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MoD clears Rs 30,000-cr defence acquisitions from Russia

Ajai Shukla

On Thursday, the defence ministry's apex procurement body, the Defence Acquisition Council (DAC), chaired by Defence Minister Manohar Parrikar, cleared the purchase of the S-400 mobile surface to air missile system (M-SAM), Russia's latest and most vaunted air defence system. A Reuters report, quoting a source speaking on the condition of anonymity, says "the deal is expected to cost around Rs 30,000 crore (\$4.52 billion) but that the final price tag would be negotiated during the procurement process." With Prime Minister Narendra Modi due to travel to Moscow shortly for an annual summit meeting with President Vladimir Putin, this purchase is likely to be pursued on a fast track. Parrikar discussed it with the Russians on his visit to Russia last month. The "Triumf", as the S-400 is designated in Russia (NATO countries call it the SA-21 Growler) can detect an incoming ballistic missile (usually carrying a nuclear payload) at a range of 600 km and shoot it down when it is still 230 km away, and 185 km above the earth. Fighter aircraft can be shot down when they are still 400 km away. The S-400, which is in service only with the Russian military, would provide a credible anti-ballistic missile (ABM) shield to cities like Delhi and Mumbai, which would figure high on the target list of any adversary. The S-400 system would complement an indigenous ABM system that the Defence R&D Organisation (DRDO) has been developing and testing for a decade. Since the DRDO's ABM system's current interception range is just about 100-120 km, and could take several more years in development, the S-400 provides an interim capability. "The S-400 would enhance national air defence capability, by helping in warding off threats from long-range missiles", it was explained during the DAC meeting, according to the defence ministry source. Worryingly for Pakistan Army planners (in Rawalpindi), the S-400 could also be deployed to neutralise Pakistani tactical nuclear weapons (TNWs), with which Rawalpindi plans to halt major Indian offensives under the "Cold Start" doctrine. Faced with the prospect of multiple Indian battle groups, led by tanks, advancing on several fronts and overwhelming Pakistani defenders, Rawalpindi has signalled it would halt the offensive with TNWs. Pakistani generals believe this defensive use of nuclear weapons would be justifiable, since it would be on its own territory, against an Indian invasion. However, Indian S-400 units, grouped with its strike corps, would undermine the logic of Rawalpindi's deterrence, by providing a capability to shoot down TNWs before they could strike their targets. Russian air defence systems have built a formidable reputation, ever since a Soviet missile shot down a U-2 spy plane in 1960, while it was being flown over the Soviet Union on a high-altitude photography mission. Several countries have expressed interest in the S-400, including Turkey (unlikely to be a customer now, after shooting down a Russian bomber over Syria), Iran, Belarus and Saudi Arabia. China has been extremely keen and, earlier this year, the chief of Russia's export agency, Rosoboronexport, stated that a contract had been clinched between Moscow and Beijing.

Fleet support ships - The DAC also cleared the navy's acquisition of five fleet support ships for Rs 9,000 crore. Each of these 30,000-tonne vessels would be grouped with a flotilla, carrying fuel, ammunition and supplies for warships like destroyers, frigates and corvettes. They also include a full-fledged workshop, allowing a flotilla to refuel, rearm, replenish and repair itself during long deployments at sea. "This is a part of the navy's "blue water" vision. Along with three existing fleet tankers - INS Deepak, Jyoti and Aditya - the five new fleet support ships will allow the navy to send eight separate flotillas on long deployments, or long-range missions, self-contained for the mission period", explained a naval officer. The five vessels will be built by Hindustan Shipyard Ltd, Visakhapatnam (HSL) under the "Make in India" initiative.

Pinaka rocket launchers - The DAC also cleared six additional regiments of the indigenous Pinaka multi-barrel rocket launcher (MBRL), for Rs 14,600 crore. These will be built together by Tata Power, Larsen & Toubro and Bharat Earth Movers Ltd. The DAC meeting also decided that the DRDO would continue developing a long-range version of the Pinaka, which would enhance the current 40-km range to 60-70 km by including a guidance system in the rockets. Each Pinaka launcher has 12 rocket tubes, which can be fired in quick succession, with a time interval of four seconds. Each Pinaka regiment has six launchers, which means that 72 rockets, filled with high explosive, can saturate a target in 44 seconds.

Other clearances - In addition, the DAC cleared the purchase of 571 light bulletproof vehicles under the "Buy Indian" category, for Rs 310 crore. Indian domestic automotive firms will now bid to build these vehicles, which would be used by troops in counter-insurgency/counter-terrorist operations. Also cleared were 120 mine trawls for Rs 450 crore, under the "Buy Global" category. Fitted on the front of tanks, trawls churn up the soil ahead, unearthing any buried anti-tank mines. Meanwhile, the DRDO will field four sets of indigenous trawls by mid-2017. The DAC also cleared two electronic warfare (EW) systems for the mountains, for a cost of Rs 425 crore. Developed by the DRDO, these will be built by Bharat Electronics Ltd.

Government clears purchase of Rs 39,000cr Russian missile systems

Rajat Pandit

The government on Thursday approved the Rs 39,000-crore acquisition of five advanced Russian S-400 Triumph air defence missile systems, which have even rattled NATO countries because they can destroy incoming hostile aircraft, stealth fighters, missiles and drones at ranges of up to 400 km. The decision by the Manohar Parrikar-led defence acquisitions council (DAC), which will take some time to materialize into an actual deal after commercial negotiations, comes just ahead of PM Narendra Modi's summit with Russian President Vladimir Putin in Moscow on December 24. TOI was the first to report on October 11 that the DAC was finalizing the game-changing S-400 acquisition - on a par with the soon-to-be-inked \$5 billion deal for 36 French Rafale fighters in terms of sheer criticality - ahead of Modi's visit to Russia. The DAC approval is just an "acceptance of necessity (AoN)" for Indian experts to now formally negotiate the government-to-government deal with their Russian counterparts. "It will take a few years for the S-400 systems to be actually inducted. The plan is to deploy three in the west (read Pakistan) and two in the east (read China) to seriously bolster the nation's air defence capability," said a source. With the IAF trying to steadily plug gaping holes in the country's air defence coverage, including protection of strategic assets like nuclear reactors, the S-400 will come as a major shot in the arm for the force. India will be the second foreign customer for the S-400, which is designated 'SA-21 Growler' by NATO. China is slated to get deliveries of six S-400 batteries from 2017 onwards after a \$3 billion deal inked with Russia last year. The DAC on Thursday also cleared other modernization proposals worth Rs 25,985 crore, including the Rs 14,600-crore acquisition of six more regiments of the indigenous Pinaka multiple-launch rocket systems. The army already has two regiments of the 40-km range Pinaka systems, while two more were approved earlier. But the S-400 was the clear takeaway to add "real defence substance" to Modi's visit to Russia, which will also see the two countries ink the inter-governmental agreement for the over \$1 billion project to manufacture 200 Russian Kamov Ka-226T light utility helicopters under the 'Make in India' policy. Then, as earlier reported by TOI, India is also on course to acquire a second nuclear-powered submarine on a \$1.5 billion lease from Russia. Indian Navy had inducted the first Akula-II submarine, christened INS Chakra, on a 10-year lease from Russia in April 2012, under a

secret \$900 million deal inked way back in January 2004. When the S-400 contract is actually inked, it will among the largest-ever deals with Russia, which has been displaced by the US as India's largest defence supplier over the last four years. The other big deals inked with Russia include the ones for 272 Sukhoi-30MKI fighters (over \$12 billion) and INS Vikramaditya (\$2.33 billion for the aircraft carrier and another \$2 billion for 45 MiG-29Ks to operate from its deck).

