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‘Can’t fight tomorrow’s war with yesterday’s weapons, incorporate AI’: DG Artillery

Several scientists from the Armament Cluster of the DRDO, representatives of the industry and students are attending the conference in Armament Technology in Pashan, Pune.

“Tomorrow’s wars can’t be fought with yesterday’s technology,” said Lieutenant General P K Srivastava, Director General of the Artillery of the Indian Army, and urged the Armament scientists of the Defence Research and Development Organisation (DRDO) to delve more into Artificial Intelligence for future warfare. Lt Gen Srivastava, who is also the Colonel Commandant of Regiment of Artillery of the Indian Army, was speaking at the inaugural ceremony of the two-day National Conference on Advances in Armament Technology (NCAAT 2018), which has been organised at Armament Research and Development Establishment (ARDE), a DRDO laboratory located at Pashan in Pune.

Several scientists from the Armament Cluster of the DRDO, representatives of the industry and students are attending the conference. “There is a need for us come out of the concepts on which we are fixated... the world is changing. We live in one of the worst neighbourhoods. If we have to become a power of reckoning, we will have to possess a weapons systems of the future. We can’t be fighting tomorrow’s war with weapons from yesterday. Right now, we are building weapons of yesterday, with more and more efficiency. To build weapons of tomorrow, we need scientists, who know warfare, and we need soldiers who understand technology.” He added, “Whatever weapon systems we are developing, we should embed artificial intelligence. If that happens, we could look at missiles that are completely automated. We need weapon systems which are intelligent and less and less manpower intensive. I also expect the Armament Cluster of the DRDO to not just develop weapon systems but also come up with ideas for the next generation of warfare. India’s strengths have been software, computers, artificial intelligence and robotics, and we need to further incorporate these into our weapons systems. Our engineers and scientists are working all over the world. We need to utilise our human resources to change the paradigm of the warfare in the subcontinent.”

Responding to Gen Srivastava’s speech, senior DRDO scientist P K Mehta, who heads the Armament Cluster of the DRDO, said after the inaugural ceremony, “There are already some ongoing projects in Artificial Intelligence and unmanned systems. Some laboratories have started incorporating them in the existing products. But it needs to be pointed out that the user, which is the armed forces, does not have a line directorate for the induction of the Artificial Intelligence and unmanned systems. We should have a long term roadmap in the area, which is not there right now. The country, as a whole, needs to have a roadmap for that. The DRDO can certainly help in forming that.” K M Rajan, director of ARDE, said, “The process of incorporating AI systems into Armament has started at the basic level. We hope to do it more in the future.”

<http://indianexpress.com/article/india/cant-fight-tomorrows-war-with-yesterdays-weapons-incorporate-ai-drdo-indian-army-5210324/>

India will buy S-400s from Russia: Saran

Says India will go ahead with the deal despite US pressure as New Delhi is committed to military-technical coop with Moscow

India will not abandon the purchase of the S-400 air defence missile systems from Russia despite US pressure as New Delhi is committed to all its military technical cooperation with Moscow, India's Ambassador Pankaj Saran said here today. India has concluded price negotiations with Russia for a nearly Rs 40,000 crore deal to procure S-400 Triumf air defence missile systems for the Indian Air Force, officials in New Delhi said last month.



In an interview with the state-run TASS news agency, India's Ambassador to Russia Saran, who has recently been appointed the Deputy National Security Advisor, said that India will not back out of buying S-400s. Military-Technical cooperation between India and Russia was discussed during the informal meeting between Prime Minister Narendra Modi and Russian President Vladimir Putin in Sochi last month, he said. It was the first informal Summit in the history of India-Russia relations. The envoy said the date for the annual bilateral summit between Prime Minister Modi and President Putin has not been announced but he expects it to take place sometime in October in New Delhi. "We are committed to all our agreements in this sphere, including purchase of S-400.

