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## **Mahindra to assemble M777 howitzers**

*BAE Systems to start delivery in 6 months, \$750 mn for 145 guns*

On Monday, the United States Department of Defense (Pentagon) delivered to the defence ministry a Letter of Acceptance (LoA), agreeing to supply 145 M777 ultra lightweight howitzers to India. Valid for 180 days, the LoA spells out the contract price, terms of supply and options available.

Sources close to the sale tell Business Standard the asking price for 145 guns is about \$750 million (Rs 5,000 crore). The vendor, BAE Systems, will supply the first batch of 155-millimetre, 39-calibre howitzers within six months of signing the contract. The remaining guns would progressively be built in India.

In August 2013, the Pentagon had notified the US Congress that it was raising the maximum price of the sale to India from US \$647 million, which had been notified in Jan 2010, to \$885 million. However, BAE Systems officials clarify that this represented a maximum ceiling price, and the actual sale price would be significantly lower.

On Wednesday, BAE Systems named the Mahindra Group as its Indian partner for assembling imported M777 kits into fully built guns. BAE Systems has so far assembled the M777 in Hattiesburg, USA. With this line now shuttered, Mahindra will build the guns in an "Assembly, Integration and Test (AIT) facility", using components shipped to India from BAE Systems facilities in the UK.

"BAE Systems is pleased to partner with Mahindra on our offer to develop an Assembly, Integration and Test facility in India. The facility is a fundamental part of the M777 production line," said BAE Systems on Wednesday.

According to BAE Systems officials, the Pentagon has drawn up the LoA in close consultation with the customer, i.e. the Indian government. That would suggest the bulk of the negotiation has been completed. Last May, after years of negotiations, the defence ministry cleared the purchase of 145 M777s for Rs 2,900 crore. The Union cabinet must now clear the sale at the new price of Rs 5,000 crore.

Over the last three years, negotiations had apparently stalled, with successive defence ministers, AK Antony and Arun Jaitley, informing parliament that the cost was too high, and BAE Systems' offset proposal was inadequate.

That impasse was broken last year when BAE Systems offered to assemble, integrate and test the M-777 in India. This brings the offer in conformity with the "Make in India" initiative. BAE Systems has also submitted a fresh offsets proposal.

BAE Systems pointed out on Wednesday: "A domestic Assembly, Integration and Test facility will enable the Indian Army to access maintenance, spares and support for the M777 locally."

The M777, which has seen extensive operational service with the US military in Afghanistan, is being acquired to support Indian army operations on the rugged Himalayan borders with China and Pakistan.

Built of titanium components and weighing just four tonnes (compared to 10-tonne conventional 155-millimetre guns), it can be air-lifted to high altitude deployment areas by helicopters like the CH-47E Chinook, which India is buying separately. The gun can also be towed more easily on narrow, twisty mountain roads.

The initial order for 145 guns could rise significantly once the M777 starts being built in India. This would equip just 6-7 artillery regiments, while the army actually needs new artillery for 50-plus artillery regiments in 16 mountain divisions.

"If India can offer a consolidated order for the 1,000-odd guns needed for 50 regiments, BAE Systems could be induced to offer far higher indigenisation," says a senior artillery officer.

India's 220-odd artillery regiments have received no new artillery since the 1980s, when it bought 400 FH-77B, 155 mm/39 calibre Bofors guns. An indigenous effort by the Ordnance Factory Board to develop a 155 mm/45 calibre gun is proceeding slowly, with a gun barrel bursting during trial firing in 2013. Simultaneously, the Defence R&D Organisation (DRDO) is developing a 155 mm/52 calibre artillery gun in partnership with the private sector.

India has pursued the M77 procurement through the Pentagon, under the Foreign Military Sales (FMS)

programme. This involves the Pentagon negotiating terms with the vendor (BAE Systems), and signing the deal as a government-to-government contract.