AERIAL SHIELD

- ▶ India to buy 5 S-400 Triumph air defence missile systems from Russia for ₹39,000 crore
- ▶ S-400 can destroy hostile aircraft, stealth fighters, missiles and drones at 400-km range
- ▶ Its long-range radars can track hundreds of targets simultaneously and can shoot down even stealth fighters like American F-35 jets

DEFENDING THE AERO-SPACE FRONTIER

India to buy 5 S-400 Triumph anti-aircraft/anti-missile systems from Russia for ₹ 39,000 cr

- ▶ Russia recently deployed an S-400 system at Latakia airbase in Syria after one of its Su-24 fighters was shot down by Turkish jets
- ▶ China in 2014 sealed a \$3 billion deal with Russia for acquisition of S-400 batteries, which will be delivered from 2017 onwards

OTHER DAC NODS

- ▶ 6 more regiments of indigenous Pinaka multiple-launch rocket systems (₹ 14,600 crore)
- ▶ 5 fleet support ships to be constructed by Hindustan Shipyard at Vizag (₹ 9,000 crore)
- ▶ 571 indigenous light bullet-proof vehicles for counter-terror ops (₹ 310 crore)
- ▶ 120 trawls for T-905 & T-72



- tanks from abroad (₹ 450 crore)
- ▶ Digitization of 16 old Pechora air defence systems (₹ 1,200 crore)
- ▶ 2 electronic warfare systems for mountain deployment (₹ 435 crore)

DAC clears Rs. 65,000-cr Defence procurements

The Defence Acquisition Council (DAC) on Thursday cleared procurements worth over Rs65,000 crore - including purchase of S-400 Triumf air Defence system worth over Rs39,000 crore from Russia, six new Pinaka multi-barrel rocket launcher regiments costing Rs14,600 crore and five support ships to the tune of Rs9,000 crore. Chaired by Defence Minister Manohar Parrikar, the DAC also gave its nod for procurement of 571 bulletproof vehicles worth Rs310 crore for the Army for its counter-insurgency operations and 120 trawls to clear anti-tank mines. These trawls to be bought from Russia will be fitted on to T-72 and T-90 tanks. The most important clearance, however, was for the five units of S-400 missile systems for the IAF as it is a critical operational requirement. This Russian-made air Defence missile system is rated to be the most advanced equipment in the world as it can track and shoot down a missile or a hostile aircraft at a distance of more than 400 km. Incidentally, China has already placed an order for ten such systems from Russia. It had inducted these missiles in 2007. Officials said the final price of the S-400 system will be decided during price negotiations expected to start sometime next year. They also said induction of S-400s will increase air Defence capability manifold as it can ward off a threat from long range. The deal is likely to figure during summit level talks between Prime Minister Narendra Modi and President Vladimir Putin during Modi's visit to Moscow later this month. Among the other deals, the DAC okayed raising of six more Pinaka regiments. The deal is under the 'Make-In-India' category and the Army will procure these rocket launchers from Larsen & Toubro and Bharat Earth Movers Limited (BEML). The Army already has two regiments and two more are in process of getting raised. One regiment has 18 multi-barrel rocket launchers. In an effort to provide more security to troops engaged in anti-terrorist and counter-insurgency operations in Jammu & Kashmir, the DAC approved procurement of 571 light bulletproof vehicles under the 'Buy Indian' category. Private manufacturers specialising in this field of bulletproof vehicles will figure prominently in this project, officials said. Another proposal to enable the Army to effectively monitor enemy communication in mountainous region -- including interception, better communication and jamming, the DAC approved procurement of two electronic warfare system sets. The project will cost Rs 425 crore and Defence Research and Development Organisation (DRDO) in collaboration with Bharat Electronics Limited (BEL) will manufacture it. The Navy was given the go-ahead for five fleet support vessels to provide logistic back up to warships operating far from shore. The Hindustan Shipyard Limited (HAL) will build these ships which double up as tankers and workshops and each ship will weigh more than 30,000 tonnes. The DAC last year had approved this project under 'Buy India' category through open tender but changed it to 'Make in India' on Thursday, officials said. The IAF got the nod for a project worth over Rs 1,200 crore for digitisation of its 24 Pichora air Defence missile system. This proposal falls in the category of 'Buy and Make in India,' officials added.



Rs 30,000-cr plan to buy Russian air defence missile system cleared

The DAC approval, which means the Acceptance of Necessity (AoN) of these equipment, gives the go-ahead to the process of purchasing them.

by Pranav Kulkarni

Ahead of Prime Minister Narendra Modi's visit to Moscow, the government Thursday cleared an approximately Rs 30,000-crore plan to purchase five units of Russian S-400 Triumph air defence missile system. The acquisition will pave the way towards plugging the gaps in the existing air defence (AD) capability of the Indian Air Force (IAF). Besides S-400, the Defence Acquisition Council (DAC) headed by defence minister Manohar Parrikar also cleared the purchase of about Rs 25,500 crore worth of defence equipment, including the crucial six regiments of Pinaka rocket system, for the Indian Army. The DAC approval, which means the Acceptance of Necessity (AoN) of these equipment, gives the go-ahead to the process of purchasing them. "The acquisition of S-400 missile defence system will enhance air defence capability and give the nation the capability to ward off threat due to long-range surveillance assets and stand off weapons at an economical cost," a defence ministry source said. Sources said the final cost will be discussed during the price negotiation stage. Hopes are high that a further concrete announcement will be made during PM Modi's Moscow visit this month. The S-400 missile, developed by Russian Almaz-Antey, will enhance IAF's long-range air defence capabilities. The 400-km range system, which has been deployed by Russia in Syria, will augment the existing AD set-up of the IAF, which involves the home-made Akash missile system, Israeli Spyder and Iгла, among others. The council also cleared a Rs 1,200-crore acquisition of 24 Pechora air defence system. Another clearance to a Rs 450-crore project to develop 120 trolleys for the T-72 and T-90 tanks for the Army has been extended partly to the DRDO. The council cleared Rs 25,000-crore worth of equipment under the Make in India programme. Among the most significant is the clearance to six regiments of Pinaka Multi-Barrel rocket system for the Army. The Army had envisaged creation of 10 regiments of Pinaka by 2017. While four regiments have already been cleared, the six on Thursday will speed up the envisaged plan. The council has also given the go-ahead to the development of five Fleet Support Ships for the Navy by state-owned Hindustan Shipyards Limited, which has recently finished the delayed overhaul of Sindhukirti submarine. The FSVs, which function like floating workshops, will ensure serviceability of Indian Navy ships in the high seas. The council also cleared the purchase of 571 light bullet-proof vehicles.

US defence major expands suppliers footprint for 'Make in India'

The world's largest aerospace company Boeing of the US today entered into a long-term agreement with two other technology firms to source the components for its Chinook helicopter, which is soon to become part of the Indian Air Force. The US company signed the agreement with Fokker Technologies, a division of GKN Aerospace, and Aequs of India, during the Boeing India Supplier Conference in Hyderabad. India signed a nearly 3 billion dollars deal for purchase of 22 Apache attack helicopters and 15 Chinook heavy-lift choppers with American aviation giant and the US government in September this year with the first helicopter is likely to be handed over in the next three to four years. The agreement between Boeing and Aequs, the company will supply machined detail parts which will be made in India for the Chinook heavy lift helicopter. Fokker Technologies will build the parts into final sub-assemblies in facilities in Papendrecht, Netherlands. "This agreement between Fokker Technologies and Aequs is significant because it capitalizes on India's industrial capability, innovation and talent to contribute to the country's long-term competitiveness as a global aerospace leader," Boeing India president Pratyush Kumar said in a statement here. "Boeing is rapidly expanding its supplier footprint in the country to reinforce our commitment to 'Make in India' and we have doubled our sourcing from India in the last 12 months," he said. Boeing has also signed an agreement with Tata Advanced Systems in November to create a joint venture manufacture Apache fuselages in India. Dynamatic Technologies is already building parts for the Chinook heavy lift helicopter in India. In recent years, Boeing has gained a considerable foothold in India's defence market, successfully concluding multi-billion dollar deals, including that of C-17 Globemaster, P-8i long range maritime reconnaissance aircraft for the Indian and most recently the Chinook and Apache helicopters contract.