India has a long history of military-technical cooperation with Russia based on trust and mutual benefit. There is no change in the approach of India to our partnership in this field," Saran said. Asked if Russia could expect signing of an agreement on supply of S-400 by the end of this year, the Indian envoy said he would not like to fix any time-frame. "I can only say that we have achieved significant progress in the negotiations," Saran said. Officials in New Delhi have said that India and Russia are now trying to find a way out to evade the provisions of a US law that seeks to punish countries and entities engaged in transactions with the defence or intelligence establishment of Russia. Both sides are now looking at ways to insulate the deal from the sanctions announced by the US against Russia under its Countering America's Adversaries through Sanctions Act (CAATSA).

The US had announced sanctions against Russia under the stringent law for its alleged meddling in the American presidential election in 2016. CAATSA, which came into effect in January, mandates the Trump administration to punish entities engaging in significant transaction with the defence or intelligence establishment of Russia. Asked about the reason for organizing the informal summit between Prime Minister Modi and President Putin, Saran said that the summit was is marked by personal chemistry between the two leaders. "The reason for this unscheduled meeting was that both sides wanted to exchange opinions on key global and regional issues including development of situation in Afghanistan, Syria and Iran as well as to discuss matters of bilateral interest. "Today relations between India and Russia are important not only for our two countries but also for the whole world," he added.

Chinese ships kept Indians company on way to Guam

By Manu Pubby

Guam: Indian warships had the Chinese Navy for company for some time as they sailed across "five seas and two oceans" to the island of Guam for the Malabar war games with the US and Japan. Chinese warships trailed the Indian deployment through the South China Sea, peeling off only after they entered the Pacific.

Beijing, which contests parts of the South China Sea as its territorial waters, is keeping an eye on the ongoing Malabar exercise, with spy ships expected to watch closely as the three friendly navies undertake joint operations. “We had good, polite conversation. They were there for some time, and then broke off. The moment we entered the Pacific across the Philippines Sea, they went back. It was interesting,” Rear Admiral Dinesh K Tripathi, the Eastern Fleet Commander who is leading the Indian delegation to Malabar, told ET.

The senior officer said the shadowing was “not surprising” through the South China Sea and that the US Navy is more used to this when it operates in the region. The primary focus of this year’s routines are the anti-submarine drills, a growing area of concern for India, as Chinese submarines are increasingly deployed in the Indian Ocean Region. Top sources told ET that no Chinese subs have been detected this year in the Indian Ocean but till last year, frequent patrols by nuclear-powered subs of the People’s Liberation Army (Navy) had been observed.

A New Experience

This has necessitated a sharing of information with the US forces in the region, as well as attempts to increase Indian ability to detect and intercept submarines if required. While similar exercises have been conducted in the past, Admiral Tripathi said operating in the Pacific will be a new experience as each ocean has its own variables such as hydrography and temperatures.

“Distance actually does not matter. Wherever Indian maritime interests are, that is our area of operation. Wherever national interest takes us, we will deploy if needed,” the officer said, explaining why Guam had been chosen for the joint drills.

Over the next few days, the three navies will exchange crews across platforms and carry out several drills including air defence missions against the F/A 18 Super Hornets deployed on board the Ronald Reagan aircraft carrier, joint search and seizure of vessels at sea and anti-surface operations. An interesting part of the exercise this time will be replenishment at sea — during which warships take on ammunition, fuel and supplies — while operating in a combat-like situation. This will cement the abilities of the navies to jointly operate in a warlike situation over prolonged periods. While drills will continue over the next editions of Malabar that are also likely to see the participation of Australia, the objectives of the exercise are based on the common principles of the three nations, senior officers said.

