resistance and the bleak forecast for 2050 put out by the UK-based study.

Antibiotic assembly

The Harvard University researchers have gone about creating modified antibiotics by a different route. They took on the synthesis of a group of antibiotics called Macrolides — whose structure includes the large ring in the left half of the Erythromycin molecule, which is shown in the picture. To this ring are attached different chemical groups, to give rise to different Macrolides, a section of which are antibiotics. Building this structure in the laboratory has not been feasible, and the route to macrolide antibiotics has been only through biological templates.

What the Harvard researchers did was to split the Macrolide molecule into eight different modules, or building blocks, as shown by the different colours in the picture, and undertook only the task of synthesising the simple modules. When dealing with simpler modules to create the Macrolide ring, it is also relatively easy to attach the different chemical groups that we may like to have in the final

molecules. When the building blocks were ready, the researchers carried out seven key coupling manoeuvres to progressively link the modules together, as shown in the picture. This process sidestepped the difficulties in the conventional way of building the Macrolide molecule, where most attempts failed while creating the ring structure.

The variety of chemical groups that can be attached to the separate portions of the final molecule, and also the process of linking the parts together enable a very high degree of variations. The Harvard group was, hence, able to create over 300 variations of the Macrolide structure, as candidates for development as useful antibiotics. One was the antibiotic, Solithromycin, which is currently produced by carrying out 16 modifications to Erythromycin, the papers says. Three hundred and five of the Macrolides created were tested against a panel of pathogens, including well known and notorious antibiotic resistant bacteria. Most of the Macrolides showed promising potency, the paper says.

The work done is hence a platform for creating an unequalled variety, with simple permutations of the components of Macrolide antibiotics, for experimentation and synthesis if found useful. There would be need for more study of the side effects and effectiveness of these Macrolides in use as a drug, but the industry now has a starting point that is most of the way to the finishing line, the paper says. Finding similar ways to synthesise other naturally occurring antibiotic families would be a logical sequel, it adds.

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लाइब्रेरी कल्चर बढ़ाने के लिए चलेगा अभियान

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■ **नई दिल्ली :** अध्ययन के प्रति लोगों की घटती दिलचस्पी को देखते हुए केंद्र सरकार ने लोगों में पढ़ने की आदत को बढ़ावा देने की योजना बनाई है। इसके लिए केंद्र सरकार देश में पब्लिक लाइब्रेरी की अवधारणा को लोकप्रिय बनाने के लिए एक अभियान चलाने की योजना बना रही है।

इसके मद्देनजर संस्कृति मंत्रालय आगामी 27 मई को दिल्ली के तीन मूर्ति भवन में एक राष्ट्रीय आयोजन करने जा रहा है।

आयोजन का मकसद देश में लाइब्रेरी कल्चर को फिर से जागृत करना है। मंत्रालय



की योजना यह भी है कि देश में नैशनल लाइब्रेरी मिशन के तहत मॉडल लाइब्रेरियों की शुरुआत की जाए। लाइब्रेरी कल्चर को फिर से पुनर्जीवित करने के लिए लाइब्रेरीज के निदेशकों व लाइब्रेरियंस के साथ मिल कर मॉडल लाइब्रेरी की रूपरेखा पर चर्चा की जाएगी। इस आयोजन का एक अन्य मकसद लाइब्रेरियों के संचालन में आ रही चुनौतियों और उनके समाधान पर विचार-विमर्श करना भी है। मंत्रालय से जुड़े सूत्र का कहना था कि टीवी, इंटरनेट, ई-बुक जैसी चीजों ने लोगों को किताबों से दूर किया है। ऐसे में लोगों को दोबारा किताबों से जोड़ने और पढ़ने की रुचि बढ़ाने के लिए माहौल बनाना पड़ेगा।