Defence Ministry gets NHRC notice over security risk to Jabalpur

The NHRC has issued a notice to the Union Ministry of Defence over security risk to the city of Jabalpur in Madhya Pradesh. The notice was issued after taking suo motu cognizance of a media report that the spontaneous combustion of thousands of unexploded and rejected bombs, which are buried and awaiting disposal at the Ordinance Factory, Khamaria has posed risk to the city. The factory is located in a densely populated area. "Giving two weeks' time to the Defence Secretary to respond with a factual report, Justice D Murugesan has observed that the contents of the press report, if true, raise a serious issue of violation of right to life and right to health of the workers and local residents," National Human Rights Commission (NHRC) said in a press release. According to the media report, carried on the 14th December, 2015, Jabalpur city also happens to be quake prone and the danger can be huge given reports of sporadic explosions in the premises in the last few years. The latest was on the 11th December, 2015 when two employees were injured. Besides, explosives from 1999 Kargil War, a stockpile of unexploded and rejected bombs are also awaiting disposal at the Ordinance Factory, it said. While referring to the variety of mortars, shells and explosives stored, the report also mentions that the detonators have corroded to the point where it is dangerous to defuse them and there was a risk of spontaneous combustion due to rapid deterioration of the duds. The report also quotes a member of Joint Consultation Machinery at Khamaria, under the Union Ministry of Defence, that the issue was taken up with authorities several times, but nobody was willing to take the risk, it said.

The Statesman

18 December 2015

U.S. says considering response to Iran ballistic missile test

By Patricia Zengerle

The Obama administration is considering how to respond to an Iranian ballistic missile launch that violated U.N. Security Council resolutions, senior U.S. officials said on Thursday, as senators pressed for a strong reaction. "We are now actively considering the appropriate consequences to that launch in October," Stephen Mull, the State Department's lead coordinator for implementing an international nuclear deal with Iran, told a Senate committee hearing. Almost every Republican U.S. lawmaker, as well as several of President Barack Obama's fellow Democrats, opposed the nuclear agreement announced in July, in which Iran agreed with major powers to curtail its nuclear program in exchange for relief from economic sanctions. Concerns in the United States about the agreement have intensified since Iran's rocket test on Oct. 10 and other events seen as hostile, including the conviction of Washington Post reporter Jason Rezaian, who has been held by Tehran for more than 500 days. Many lawmakers criticize the Obama administration for what they see as an inadequate response to Tehran. "One area that we all agree on is the need to be tough on any destabilizing or illegal action by Iran. With that view, I think the agreement is off to a really terrible start," said Republican Senator Bob Corker, chairman of the Senate Foreign Relations Committee. As first reported by Reuters, a team of sanctions monitors in a report on Tuesday found that Iran violated a U.N. Security Council resolution by test-firing a missile capable of delivering a nuclear warhead. "We have a very permissive environment," said Democratic Senator Robert Menendez, who opposes the nuclear deal, as he closely questioned Mull and other administration officials about the response to the missile test. Senator Chris Coons, another Democrat who backed the Iran deal but with reservations, said that starting next month members of Congress would push for renewal of a U.S. sanctions bill that is in force until the end of 2016. Mull said the administration is looking forward to working with Congress on the issue. Asked whether he thought Iran would view renewing the legislation as a U.S. violation of the nuclear deal, Mull said it would be hard to predict. Separately, two-thirds of the Republicans in the Senate signed a letter sent to Obama on Wednesday urging him not to lift sanctions on Iran under the nuclear deal, saying Tehran's recent ballistic missile testing showed "blatant disregard for its international obligations." On Thursday, 21 Democratic senators led by Ben Cardin, the top Democrat on the foreign relations panel, also wrote to Obama, saying they were deeply concerned about Iran's ballistic missile testing.

US asks Pak to hold back N-plans

Voicing concern over Pakistan's nuclear and missile programmes, the US has asked it to restrain them and avoid any developments that might lead to increased risk to nuclear safety and strategic stability. "I wanted to say that we do share your concerns particularly about the development of Pakistan's nuclear arsenal. We're concerned most by the pace and the scope of the Pakistan's missile program, including its pursuit of nuclear systems," Special US Representative for Afghanistan and Pakistan Richard Olson told lawmakers during a hearing on Pakistan convened by House Foreign Affairs Committee. "We are concerned that a conventional conflict in Southwest Asia could escalate to include nuclear use as well as the increase security challenges that accompany growing stockpiles. We have had a very active dialogue at the highest levels with the Pakistanis in which we have made clear the nature of our very specific concerns," Olson said yesterday in response to a question from Congressman Brian Higgins. He said the United States has asked Pakistan to restrain its nuclear and missile programmes. "As with all nuclear-capable states, we have urged Pakistan to restrain its nuclear weapons and missile development and stressed the importance of avoiding any developments that might invite increased risk to nuclear safety, security, or strategic stability," he said. "We are not negotiating a 123 agreement with Pakistan," he said. His remarks came after US lawmakers asked the American government to be tough on Islamabad as it does not seem to be sincere in improving ties with India and has accelerated the pace of arsenals' production. Higgins during the hearing alleged that Pakistan is not sincere in improving its relationship with India. "Pakistan is involved in an arms race against what it believes is its existential threat with India. According to the Carnegie Endowment for International Peace, Pakistan could have 350 nuclear warheads in the next decade, becoming the world's third biggest nuclear power, outpacing India, France, China, and the UK," he said. "There is no positive sign of any improved relations with India because Pakistan justifies its nuclear proliferation as a deterrent against aggression from the outside. So the United States has to get tougher with Pakistan. We have to call them out on this double game they have been playing, not this year, not last year, not five years but for the past 15 years," Higgins said. "Pakistan, let's be truthful about this, plays a double game. They're are military partner, but they're the protector and the patron of our enemies. And this has been going on for 15 years. Since 2002, US aid to Pakistan, economic and military, has averaged about \$2 billion a year. Pakistan's annual defence budget is only about \$5 billion a year." He said if Pakistan falls apart or if Islamic extremists take over, it's a nightmare scenario for the US. "It's a big country, about 180 million people, it has a lot of Islamic extremists, and it has nuclear weapons. And to have Islamic extremists with nuclear weapons is a primary goal of al-Qaida and it would be major victory for them and the outgrowth of al-Qaeda, the Islamic state and a major defeat for us, the US," Higgins added.