**The Asian Age**

**18 Feb, 2016**

## **India likely to select fighter plane under 'Make in India': Parrikar**

*Development came in wake of last stage of Indo-France Inter-Government Agreement on purchase of Rafale jets.*

**New Delhi:** India is likely to select by the year-end at least one fighter aircraft that will be manufactured by the private sector under the 'Make in India' process for supply to IAF, said Defence Minister Manohar Parrikar Tuesday. He said that there may be one or two more jet fighter plants, either operational or in the process of being set up, in India in the next three years or so. Asked if this meant HAL will set up more plants, Parrikar said, "It is private sector which will be required to supply to the air force. We need fighters. We may encourage...there are proposals." He, further, added, through "proper process", by year end "we might select few aircraft to Make in India. Which one I don't commit. But there will be at least one, may be two also." Boeing and Lockheed Martin of the US, Saab of Sweden, Dassault Aviation of France and Eurofighter have offered to set up manufacturing bases in India along with transfer of technology if their fighter aircraft was selected for Indian Air Force. All the companies are also in talks with Indian private firms to select a local partner. However, they are awaiting a clear signal from the government before selecting their partners. Parrikar also made it clear that 'Make in India' does not mean just assembly of equipment but manufacturing through transfer of technology. The development comes as both India and France are in the last stage of concluding an Inter-Government Agreement on direct purchase of 36 Rafale fighter jet planes. The government has also decided to equip IAF, which is facing a severe fighter shortage, with indigenously developed Tejas combat aircraft. HAL is already in the process of increasing its capacity to manufacture 16 Tejas aircraft per year.

**The Statesman**

**18 Feb, 2016**

## **'India likely to select fighter plane under Make in India'**

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## **A budget for soldiers and workers**

*By Rahul Gangal*

Along with the impending finalisation of the Defence Procurement Procedure, the Budget presents a milestone that will set the stage for the coming year. Like every year, the Budget will be seen by the armed forces, the Indian industry and observers alike, as a signal of intent from the government. Broadly speaking, two priorities drive India today - first is better equipped and better paid armed forces, and second is the creation of a wide-spread, robust and indigenous manufacturing base. While both the objectives are journeys rather than milestones, the government has taken a number of steps on both the fronts. These along with the 'Make in India' push are expected to provide the framework on which the Union Budget for defence will be constructed.

### **Explicit expectations**

An expansion in the capital budget, focused on new acquisitions, is expected. The Armed forces require substantial spends in both new equipment procurement, as well as to cater to obsolescence. We also need to remember that our country's spends are really quite miniscule when compared with other countries, notably China. Traditionally, Indian suppliers found it tough to be integrated into global A&D (aerospace and defence) supply chains because of the difference between profitability expectation of Indian companies (who have a much higher cost of capital to deal with) and those of global players (who have traditionally had supply chain partners operating with EBIT levels in single digits). This budget could be a great opportunity to announce a model that provides manufacturers a cheaper source of finance, thereby making them relevant to global OEMs. (The writer is a Partner at Roland Berger)

Measures to rationalise cost structures for services like maintenance, repair, overhaul, and an impetus to nascent activities like warehousing, fit outs and completions - areas where India has potential but business is currently going outside. Globally, A&D industry thrives in manufacturing ecosystems. For A&D industry in India to step up and realise the 'Make in India' thrust, the Finance Ministry will have to announce substantial fiscal and tax incentives for both developers as well as units.

**The Pioneer**  
**18 Feb, 2016**

## **Not doing enough for Armed Forces**

*It's ironic that issues like the arrest of a student activist or the death of a student galvanises our politicians and public more than the grave issue of national security*

Lance Naik Hanamanthappa Koppad's gallant but ultimately unsuccessful fight for survival is finally over and he has been cremated with full military honours. It is now time to step back and introspect on the media hoopla, public mass hysteria and ersatz patriotism that followed his death. Indeed ironically, his miraculous survival against all odds under 35 feet of ice for six days forced people to sit up and take notice of the difficult challenges that our military faces while defending our borders. That public memory is short and media attention is fleeting, comes as no surprise. Media and public focus, with attendant political activity, has now shifted to 'graver' issues of the alleged anti-national activity and Government high-handedness at the Jawaharlal Nehru University. In all the petty politics, other nine colleagues of Koppad who tragically lost their lives in the same incident and also the superlative action, the grit, the courage and determination displayed by all those who were involved in the search and rescue operation, at great personal cost and physical danger, is all but forgotten.