Quoting Prime Minister Narendra Modi’s speech at the Shangri-La dialogue, the US Task force 70 Commander Rear Admiral Marc Dalton — leading the Ronald Reagan battle group-said the sea can be the pathway to prosperity if principles such as freedom of navigation are upheld. The Japanese Navy - participating in full strength with its biggest warship in service — said the exercise would demonstrate a joint commitment to maintaining maritime order in the region. “At present, destabilising maritime threats are drastically increasing... there’s an attempt to change status quo by force, these are existential threats. We have a shared view on the importance of the Indo-Pacific and will address the maritime challenges together based on common values,” said Vice Admiral Hiroshi Yamamura, vice chief of staff, Japanese Maritime Self Defence Force.

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China’s project faces web issues in Pok’s Gilgit

By Dipanjan Roy Chaudhury

A newly introduced web-based customs clearance system is proving to be an inconvenience to China-Pakistan trade through the Khunjerab Pass in Gilgit in PoK, an important part of the China-Pakistan-Economic-Corridor (CPECNSE 0.00 %), the flagship project of Beijing's belt and road initiative. For about a month now, traders in the town of Gilgit (Pakistan-occupied Kashmir) have reportedly been refusing to clear their consignments through the web-based one customs (WeBOC) system, saying Internet service in the region is not dependable and that they are not educated enough to learn the WeBOC system. People in the know said traders fear that the new system will render thousands of people jobless.

The Federal Board of Revenue (FBR), which has introduced We-BOC, however says the online system will make trade through the Pakistan-China border easy and help improve dry ports operations across the country. These traders have the backing of the Gilgit- Baltistan Chamber of Commerce and Industry (GBCCI) and other trade organisations in the region. The CPEC is China's flagship project under its belt and road initiative, which aims to link the country with economies in southeast and central Asia. India has concerns regarding the CPEC as it overlaps with PoK. At the Shanghai Cooperation Organisation (SCO) summit this weekend, Prime Minister Narendra Modi is expected to reiterate the country's reservation over connectivity project like CPEC that violate India's sovereignty and call for projects that are inclusive in nature. Over 36 trucks carrying goods to and from China are stranded at the Sust Dry Port in Khunjerab Pass due to this ongoing dispute between Pakistani traders and government officials. The new clearance system was launched in April.

THE ECONOMIC TIMES

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India Pak to hold joint Military drill

By Dipanjan Roy Chaudhury,

India and Pakistan will take part in a joint military exercise for the first time, courtesy the Shanghai Cooperation Organisation (SCO). The exercise, which is aimed at countering terrorism and will be conducted in Ural region of Russia, may act as a confidence-building measure or CBM between India and Pakistan. Member states of the SCO will participate in the joint military drill - 'Peace Mission 2018'-to promote mutual trust, cooperation and coordination against terroris . threats and to maintain regional peace and stability, said people aware of the matter. The drill will follow the 18th SCO Summit, scheduled for June 9-10 in Qingdao, Shandong province. The summit will be attended by a galaxy of world leaders including Prime Minister Narendra Modi.

THE ASIAN AGE

Sat, 09 June, 2018

Equipping the Army for serious fighting

By Mohan Guruswamy

The million-plus Indian Army was forced to prune down its requirement for 800,000 rifles, estimated to cost about Rs 15,000 crores, to less than a third of it. The Indian Army has 450,000 infantry troopers. This reminds me of China's People's Liberation Army, which when fighting the Americans in Korea back in the 1950s sent in ranks of infantrymen one behind the other with only the lead soldier armed with a rifle. No sooner he fell, the man behind him would pick up the rifle and continue the fight.

Field Marshal Archibald Wavell, who was a distinguished infantryman with the British Army before he became a somewhat less distinguished Viceroy of India, once wrote: "Let us be clear about three facts: First, all battles and all wars are won, in the end, by the infantryman. Second, the infantryman always bears the brunt; his casualties are heavier, he suffers greater extremes of discomfort and fatigue than the other combat arms. Third, the art of the infantryman is less stereotyped, and far harder to acquire in modern war, than that of any other arm." In the 1953 bestseller *Battle Cry* by Leon Uris, a Marine recruit is punished for the transgression of calling a rifle a gun by being asked to do rounds of the drilling ground, naked and chanting: "This is my rifle, this is my gun. This is for fighting, this is for fun!" In military parlance, a gun can be anything that fires a projectile. A howitzer (which fires shells at high trajectories) is a gun, as is a cannon. The rifle is a specific weapon used by a soldier. It is a gun fired from shoulder level with a long spirally grooved barrel intended to make a bullet spin and thereby have greater accuracy over a long distance. It is what a soldier mostly uses to do his work. Stalin famously said: "The only real power comes out of a long rifle."