'Concerned' at Pak's nuke arsenal

- * Richard Olson (in pic), Special US Representative for Afghanistan and Pakistan, has said the US is concerned at the pace and scope of the Pakistan's missile programme, including its pursuit of nuclear systems
- * The US is worried that a conventional conflict in Southwest Asia may escalate to include nuclear use, he said
- * He asked Pakistan to 'restrain its nuclear weapons and missile development' and avoid any developments that might invite 'risk to nuclear safety, security, or strategic stability'

Obama administration authorizes \$1.83-billion arms sale to Taiwan

By David Brunnstrom And Patricia Zengerle

The Obama administration formally notified Congress on Wednesday of a \$1.83-billion arms sale package for Taiwan, including two frigates, anti-tank missiles, amphibious assault vehicles and other equipment, drawing an angry response from China. The authorization, which Reuters on Monday reported was imminent, came a year after Congress passed legislation approving the sale. It is the first such major arms sale to Taiwan in more than four years. The White House said there was no change in the longstanding U.S. "one China" policy. Past U.S. weapons sales to Taiwan have attracted strong condemnation in China, which considers Taiwan a renegade province. The White House said the authorization followed previous sales notifications by the administration totaling more than \$12 billion under the Taiwan Relations Act. "Our longstanding policy on arms sales to Taiwan has been consistent across six different U.S. administrations," a National Security Council spokesman, Myles Caggins, said. "We remain committed to our one-China policy," he added. Although Washington does not recognize Taiwan as a separate state from China, it is committed under the Taiwan Relations Act to ensuring Taipei can maintain a credible defense. The sales come at a period of heightened tension between the United States and China over the South China Sea, where Washington has been critical of China's building of man-made islands to assert expansive territorial claims. China summoned the U.S. charge d'affaires in Beijing, Kaye Lee, to protest and said it would impose sanctions on the companies involved, state news agency Xinhua reported. "Taiwan is an inalienable part of China's territory. China strongly opposes the U.S. arms sale to Taiwan," Xinhua quoted Vice Foreign Minister Zheng Zeguang, who summoned Lee, as saying. Zheng said the sales went against international law and basic norms of international relations and "severely" harmed China's sovereignty and security. "To safeguard our national interests, China has decided to take necessary measures, including imposing sanctions against the companies involved in the arms sale," Zheng said. The U.S. State Department said Raytheon (RTN.N) and Lockheed Martin (LMT.N) were the main contractors in the sales. It was not clear what impact sanctions might have on the companies, although in 2013, Lockheed Martin signed a pact with the Thailand-based Reignwood Group to build an offshore plant to supply energy for a luxury resort on Hainan island in southern China. "U.S. companies participating in arms sales to Taiwan gravely harm China's sovereignty and security interests," Foreign Ministry spokesman Hong Lei said. "China's government and companies will not carry out cooperation and commercial dealings with these types of companies." However, previous Chinese sanction threats have not been followed up by Beijing. China's Defense Ministry said the sale would also inevitably affect military-to-military ties, but did not elaborate. Taiwan's defense ministry said the new weapons would be phased in over a number of years and would enable Taiwan to maintain and develop a credible defense. U.S. State Department spokesman John Kirby said the decision was based solely on Taiwan's defense needs. "The Chinese can react to this as they see fit," he said. "This is nothing new. ... There's no need for it to have any derogatory effect on our relationship with China." Kirby said Washington wanted to work to establish a "better, more transparent more effective relationship" with China in the region and had been in contact with both Taiwan and China on this on Wednesday. He declined to elaborate. David McKeeby, another State Department spokesman, said the arms package included two Perry-class guided-missile frigates; \$57 million of Javelin anti-tank missiles made by Raytheon and Lockheed Martin; \$268 million of TOW 2B anti-tank missiles and \$217 million of Stinger surface-to-air missiles made by Raytheon, and \$375 million of AAV-7 Amphibious Assault Vehicles. The State Department said the frigates were being offered as surplus items at a cost of \$190 million. The package also includes \$416 million of guns, upgrade kits, ammunition and support for Raytheon's Close-in Weapons System. Analysts and congressional sources believe the delay in the formal approval of the sales was due to the Obama administration's desire to maintain stable working relations with China, an increasingly powerful strategic rival but also a vital economic partner as the world's second-largest economy. U.S. Republican lawmakers said on Wednesday they were pleased the administration had authorized the sale but called for a more regular process for such transactions. John McCain, chairman of the Senate Armed Services Committee, said this would "avoid extended periods in which fear of upsetting the U.S.-China relationship may harm Taiwan's defense capabilities."

Iran missile test sparks concern over nuclear deal implementation

By Jeremy Diamond

Iran is once again testing the international community. A United Nations panel announced this week that Iran violated a U.N. Security Council resolution when it tested a ballistic missile capable of carrying a nuclear warhead in October. Coming just months before the international community prepares to implement the landmark nuclear deal brokered between Iran, the U.S. and five other world powers this summer, the Iranian missile test is raising questions about Iran's commitment to international protocols and the ability -- and will -- of the U.S. and the international community to enforce the terms of the controversial nuclear accord. The response from the international community, so far, has been a tepid one, sowing some doubt about its ability to agree on what would constitute a violation of the nuclear deal and which violations should be punished. Russia and China were quick to cast doubt Tuesday on the findings announced Tuesday by the U.N. Security Council's Panel of Experts that Iran's October test of its medium-range Emad rocket constituted a violation of Security Council resolution 1929. The resolution prohibits Iran from testing ballistic missiles capable of delivering a nuclear weapon. That resolution is separate from the agreements made between Iran and the international community as part of the nuclear accord reached in July. Iranian Defense Minister Hossein Dehqan on Wednesday dismissed the international objections, saying that the missile test was meant "to tell the world that the Islamic Republic of Iran acts based on its national interests." READ: U.S. welcomes U.N. agency decision to close book on Iran's nuclear history "No power anywhere in the world can decide for our nation and country, and (Iran) will not accept any restriction on this issue," Dehqan was quoted as saying by Iran's state news agency, IRNA. The United States and its Western allies, like France, issued swift verbal condemnation of Iran's actions and called on the U.N. Security Council to hold Iran accountable for the violation. Speaking at the U.N. on Tuesday, U.S. Ambassador to the U.N. Samantha Power criticized Iran's violation -- as well as China and Russia's defense of Iran. "This council cannot allow Iran to feel that it can violate our resolutions with impunity," Power said. "Some council members may not like those resolutions, but they are our resolutions." White House Press Secretary Josh Earnest called the missile test "a serious matter that undermines regional stability." But beyond words, the U.S. has yet to take concrete action to rebuke Iran's violation, such as through economic sanctions. Two experts -- a supporter and an opponent of the Iranian nuclear deal -- told CNN that they did not foresee the U.S. taking much more than symbolic action in light of the high stakes of the impending nuclear agreement. "The administration is deeply concerned that the Iranians won't implement the agreement and that they'll walk away from the (nuclear) agreement," said Mark Dubowitz, executive director of the Foundation for Defense of Democracies, who opposes the deal. "There is a deep reluctance on the part of the administration to impose sanctions for any violations." Even though sanctions in response to Iran's missile test would be unrelated to the nuclear agreement, some fear that punishing Tehran too strongly could cause Iran to withdraw from the nuclear pact. The ballistic missile test violation would not contravene the nuclear agreement brokered with Iran once it goes into effect in early 2016. Under the new deal, Iran will be able to conduct ballistic missile tests -- a concession to Iran included in the deal -- meaning Iran could have simply waited until early next year. But Dubowitz argued that Iran, which has been known to incrementally cheat on international agreements, used the missile launch to challenge the West and gauge its reaction to a breach of a Security Council resolution. Dubowitz called for a heavy-handed response to what he views as a "major violation" but said he is "deeply skeptical this administration will resort to tough economic sanctions." "The only way the Iranian regime has ever been deterred from bad behavior or has sort of stood up and said, 'Wait a second, the Americans might be serious,' was when the administration and Congress have slapped very serious sanctions on Iran," Dubowitz said. A lack of a response could send a signal to Iran that the U.S. will turn the other cheek on small, incremental violations of the nuclear agreement. Gary Samore, who previously served as President Barack Obama's top arms control adviser, said he believes the White House is "nervous that if they over-respond to the missile test, they will jeopardize implementation of a nuclear deal." But Samore, an early skeptic who eventually came out in support of the Iran deal, said the administration faces a tough calculus, as it must still send a message to the Iranians that missile test violations won't be tolerated without pulling the rug out from under the deal. "By doing nothing to respond, we run the risk of potentially indicating to the Iranians that we're willing to tolerate non-nuclear activity in a way that could make the Iranians misbehave more than they would otherwise," Samore said. Samore suggested the administration should offer up a set of targeted economic sanctions designed to hit individuals or entities tied to Iran's ballistic missile activity -- sanctions that Samore said would be largely symbolic but would send a message to Iran that the U.S. won't ignore its bad behavior. Iran's missile launch is also a test of the international community's ability to coalesce to take action to address potential Iranian violations of the nuclear deal. While the nuclear deal lays out in detail how the international community should address suspected violations of the deal, Russian and Chinese skepticism of the ballistic missile test are sending red flags about the two countries' willingness to cooperate should Iran violate the terms of the more consequential nuclear deal. "This sets a bad precedent for our ability to vigorously enforce the nuclear agreement going forward," Dubowitz warned.