Indeed, it is ironic that the tragic suicide by a student or the arrest of a student activist galvanises our politicians and the public more than either issues of national security or the pathetic circumstances in which a vast majority of military veterans or their widows survive. One needs to accept the hard reality that the military in this country is seen as nothing more than security guards who is paid to protect the treasury; to be seen, but not heard. That is why, the sacrifice of a thousand of our soldiers who have been psychologically or physically maimed while protecting our borders and their way of life have never

concerned the common man or the more privileged in their drawing rooms. If it had, Governments, over the years, would have been more empathetic and sensitive in their dealings with the military.

We would then not have witnessed the unsavoury sight of an 80-year-old war veteran being pushed around by policemen in the name of 'security'. Nor would there have been the necessity of the veterans to protest or resort to hunger strikes against the Government's deplorable interpretation of the one-rank-one-pension imbroglio.

For that matter, there would have been no need for the serving military Chiefs to object to the Government against the horrendous recommendations of the Seventh Pay Commission which has taken upon itself the task of demeaning and castrating the Armed Forces, probably just to prove who's the boss, by justifying its arguments with mistruth and outright lies. How else can one justify paying bureaucrats double the 'hardship allowance' of that received by those serving in Siachen while serving in Guwahati or elsewhere in the North-East. Or, why should the paratroopers get 'hazard allowance' that is around 10 per cent of the allowances received by personnel of the 'Cobra' battalion of the Central Reserve Police Force deployed in Maoist-affected areas.

The Prime Minister certainly earned brownie points for his unprecedented visit to the Army hospital where attempts were made to revive Hanamanthappa. His 'gracious' gesture is to be welcomed, but it means little if such symbolism continues to be at complete variance with the action initiated by his Government to fulfill its promises made to the military earlier. It may be recalled that former Prime Minister Indira Gandhi had done exactly the same when she publicly credited the Armed Forces for the 1971 victory, honoured its architect, Field Marshal Sam Manekshaw, while quietly ensuring that their pensions were drastically cut, compensations reduced and their prestige and standing eroded by the Third Central Pay Commission. It is in this context that the action of the Congress, which was then in power, to refuse to send the Defence Minister or the Service Chiefs to attend his funeral three decades later, must be seen. Soldiers, both serving veteran, are not stupid. They will no longer be fooled by symbolism.

A vast majority of the soldiers who toil for a living fully understand that the compensation they receive only guarantees their loyalty to the extent that the organisation that they serve looks after them. We need to remember that the men and women who join the military of their own volition do so not to earn money, but because of their abiding faith in the country and what it stands for. Unfortunately, over the years, their expectations have been belied and they have been let down by an uncaring public, scheming politicians and self-serving bureaucrats. The vital question that confronts us today is: Are we worth for our soldiers to die for?

**The Tribune  
18 Feb, 2016**

### **Life & death in world's highest combat zone**

*Ideally, Siachen should be demilitarised and restored to status quo ante, with both sides withdrawing amicably. However, this will require a high degree of maturity from both sides. This is easier said than done.*

THE Siachen glacier, located at the world's only nuclear tri-junction and where the overlapping boundary claims of three nuclear weapon states — China, India and Pakistan — converge, is again in the news following the death of 10 Army soldiers belonging to the Infantry's 19 Madras Regiment following an avalanche on February 3. Also known for being the world's highest, coldest and most expensive-to-maintain battlefield, the incident raises a question about the rationale of maintaining troops in an area that has led an American commentator to describe India and Pakistan as "two bald men fighting over a comb".

This is not the first time that both India and Pakistan have lost soldiers to an avalanche in this region where the human body reaches its limits and where helicopters, the only source of air support, exceed their flight envelope. On December 16, 2012, six soldiers belonging to the Infantry's 1 Assam Regiment were killed, while a seventh went missing following an avalanche in sub sector Hanif in Turtuk area of the glacier region. The worst-known incident, however, occurred on April 7, 2012, when about 140 Pakistani soldiers were killed after an avalanche slammed into their army camp in Gyari. The incident then led Pakistan President Asif Ali Zardari to appeal to Prime Minister Manmohan Singh to cooperate in demilitarising the glacier region.