I have always suspected that the lowly rifle doesn't get the priority it deserves because big-ticket items for war are far more "sexy" and the attendant benefits that go with them. They also make very good parade ground and military show displays. When I was a young boy I used to be enthralled by the low swoop of the Hawker Hunters over the Secunderabad Parade Maidan as I am of the SU-30 MKI now doing a Vertical Charlie over Rajpath. But the rifle is what our soldiery lives and dies by. Our soldiers are mostly drawn from our rural areas, call it a coincidence, and hence the lethality of an infantryman seems low among our priorities. The development of the light automatic rifle was the consequence to a well-known post-World War II study of the pattern of usage of infantry weapons by US infantrymen in combat by Brig. Gen. S.L.A. Marshall, a prominent American military analyst. Gen. Marshall's study revealed that most infantrymen actually used their weapons very little, preferring to take cover most of the time and firing occasionally. The study also revealed that the infantrymen most likely to fire their weapons were those closest to a soldier firing a Browning automatic rifle. This was because when the BAR man fired, he was able to literally hose down a wide arc in front of him. When he did this the opposing infantry lay low and infantrymen by his side were able to rise from behind their chosen cover and fire their weapons. Quite clearly, this itself suggested a need for greater deployment of automatic weapons, if you had to get more fighting out of soldiers. The legendary American Gen. Douglas MacArthur typically put it into context when he said: "Whoever said the pen is mightier than the sword obviously never encountered automatic weapons."

The Americans were first off the mark with their M-14 7.62mm automatic rifle, and most others soon followed. But we in India missed this switch completely. While we were expending our defence rupees on Hunters and Mystere jet fighters and even on an aircraft-carrier, the Chinese went in for better equipment and gear for its men on the ground. Thus, when the 1962 war was upon us, the poor foot soldier with .303 Lee Enfield single shot rifles and in flimsy clothing was left to deal with the Chinese juggernaut of foot soldiers equipped with automatic rifles and burp guns. Given the pattern of recent defence spending, it seems our strategists once again seem to have reverted to the old habit of spending all on the big and extravagant and least likely to be used, than on arms for the foot soldier who in the ultimate analysis, even today, still wins or loses battles for his country. Thus while debates have raged and money obviously made on the purchases of SU-30 and Rafale jets, 155mm self-propelled guns, nuclear submarines and aircraft-carriers, little thought was given to the foot soldier and his weapon.

The change in thinking, as far as rifles are concerned, was as a result of three observations. First was due to the fact that since the 7.62 mm round needed a bigger explosive charge to propel it at the desired 900 metres per second, the recoil as a result of this in automatic fire mode made the weapon virtually uncontrollable. Not only was the soldier unable to aim properly, but also quite often the recoil caused serious injuries. The second observation was that the infantryman did not need a marksman's weapon firing accurately up to 800 metres. Statistical analysis by the US Army of rifle engagements in World War II and Korean and Vietnam wars revealed that 90 per cent of them were at a range of less than 300 metres and 70 per cent at 200 metres or less. Therefore, the emphasis on long-range accuracy of 300-800 metres was somewhat redundant. Since most engagements were at close quarters, it also suggested a weapon that could be fired from either the shoulder or hip. The third observation related to wound ballistics. Studies commissioned by the US Army revealed that a smaller round or a slower round caused more damaging wounds. Ever since the US Army introduced the Eugene Stoner-designed M-16, a 5.56 mm calibre automatic rifle, in the later stages of the Vietnam War, the 5.56 weapon has been the Nato standard. The Russian AK-47 assault rifle, while a 7.62 mm calibre weapon, fires a lighter round at a lower muzzle velocity of 710 metres per second. The consequent drawback is its limited range, as at over 200 metres the AK-47 rounds begin to drop. Since the recoil is minimal, it makes it an extremely manageable weapon with the wound ballistic characteristics and ergonomic advantages of the 5.56 mm rifle.