U.S. missile defense site in Romania starts up, angering Russia

By David Larter

The new ballistic missile defense site in Romania is set to come online Friday, as the Navy takes control of it after years of construction and prepares it to track and shoot down missiles bound for Europe. The U.S. and Romania are expected to announce the radar site and missile battery has reached "technical capability" in a ceremony in Bucharest. The announcement means that all the radars, consoles, SM-3 interceptor missiles work and sailors who man it are trained and in place. The site is not being declared "operational," said a defense official with knowledge of the announcement, because the land-based system still needs to be integrated into NATO's larger ballistic missile defense architecture, which has been a major Obama administration drive. The sea-based arm of the shield is provided by four BMD-capable destroyers forward-based in Rota, Spain. The Romania site should be declared operational this spring. "The Aegis Ashore site in Romania is an important step in our efforts to protect against the growing threat posed by the proliferation of ballistic missiles of increasingly greater ranges, lethality, and sophistication," said Navy spokesman Lt. Cmdr. Timothy Hawkins. "The Romania site will provide a defensive capability to protect NATO Europe against ballistic missiles." The missile base has been a source of tension between Russia and the United States. Russian President Vladimir Putin has criticized the program, saying it is an attempt to upset the strategic stalemate that deterred a nuclear exchange between the West and Russia during the Cold War. The U.S. government has maintained that the shield in Romania, and its planned sister installation in Poland, is aimed at countering a nuclear threat from Iran - not Russia. On Thursday, the head of Russia's strategic missile program said his country had developed a weapon that could "neutralize" the new missile shields, according to the Associated Press. The missile site is located on an old, 430-acre Romanian air base and will be manned by sailors rotating through for six months at a time. It will be equipped with an Aegis SPY-1 radar system and a vertical-launch missile system armed with long-range anti-air missiles, which was estimated to cost \$1 billion. Much like the combat information center watch teams on surface combatants, the Aegis Ashore sites will be run round-the-clock by three crews. Each shift has an 11-person watch team, including rates that typically work in a ship's combat information center: fire control technicians, operations specialists, and cryptologic technicians (technical). One watch officer will oversee them. The Navy is deploying three of these specially trained watch teams for six months at a time. This will be an operational tour, similar to a ship's cruise, and won't come with permanent change-of-station orders or the possibility of bringing dependents to Romania. Mission control of the Romania defense site will ultimately be transferred to NATO once it's fully operational, Hawkins said.

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Foreign satellite launches creditable: Anil Kakodkar

It is 'a great recognition' for the country that foreign clients are vying to launch their satellites aboard the Polar Satellite Launch Vehicle (PSLV), former chairman of the Atomic Energy Commission, Anil Kakodkar said on Thursday. Inaugurating the Heat and Mass Transfer Conference at the Vikram Sarabhai Space Centre, Thumba, here, Mr. Kakodkar congratulated the ISRO team on the successful PSLV C-29 mission which placed six Singapore satellites in orbit on Wednesday. The C-29 commercial flight was the PSLV's 31st consecutive, successful mission. "The PSLV has proven itself a great workhorse; shall we say 'never fail' launcher? It is a fantastic technological achievement," he said. The former AEC chairman said the Department of Atomic Energy and the Department of Space have the same umbilical cord and both the departments help each other. In a first for ISRO, the engine on the upper stage of the PSLV was shut off and re-started while placing the six Singapore satellites in orbit. The technique is useful when satellites have to be positioned in multiple orbits, Director, Liquid Propulsion Systems Centre, S. Somanath said. "It was tried for the first time and was a success," he added.

Nearly 30 satellite launch orders at hand for ISRO's Antrix

Emerging as a global competitive provider for satellite launches, Indian Space and Research Organisation's commercial arm Antrix Corporation has almost 30 orders at hand from different countries for satellite launches which are scheduled to be completed in next two to three years. ISRO Chairman AS Kiran Kumar said on Thursday night that the organisation is working on increasing its capabilities on critical technologies. "We have (orders of) almost 30 odd satellites from about 7-8 countries. We have to put them into orbit in next two-three years and we are working on it," he said here. "We are working on various projects and technologies. Yesterday, we had put the 57th international satellite into orbit and many more launches will be there in the next couple of years," he said. Achieving a new milestone, ISRO successfully launched six Singaporean satellites through Polar Satellite Launch Vehicle (PSLV)-C29 from Satish Dhawan Space Centre (SDSC) in Sriharikota, Andhra Pradesh on Wednesday. The ISRO Chairman was in the city to attend a national symposium on 'Geomatics for Digital India' organised by the Indian Society of Geomatics (ISG) and the Indian Society of Remote Sensing (ISRS) at JK Lakshmi Pat University. Talking about the space programmes, Kumar said a study team is going through various options to recommend the next space mission. "We have a study team which is going through various options such as in what time frame we can do the next mission... whether it should be the Mars Mission-2 or an asteroid mission." "Once they come up with their recommendations, then it will be decided," the ISRO Chairman said, adding that the preparations for Chandrayaan Mission-2 which will carry Lander and Rover are going on. The country's second mission to the Moon -- Chandrayaan-2 -- is an advanced version of the previous Chandrayaan-1 Mission and consists of an Orbiter, Lander and Rover configuration. Kumar also stated that ISRO was planning to launch next generation launch vehicle GSLV Mk-III with indigenous cryogenic upper stage technology by December 2016. When asked about manned space programmes, he said it was for the government to take a decision. "Manned programme will be done only after the government gives permission. We have not got any clearance so far." "However, ISRO is working on various projects and critical technologies like crew module, creating an environment inside the crew module for people inside to survive and also space suit. "Some activities are going on but finally, the government has to make up its mind and then tell whether we should take up manned mission or not," Kumar said.