For the record, the 76.6-km-long Siachen glacier, the second-longest glacier outside the polar regions, is located well within Indian territory. Indian troops are located in over 100 posts atop the Saltoro Ridge, which in turn forms the 110-km-long actual ground position line (AGPL) located at heights between 17,500 and 22,000 feet, starting from NJ 9842, a grid map reference. This is the point until which the Line of Control (LoC) is officially demarcated. The Siachen glacier, in roughly the form of an inverted triangle, “rests” on NJ 9842 with Indra Col (to the left) and the Karakoram Pass (to the right) in the north as the two extremities. The glacier, located in Ladakh district of Jammu and Kashmir, is situated between the Saltoro ridge to the west and the main Karakoram range to the east. Such is the geo-political location of the Siachen glacier that it lies just south of the great watershed that separates Central Asia from the Indian subcontinent and Pakistan from China in this region.

The origin of the Siachen conflict lies in a set of five words dating back to the CFL (Ceasefire Line) Agreement signed in Karachi on July 27, 1949 by military representatives of India, Pakistan and the UN Military Observers Group. The CFL (renamed LoC following the July 1972 Simla Agreement) was demarcated up to Chalunka, Khor and NJ 9842 with the remaining portion extending northwards left open with the five words “thence north to the glaciers”. Neither side then imagined demarcating a difficult-to-survey terrain, let alone occupying it. But all that changed following a long chain of events starting with India's loss of territory to China in the Ladakh region in the 1962 Sino-Indian War, the China-Pakistan border agreement of 1963 in which the 5,800 sq km Shaksgam tract was ceded by Pakistan to Beijing, Pakistan's dismemberment in the 1971 Indo-Pak war, the subsequent cartographic claims by Pakistani and western countries and mountaineering expeditions for westerners facilitated by Pakistan in the glacier region during the 1970s.

On April 13, 1984, the Indian Army pre-empted a Pakistani Army plan to occupy the Siachen glacier after it heli-dropped 29 soldiers belonging to the 4 Kumaon Regiment on the Bilafond La, a tactically important Pass, located on the Saltoro range. Following this, the Army then secured Sia La, another tactically important Pass, and Indra Col, the northern most point of the Saltoro ridgeline. Both sides then rushed to secure the dizzying heights of the Saltoro Ridge overlooking the glacier to gain visual domination of the other. It was a race which the Indian Army quickly managed to win, thus completely denying Pakistan a piece of the Siachen glacier. This continues till today.

But this victory also brought with it the nightmare of logistics and of creating an infrastructure to maintain some 4,000 soldiers in a terrain and environment which tests the limits of human physiological and psychological endurance. The biggest enemy remains the weather where temperatures can fall to as low as minus 50 degrees Celsius, with a constant danger of blizzards and avalanches. The minefield of numerous crevasses adds to the challenge to foot soldiers as does the lack of oxygen. Transporting supplies is a major challenge considering that single-engine light helicopters can only carry a limited weight to those heights. Since India has access to the entire glacier, it also means that the supply line is long from the nearest road head — about 70 km. In contrast, because Islamabad does not have the glacier, the farthest distance the Pakistani Army has to cover from its road head is 20 km.

After initially suffering considerable losses, the Indian Army has, in fact, managed to reduce casualties in the glacier region by improving equipment for the soldiers, installing pre-fabricated fibre glass huts and laying a kerosene oil pipeline, to name a few measures. In a rare admission, Pakistan conceded it had lost 213 soldiers between 2003 and 2010. The approximately 140 soldiers killed in 2012 are in addition. In the absence of figures released by the Pakistani Army both preceding and following this 2003-2010 period, it is difficult to put an exact figure on Pakistani casualties. Data released by the Indian government in Parliament reveals that the Indian Army had lost 869 soldiers on the glacier in 31 years, starting from April 1984 to December 2015. This includes 33 officers, 54 junior commissioned officers and 782 other ranks. But this does not include the number of Indian soldiers injured or permanently incapacitated. The extent to which Indian casualties have reduced is evident from the fact that the Army lost just four soldiers each in 2007 and 2008, 10 in 2013, six in 2014 and five in 2015. In contrast, some stray Pakistani casualty figures reveal 12 Pakistani soldiers killed in 2007 and 13 in 2008. Almost all casualties are attributed to the harsh weather and terrain rather than to enemy firing. Although the two sides have held 13 rounds of discussions to demilitarise the glacier, the biggest hurdle is Pakistan agreeing to record the existing positions on the Indian side.