However, we decided to develop an automatic rifle of our own, the Insas 5.56 (Insas standing for a very grandiloquent Indian National Small Arms System). The Insas was not only very late in coming but came with serious performance drawbacks, particularly in cold conditions. The Indian Army's performance quality requirements have typically been unrealistic and have hindered the development of an effective basic combat rifle. Among PQRs was a requirement that it should also be capable of being swung by its barrel like a club when the ammunition runs out! What we got was a rifle whose receiver and pistol grip are that of the Russian

Kalashnikov; the butt, gas regulator and flash hider from the Belgian FN FAL; fore-end from the US Armalite AR-15; and cocking handle from the German Heckler and Koch!

Sat, 09 June, 2018

NASA rover finds building blocks of life on Mars

NASA's Curiosity rover has discovered potential building blocks of life in an ancient Martian lakebed, advancing the case for possible life, past or even present, on the red planet, the US space agency said. The new findings published in the journal *Science* describe "tough" organic molecules in three-billion-year-old sedimentary rocks near the surface, as well as seasonal variations in the levels of methane in the atmosphere. Organic molecules contain carbon and hydrogen, and also may include oxygen, nitrogen and other elements. While commonly associated with life, organic molecules also can be created by non-biological processes and are not necessarily indicators of life. These findings are a good sign for future missions exploring the planet's surface



and subsurface, NASA said in a statement. "With these new findings, Mars is telling us to stay the course and keep searching for evidence of life," said Thomas Zurbuchen, associate administrator for the Science Mission Directorate at NASA Headquarters here. "Curiosity has not determined the source of the organic molecules," said Jen Eigen rode of NASA's Goddard Space Flight Center in the US. "Whether it holds a record of ancient life, was food for life, or has existed in the absence of life, organic matter in Martian materials holds chemical clues to planetary conditions and processes," Eigen rode said. Although the surface of Mars is inhospitable today, there is clear evidence that in the distant past, the Martian climate allowed liquid water, an essential ingredient for life as we know it, to pool at the surface, NASA said. Data from Curiosity reveals that billions of years ago, a water lake inside Gale Crater held all the ingredients necessary for life, including chemical building blocks and energy sources, it said. "The Martian surface is exposed to radiation from space. Both radiation and harsh chemicals break down organic matter," said Eigen rode. "Finding ancient organic molecules in the top five centimeters of rock that was deposited when Mars may have been habitable, bodes well for us to learn the story of organic molecules on Mars with future missions that will drill deeper," he said. Scientists also discovered seasonal variations in methane in the Martian atmosphere over the course of nearly three Mars years, which is almost six Earth years. This variation was detected by Curiosity's Sample Analysis at Mars (SAM) instrument suite. Water-rock chemistry might have generated the methane, but scientists cannot rule out the possibility of biological origins. Methane previously had been detected in Mars' atmosphere in large, unpredictable plumes. This new result shows that low levels of methane within Gale Crater repeatedly peak in warm, summer months and drop in the winter every year, NASA said. "This is the first time we have seen something repeatable in the methane story, so it offers us a handle in understanding it," said Chris Webster of NASA's Jet Propulsion Laboratory (JPL) in California. To identify organic material in the Martian soil, Curiosity drilled into sedimentary rocks known as mudstone from four areas in Gale Crater. This mudstone gradually formed billions of years ago from silt that accumulated at the bottom of the lake. The rock samples were analyzed by SAM, which uses an oven to heat the samples (500 degrees Celsius) to release organic molecules from the powdered rock. Some of these fragments contain sulphur, which could have helped preserve them in the same way sulphur is used to make car tires more durable, according to Eigen rode.