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Hubble spots first ever supernova explosion

The Hubble Space Telescope has captured the image of the first-ever predicted supernova explosion that offers a unique opportunity for astronomers to test how mass - especially that of mysterious dark matter - is distributed within a galaxy cluster. Many stars end their lives with a bang, but only a few of these stellar explosions have been caught in the act. When they are, spotting them successfully has been down to pure luck - until now. On December 11, astronomers not only imaged a supernova in action, but saw it when and where they had predicted it would be. The supernova, nicknamed Refsdal, has been spotted in the galaxy cluster MACS J1149.5+2223. While the light from the cluster has taken about five billion years to reach us, the supernova itself exploded much earlier, nearly 10 billion years ago. "While studying the supernova, we realised that the galaxy in which it exploded is already known to be a galaxy that is being lensed by the cluster," explained Steve Rodney, study co-author from University of South Carolina in a NASA statement. "The supernova's host galaxy appears to us in at least three distinct images caused by the warping mass of the galaxy cluster," he noted. These multiple images of the galaxy presented a rare opportunity. As the matter in the cluster - both dark and visible - is distributed unevenly, the light creating each of these images takes a different path with a different length. Therefore, the images of the host galaxy of the supernova are visible at different times. "We used seven different models of the cluster to calculate when and where the supernova was going to appear in the future," added Tommaso Treu, lead author from University of California-Los Angeles. Astronomers are now eager to see what other surprises the ongoing Hubble Frontier Fields programme will bring to light.



Be 'smart' online at your peril

Vineeta Pandey

Watch out before you transfer money using internet or store your personal details on smartphones. Experts have cautioned that given the pace of rise in the cyber crime in the world, it is expected that by 2025 almost every person hooked to smartphone or connected to a smart device/gadget will be victim of the cyber attack. And as internet increasingly makes our life comfortable the vulnerability of a possible cyber attack will grow, said cyber security experts during a brainstorming session at the World Internet Conference on Wednesday. Experts felt that cyber attack is no more going to be limited to mere email, Facebook or Twitter accounts hacking but "it may soon possibly lead to hacking of our bank accounts, certificates stored online, other classified information, passport and travel related details, online trading, online payment information, private and search information of users including whom we talk, what we chat and what we do on internet - almost everything that netizens are hooked to is going to be impacted". Besides, there is a bigger threat to the security and infrastructure installations like the nuclear & power plants, railway networks, air traffic control and even shipping sector. The experts discussed every potential threat to people and ways to safeguards against them. "Driverless vehicles, smart grid, smart cities, smart chopsticks that can detect food contamination, everything will be impacted. There can also be a situation of malfunctioning of medical devices, traffic congestion, miscalculation of sensitive data," said Bruce McConnell, senior vice president with the cyber security think tank Eastwest Institute. "The problem is we have weak data integrity, poor authentication and security systems. And as we move more towards internet integration, the most disruptive phase is coming soon because if one point fails then the entire system will collapse," McConnell added. According to Alexander Klimburg, a research fellow in Hague Centre for Strategic Studies, by June 2015, already a damage worth \$445 billion has been done by cyber crime out of which \$100 billion is from USA alone while \$45 billion is from China. "The cyber world is fragile," Klimburg said. There was a bigger concern for misuse of cyber space by the terror groups and experts felt that the cross border nature of internet poses higher risk in cross border terrorism. Use of cyber space by the terror groups ISIS, Al Qaeda, Boko Haram for espionage and destruction was also discussed. "A lot of money that is stolen from banks through e- fraud has gone to the funding of Boko Haram, (Islamic fundamentalist terror group). They have used the money to buy weapons. Money stolen through cyber crime is also used for money laundering. In fact, the London Police has found strong links between money laundering and cyber crime," said Israeli cyber security expert David Nordel. He added that constant stream of new and sophisticated malwares are regularly adding to the threat. "Protecting critical infrastructure that can kill thousands of people is a bigger challenge for governments now," Nordel said. He gave an example where a container handling system in Antwerp was hacked and drugs were taken out of a ship without the knowledge of the customs. Internet security expert Eugene Kaspersky said cyber terrorist activities on internet are not merely limited to communicate, pass encrypted messages, recruit jihadis or spread propaganda. "They have the potential to attack critical plants and installations like nuclear set up, power plants, air traffic control systems etc. They also can attack and steal critical data relating to finance and defence security and attack on telecommunication system, by hacking our internet and mobile systems," said Kaspersky, who is chairman and CEO of Kaspersky Labs that sells multi-device security solutions, said, all internet related installations will be under threat and there is going to be an integration between online and offline crimes. Experts displayed how by hacking into retail chains customer information, their identity could be established and how even CCTV cameras can be manipulated and misused. There was concern over websites offering hacking techniques and password recovery or regeneration softwares. Safety of Cloud network and Big Data and JPEG (picture format) privacy was also a new area of concern. Sale of prohibited drugs, surrogacy, recruiting killers, online blackmailing, damage to intellectual property rights are some new areas according to Yang Peng, director of Information Security executing committee, Tencent. He said recently We Chat was found to be used for gambling and financial transactional chats. He said user awareness is first step to cyber crime and need to encourage whistleblowers. To avoid such situations, the experts suggest using biometric systems for even online payments while there was stress on enterprises to make secure products.

Take risks in life, Google CEO tells students at SRCC

Kritika Sharma Sebastian

"My Class XII score was not enough to get me admission in SRCC", said Google CEO Sundar Pichai on being asked about his academics, during an interactive session at Shri Ram College of Commerce (SRCC) in Delhi University on Thursday. Mr. Pichai, who was attending an interactive session #AskSundar with students from various schools and colleges of Delhi University, revealed his candid side. He answered various questions asked by students who gathered at the event. From things like what he would have been if not the Google CEO and what kind of work place Google is, to when he bought his first smartphone, he answered it all. "Google is a really fun place to work. When you are walking in the office, you see everyone is doing something interesting. When I walked inside the Google office for the first time, I was like a kid in a candy store," Mr. Pichai said. Apart from talking about Google and the company's expansion plans in India, he also encouraged students to take risks in life. When a student asked him how he felt when he started working in Google and everyone else around him was more experienced, he said: "It is always good to work with people who make you feel insecure about yourself. That way, you will constantly keep pushing your limits," said the 43-year-old tech executive. The India-born executive, who took over as the head of one of the world's largest tech companies in August, also emphasised the need to encourage creativity and experiential learning as part of the Indian education system. "I think the Indian education should allow a system of creativity, project-based, experiential learning. We should teach students to take risks and not penalise them," he told an audience of over 1,800 people. A candid rapid-fire session with star commentator Harsha Bhogle followed the #AskSundar session during which Mr. Pichai told the audience that he bought his first smartphone in the year 2006 and he now owns about 20-30 of them. The event that was organised in SRCC in association with Google saw a huge response from students who gathered from around 10 schools in the Capital and some DU colleges, including the technical colleges. A visibly excited school student who came for the event said: "It was an enthralling experience to meet Sundar Pichai. In the entire session what I loved most was the rapid fire session where he answered some personal questions."