Google says AI won't be used for weapons

By Paresh Dave



Google will not allow its artificial intelligence software to be used in weapons or unreasonable surveillance efforts under new standards for its business decisions in the nascent field, the Alphabet unit said on Thursday. The restriction could help Google management defuse months of protest by thousands of employees against the company's work with the U.S. military to identify objects in drone video. Google instead will seek government contracts in areas such as cyber security, military recruitment and search and rescue, Chief Executive Sundar Pichai said in a blog post on Thursday. "We want to be clear that while we are not developing AI for use in weapons, we will continue our work with governments and the military in many other areas," he said. Breakthroughs in the cost and performance of advanced computers have carried AI from research labs into industries such as defense and health in the last couple of years. Google and its big technology rivals have become leading sellers of AI tools, which enable computers to review large datasets to make predictions and identify patterns and anomalies faster than humans could. But the potential of AI systems to pinpoint drone strikes better than military specialists or identify dissidents from mass collection of online communications has sparked concerns among academic ethicists and Google employees. A Google official, requesting anonymity to discuss the sensitive issue, said the company would not have joined the drone project last year had the principles already been in place. The work comes too close to weaponry, even though the focus is on non-offensive tasks, the official said. Google plans to honor its commitment to the project through next March, a person familiar with the matter said last week. More than 4,600 employees petitioned Google to cancel the deal sooner, with at least 13 employees resigning in recent weeks in an expression of concern. A nine employee committee drafted the AI principles, according to an internal email seen by Reuters. The Google official described the principles as a template that any software developer could put into immediate use.

Indian scientists discover planet 600 light years away

A team of scientists from the Physical Research Laboratory (PRL), Ahmadabad, discovered a sub-Saturn or super-Neptune size exo planet, which is about 27 times the mass of Earth and six times the radius of Earth. The planet revolves around a Sun-like star, some 600 light years away from Earth. The discovery was made by measuring the mass of the planet using the indigenously designed 'PRL Advance Radial-velocity Abu-Sky Search' (PARAS) spectrograph integrated with 1.2m telescope at PRL's Gurushikar Observatory in Mount Abu. With this discovery, India has joined a select league of countries which has discovered planets around stars. In a post on the website of the Indian Space Research Organisation, scientists said the name of the host star is EPIC 211945201 or K2-236 and the planet will be known as EPIC 211945201b or K2-236b. The planet was found to go around the star in about 19.5 days. The surface temperature of the planet was found to be around 600 degrees Celsius, as it is very close to the host star. It is seven times nearer to its star, in comparison with Earth-Sun distance. This might make it uninhabitable.

The discovery is of importance for understanding the formation mechanism of such super-Neptune or sub-Saturn kind of planets, that are too close to the host star, according to scientists. Paras spectrograph made an independent measurement of the mass of the planet body, as it was necessary for discovery after data from NASA'S K2 (Kepler2) photometry could not confirm the planetary nature of the system. Initially, it was NASA'S K2 (Kepler2) photometry that found that the source was a planetary candidate as it was transiting, where the planet body comes between the star and the observer on Earth.

It goes around the star and therefore blocks a tiny amount of star-light. By measuring the amount of light blocked by the planet body, the diameter or size of the planet can be measured. It was found to be 6 Earth radii. However, that data was not sufficient to confirm the planetary nature of the system. PRL scientists, who observed the target for about 1.5 years with the spectrograph to probe the nature of the system, made calculations that suggested that the heavy elements like ice, silicates and iron content make 60%-70% of the total mass. This detection was important as it adds to a sparse catalogue of confirmed exoplanets with masses between 10 and 70 M Earth and radii between 4 and 8 R Earth, whose masses and radii are measured to a precision of 50% or better. Only 23 such systems (including the present) are known to this date with such precise measurement of mass and radii.