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An app to detox you from smartphone addiction

Lock n' LoL, tested in college campuses, limits the time you spend on social media

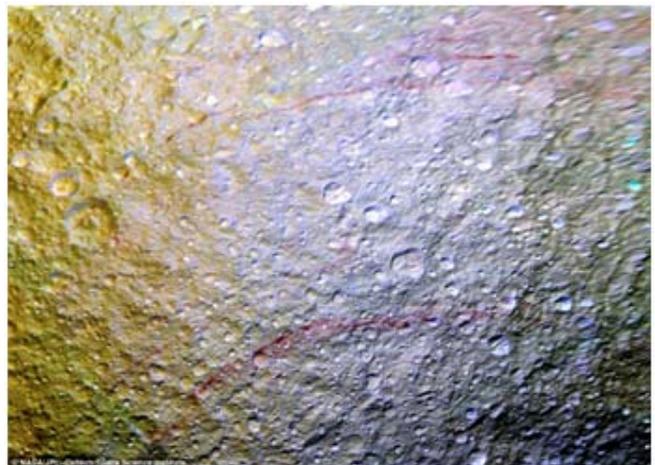
Tired of WhatsApp messages and e-mail pings during a key client meet? Well, here comes an app that will lock the smartphone altogether and keep you from using it while engaged in activities such as meetings, conferences and discussions. Called "Lock n' LoL" (Lock Your Smartphone and Laugh Out Loud) and developed by researchers from the Korea Advanced Institute of Science and Technology in Daejeon, South Korea, the app helps people restrain themselves from using smartphones during meetings or social gatherings. It allows users to create a new room or join an existing room. The users then invite meeting participants or friends to the room and share its ID with them to enact the Group Limit (lock) mode. When phones are in the lock mode, all alarms and notifications are automatically muted and users must ask permission to unlock their phones. However, in an emergency, users can access their phones for five minutes in a temporary "unlimit" mode. "We conducted the 'Lock n' LoL' campaign throughout the campus for one month this year with 1,000 students participating. We discovered that students accumulated more than 10,000 free hours from using the app on their smartphones," said lead researcher professor Uichin Lee. The students were able to focus more on their group activities. "In an age of the 'Internet of Things', we expect that the adverse effects of mobile distractions and addictions will emerge as a social concern, and our Lock n' LoL is a key effort to address this issue," he noted. In addition, the app's "Co-location Reminder" detects and lists nearby users to encourage app users to limit their phone use. The "Lock n' LoL" also displays important statistics to monitor users' behaviour such as the current week's total limit time, the weekly average usage time, top friends ranked by time spent together and top activities in which the users participated. "This app will certainly help family members to interact more with each other during the holiday season," Prof. Lee added. The "Lock n' LoL" is available for free download on the App Store and Google Play.

Brazilians shocked - Meanwhile, millions of Brazilians woke up shocked and cranky on Thursday after WhatsApp was shut down for two days on a judge's order. The service is wildly popular in Brazil. The measure, which is to last until midnight Friday, was roundly denounced by parent company Facebook. It was ordered by a judge after WhatsApp failed to disclose information requested for a criminal investigation. WhatsApp is causing headaches for Brazil's telecoms companies because it offers a free alternative to the country's high cell phone rates.

Saturn's moon has a mystery bloodline

By Ellie Zolfagharifard and Mark Prigg

It is a mystery that has baffled the world's top scientists - why are there 'blood streaks' on one of Saturn's moons? 'It's clearly painted on the surface in some way that we do not as yet understand,' says Paul Schenk of the Lunar and Planetary Institute, who presented the results of the latest investigation at the American Geophysical Union's annual meeting. 'We basically have a little mystery.' Cassini first spotted these mysterious red lines, which stretch 1,000 of miles across, scratched across the surface of Saturn's icy moon Tethys. The unexplained arc-shaped 'blood trails' are among the most unusual colour features on Saturn's moons to be revealed by the probe. Astronomers have in the past suggested they may be exposed ice containing chemical impurities, or the result of outgassing from inside Tethys. 'You don't see any trace of scarps or ridges or depressions of any kind,' Schenk says, meaning there are no obvious landforms associated with the smears - or at least nothing that's big enough to see at Cassini's current resolution. The colour images from Cassini, taken in April, are the first to show large northern areas of Tethys under the lighting and viewing conditions needed to see the arcs clearly. As the Saturn system moved into its northern hemisphere summer over the past few years, northern latitudes have become increasingly well illuminated. As a result, the arcs - which are only a few miles wide - have become clearly visible for the first time. 'The red arcs really popped out when we saw the new images,' said Cassini participating scientist Paul Schenk of the Lunar and Planetary Institute in Houston. Some of the nearby craters have dark material inside them, but it's unclear what this material is made from or how it formed. To get some clues, he plotted the locations of the streaks on the moon. He noticed a pattern suggesting the moon was deformed some form of stress, such a tilted orbit, change in the poles or irregular rotation. So far, however, simulations of those changes don't match up exactly to the streaks. Schenk's guesses that these streaks are formed by fractures that Cassini is unable to capture with its cameras. He says those fractures may have formed recently, exposing fresh and unusual material. As Cassini's days of exploring the Saturn system wind to a close, scientists are hoping to solve this little mystery - and spy on a host of otherworldly enigmas associated with the giant, ringed planet and its clutch of moons. Except for a few small craters on Saturn's moon Dione, reddish-tinted features are rare on other moons of Saturn. Many reddish features do occur, however, on the geologically young surface of Jupiter's moon Europa. 'The red arcs must be geologically young because they cut across older features like impact craters, but we don't know their age in years,' said Paul Helfenstein, a Cassini imaging scientist. 'If the stain is only a thin, coloured veneer on the icy soil, exposure to the space environment at Tethys' surface might erase them on relatively short time scales.' The Cassini team is currently planning follow-up observations of the features, at higher resolution, later this year. 'After 11 years in orbit, Cassini continues to make surprising discoveries,' said Linda Spilker, Cassini project scientist at Nasa's Jet Propulsion Laboratory in Pasadena, California. 'We are planning an even closer look at one of the Tethys red arcs in November to see if we can tease out the source and composition of these unusual markings.'



Sat camera captures lunar eclipse

By Jonathan Amos

An American satellite stationed a million miles from Earth has obtained a unique view of a lunar eclipse. The DSCOVR spacecraft, which was launched in February, has a camera that stares constantly at the sunlit face of the Earth. The images are being used to track moving features such as clouds and dust storms, and to monitor the climate. But on 27 September, it was in just the right position to see the Moon go behind the Earth and into its shadow. On the ground at this time, skywatchers would have observed the lunar body turn a shade of red. It does this because some sunlight is still able to reach the Moon's surface after being filtered through the Earth's atmosphere. "Our camera is normally centred on the Earth but we use the Moon for calibration," explained Jay Herman, the US space agency's (Nasa) lead investigator on DSCOVR's Epic camera system. "That's what we were doing on this occasion. We were staring at the Moon and the Earth moved in front about four hours before the eclipse was seen on Earth. And that's because we were at an angular position, just to the side of the Sun-Earth line. "The Earth is rotating as it goes by. It's kind of neat because you can watch the motion of the clouds." Dr Herman was speaking at the Fall Meeting of the American Geophysical Union in San Francisco - the largest annual gathering of Earth scientists. The DSCOVR satellite is reported to be in excellent shape. In-space testing continues following the launch but science operations have started up nonetheless, and the AGU gathering is being used to report some early observations and results. One of the satellite's objectives is to track cloud behaviour. The different wavelength filters on Epic allow the camera to estimate cloud heights. This is important not just for monitoring weather systems, but also to understand the clouds' impact on the climate. Some help to cool the planet by reflecting sunlight back out into space; other clouds actually warm the Earth because they trap heat. And in pursuing this work, Epic data has already observed some unexpected things, like the tracks of ships. These are not the wakes created by the vessels cutting through the ocean surface, but rather the clouds their exhaust system are seeding up above. "It was very surprising for us that we could see them from one million miles, and they're even better seen if we use a longer wavelength because this gives you a strong contrast with the dark ocean," said Alexander Marshak, the DSCOVR deputy project scientist. Also still being tested is the satellite's NISTAR instrument. This is a radiometer that measures the total amount of solar energy being reflected off Earth, as well as the heat emitted from our planet. Its principal investigator is Steven Lorentz, who works for the company L-1 Standards and Technology. He explained how the amount of solar energy bouncing off the planet would vary depending on which continents or oceans are in view. The Earth was most reflective, he said, when Africa dominated the scene (land surfaces are brighter than sea surfaces) with Antarctica visible also during the austral summer. "The two poles do show up very clearly in the data," he told BBC News. "When the Earth is tilted this way or that way, it really does make a difference to the planetary albedo. And that just underlines the ice's importance to the climate because if the poles weren't there, or as they shrink, the amount of energy going into the system will go up." DSCOVR's project scientist, Adam Szabo, added: "The type of measurements that the satellite is making is nothing new - we've been making these exact observations from low-Earth orbiting or geostationary satellites. But the vantage point is really unique. "Sitting between the Sun and Earth, we are seeing the full sunlit face of Earth all the time, allowing Earth to rotate beneath us rather than the satellite going around the Earth."

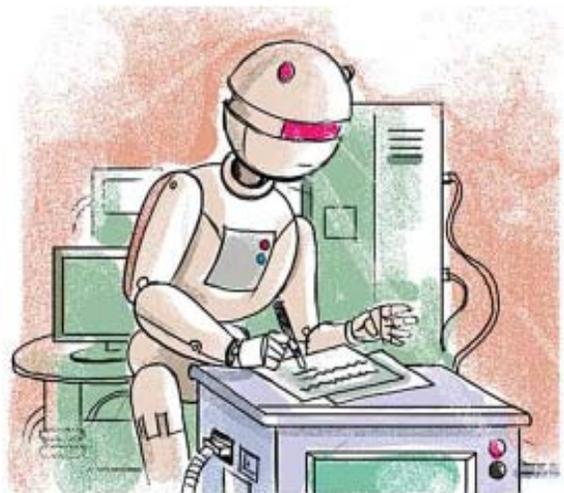


Hand-written card, signed and sealed by latest tech

Eilene Zimmerman

Communication today is faster and more ephemeral than ever. We fire off emails, skip the punctuation in our texts, and watch our photos and messages vanish in seconds on Snapchat. Digital tools have made communicating with others easier but not necessarily more thoughtful, and this bothered Sonny Caberwal, an entrepreneur. "We're in a rush to make everything disappear," he said. Receiving a physical, hand-written thank-you note or letter these days feels special, but it also requires some work. "You have to assemble all the pieces," Caberwal said - including paper, a pen, the recipient's address, an envelope and a stamp - and then the note has to be written and mailed, all of which is time-consuming. He wanted to enable people to do that more easily, by harnessing technology to create a product that still felt very personal and worth keeping. His company, Bond, harks back to a time of fountain pens, creamy sheets of writing paper and wax-sealed envelopes. Caberwal, founder and chief executive of the New York City start-up, describes it as "the opposite of Snapchat." Bond was started in 2013, and has about 50 full-time employees and several high-profile backers, like Gary D. Cohn, the president of Goldman Sachs, and the rapper Nasir Jones (known as Nas). Although hand-written notes and cards may seem like artefacts of the 20th century, greeting cards are still a strong business. According to the Greeting Card Association, Americans purchase about 6.5 billion cards a year and annual sales are estimated to be \$7 billion to \$8 billion. Despite a culture awash in digital communications, the greeting card and stationery industries have not declined precipitously but have remained largely flat, said Patti Stracher, director of the National Stationery Show, an annual trade show and business event for stationery, greeting card and gift companies. "One could say the digital age has grown connectivity and expanded the reasons for other forms of personal communication, for a tangible, experiential connection," she said. At the Greeting Card Association's annual convention in October, nearly every presentation included a discussion of the intersection of digital technology and traditional greeting cards, said Carlos LLansó, the organisation's president. "We're actually finding that social media gives people another opportunity to identify card-worthy occasions," he said. "You can't save a Facebook birthday message and put it in a drawer." That overlap of digital and traditional is where Bond lives. The company built its own writing machine, which can produce personalised notes for every customer. Designed by the company's chief technology officer, Kenji Larsen, the machines have robotic arms that can hold a pen, a paintbrush or a marker. The paper is moved around using static electricity - rather than a roller - so it stays pristine, with no wrinkles or marks. Bond also seals each envelope with wax, adds postage and mails it. Customers can choose from a variety of handwriting styles, or they can have their own handwriting copied and digitised for \$500. Each customer's original signature is uploaded to Bond via smartphone, to be used on cards and notes.

Customers also upload recipients' addresses. If an address is unknown, the service will send an email or text message to the recipient asking for it. An invitation-only premium service, Bond Black, costs \$1,200 a year and provides clients with a personalised mobile app to send notes in their own handwriting on custom stationery. Many of Bond's biggest customers are commercial, including Fortune 500 companies, nonprofits, and small independent businesses like professional services firms and real estate brokers. "Companies spend \$23 billion on customer relationship management tools to understand and have a more



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Hand-written card, signed and sealed by latest tech

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personal relationship with their customers. We are the physical implementation of that," Caberwal said. One Bond client, a Fortune 500 retailer, tested the service by sending personalised thank-you notes to some of its best customers. Those customers, Caberwal said, ended up spending, on average, \$16 more each month after receiving the thank-you note and returned 33 per cent less merchandise. Caberwal followed an unusual path on his way to starting Bond. He was a corporate lawyer, played percussion with the band Thievery Corporation, founded a tea store, modelled for Kenneth Cole and, with his wife, started the online fashion company Exclusively.com in India. That company was acquired by the Indian e-commerce marketplace Flipkart. By that time he, his wife and their young daughter were back in New York, and Caberwal was looking to start another company. "That's really what I know how to do best," he said, "build e-commerce companies." Bond now has 200 robotic writing machines in its Manhattan facilities (although the machines are manufactured at a plant it owns in Rhinebeck, N.Y.), and it also produces its own stationery. The company raised "a few million" in seed funding, Caberwal said, and is in the midst of an effort to raise \$3 million. By the end of the year, Bond expects to have about \$500,000 a month in sales, he said, adding that revenue has been growing from 30 to 50 per cent a month. Caberwal said he expected Bond to be profitable by the second quarter of 2016. A single card costs \$3.50, but for corporate customers with larger orders, the price ranges from \$2 to \$2.50 a card. Jason Hirschhorn, founder and chief executive of the New York start-up Redef, which provides curated information streams, began using Bond's services this summer. "They are using robotics in a very clever way," Hirschhorn said. "I don't have a lot of time, but I like the idea of being able to use personalised stationery in my own hand, using my own words, all done remotely for me. And it's all in my computer, so I can track what I've done." Saneel Radia, founder and president of Finch15, a New York firm that helps companies develop new products and services, uses Bond's service early in his relationships with customers and business partners. At first Radia had his own handwriting duplicated but then switched to one of the styles offered by Bond. "I hate what my handwriting looks like, so I upgraded it," he said. "Now it's an odd mix of creative and energetic, handwriting I wish I had." Radia said people often thanked him for the notes they received, and he readily admitted that a robot had written them. "People hire us because we are at the intersection of service and technology," he said. "Bond, like us, is also at that intersection, so using the service shows that our company has its finger on the pulse of what is new and useful in this space." Radia said although the cards created by Bond are not actually hand-written, they are still a far cry from an email or a mass-produced thank-you note. "You're giving someone something that took time and is work - not the same amount of work as mailing a letter you wrote yourself, but more than a text message that says, 'Thanks for the meeting,'" Radia said. "It's thoughtful, and it is my sentiments. And it comes in an envelope with a wax seal, which certainly helps."