Increase in CSIR earnings through licensing tech

In the 2017-18 financial year, CSIR increased its earnings from the private sector by 70% over the previous year, largely owing to technology transfers

By Anonna Dutt

The Union science ministry's usually cash-strapped Council of Scientific and Industrial Research (CSIR) has managed to increase its earnings by licensing patented technologies to private industries, according to data provided by the body. In the 2017-18 financial year, CSIR increased its earnings from the private sector by 70% over the previous year, largely owing to technology transfers. The body's director Girish Sahni has described this as a turning point for CSIR, and a move towards "self sustainability". Of the Rs 963 crore total revenue generated by CSIR in 2017-18, Rs 515 crores came from licensing its technologies to private companies and Rs 448 crore, from doing so to the government sector. This is the first time that its earnings from the private sector are higher than the earnings from government agencies.

In 2016-17, the department generated a total of Rs 727.3 crore revenue—Rs 302 crore from licensing its technologies to the private sector and Rs 425.45 crores from other government agencies. "In previous years, our private sector earnings would just touch about Rs 100 or Rs 200 crore. Although, Rs 500 crore might not seem like much, it is representative of the trend of CSIR generating funds through its patents," Sahni said. Established in 1942, CSIR is a research and development organisation that runs 38 laboratories and 39 field stations. Mainly funded by the ministry of science and technology, it operates as an autonomous body. In 2015, a CSIR Dehradun declaration had said the body would attempt to make all its labs self-financing over the next two or three years, along with developing 12 game-changing technologies every year and focusing on developing technologies for the poor. Over the last four years, CSIR says it has licensed 600 technologies to various industries. These include the hand-held milk-testing device Ksheer Tester — which can detect adulterants such as urea, detergent, soda, boric acid and hydrogen peroxide in milk samples within 60 seconds — and a waterless chrome tanning method that eliminates chromium emission in the water bodies. Over 100 tanneries have already obtained the license for this, and other countries have shown interest with Ethiopia already striking a deal for technology transfer.

CSIR had written to its 38 labs just last year that only Rs 202 crore of the total allocation of more than Rs 4,000 crore could be spared for new research projects, and asked them to look outside for meeting their expenses. "The CSIR labs are now focussing on translational research that can be licensed rather research in pure sciences. This is, however, not to say that there is no pure science research happening," said a senior official from the department. Experts welcome the change in trend but warned that becoming too product-oriented may hurt research in the long term. "If CSIR is able to generate funds by licensing its technologies, it is a good move and my hope is that it offsets the costs of fundamental research. However, this whole mandate of generating funds for oneself forces scientists to create 'products' instead of focussing on fundamental research. This might seem like a good deal in the short run, but in the long run research will suffer," said Professor Soumitro Banerjee, general secretary of the Breakthrough Science Society and a professor at Indian Institutes of Science Education and Research, Kolkata.

चार दिन के अंदर एयरफोर्स का एक और जगुआर हादसे का शिकार



■ पीटीआइ, जामनगर

चार दिन में जामनगर एयरफोर्स स्टेशन का दूसरा जगुआर विमान हादसे का शिकार हुआ। शुक्रवार सुबह 9:20 बजे की इस घटना में पायलट बाल-बाल बच गया। जगुआर जब लैंड कर रहा था, तभी तकनीकी गड़बड़ी आई और वह 500

फुट तक घिसटता चला गया। विमान को मामूली नुकसान ही पहुंचा है। जगुआर उड़ा रहे स्क्वाड्रन लीडर सुरक्षित निकलने में कामयाब रहे। हादसे की जांच के आदेश दिए गए हैं। इससे पहले मंगलवार को जगुआर विमान के क्रैश होने से उसमें सवार एयर कोमोडोर संजय चौहान की मौत हो गई थी।