The Indian Army considers this paramount to prevent Pakistan from occupying it as soon as India vacates the Saltoro ridge gained at much human and financial cost. Pakistan refuses to oblige so as to prevent a subsequent legal claim by India. A formal demarcation will also expose the Pakistani Army to ridicule considering that, contrary to claims made domestically, they have never fought on the glacier. Pakistan claims a diagonal line running north-east, from NJ 9842 to the Karakoram Pass, which not only encompasses the entire Siachen glacier but also threatens Indian positions in Leh. In addition to forming a direct linkage with Chinese-occupied Ladakh, the Indian Army says that such a claim is in direct violation of the watershed principle which India has followed in occupying the Saltoro ridge. The area should be demilitarised in the interest of preventing further environmental degradation of the area. Decisions related to geo-politics can never be and never are based on sentiments and emotion. Unfortunately, in our world where realpolitik continues to dictate statecraft, a price tag cannot be placed on a country's national interest. A country has to pay the price, no matter how severe, to preserve its national interest unless, of course, a détente can be effected or one side is willing to compromise.

**The Hindustan Times**  
**18 Feb, 2016**

### **Won't pull out from Siachen, says army chief**

NEW DELHI: There is no question of demilitarising Siachen unless Pakistan agrees to mark out exact troop positions on the ground, and the recent death of 10 soldiers in an avalanche has only "hardened the army's resolve" to hold onto the strategic ally significant glacier, army chief General Dalbir Singh said.

Speaking of the February 3 tragedy, Singh said, "They were buried too deep and the ice had become harder than concrete. It couldn't have been blown up with explosives. We flew in electric ice cutters and radars that can detect heat signatures 20 metres deep. My instructions were clear: rescue ops will continue till we find survivors or the bodies."

There's no question of demilitarising Siachen despite the recent death of 10 soldiers unless Pakistan was prepared to mark out exact troop positions on the world's highest and coldest battleground, army chief General Dalbir Singh said.

In his first interview a fortnight after an avalanche swept the soldiers away at an altitude of 20,500 feet, Singh said on Wednesday each casualty on the glacier only "hardened the army's resolve" to hold on to the heights that were of "immense strategic significance".

"Troop withdrawal remains out of the question unless they (Pakistan) agree to sit down at the negotiating table and agree to the conditions set by us to authenticate troop positions. That has been our stand and we are not budging from it," Singh said.

He has visited Siachen four times after taking over as army chief in July 2014. In coming weeks, he will travel to Sonam, the army post crushed by the February 3 slide. India can't risk a withdrawal as it holds dominating positions on the Saltoro ridge, with Pakistani posts located 3,000 feet below. Reclaiming lost advantage could be tough. Pakistani high commissioner Abdul Basit had last week called for mutual withdrawal of troops.

Nearly 1,000 soldiers have died guarding Siachen since the Army took control of the glacier in April 1984, almost twice the number of lives lost in the Kargil war. "Our deployment has stabilised with the casualty rates being the lowest since we took control of the heights. Top-notch equipment, rigorous monitoring of training, fine leadership and adherence to strict codes and drills have helped save lives," said Singh.

On the February 3 tragedy, Singh said, "We map areas meticulously and maintain year-wise records of danger zones to keep casualties low. Soldiers know at what precise time, in which month, there was an avalanche in their area, say, 10 years ago. But given the geography, such incidents are unavoidable," Singh explained.

One of the soldiers, Lance Naik Hanamanthappa Koppad, miraculously survived being trapped under 35 feet of snow for six days but died in an army hospital on February 11.

Singh said, "They were buried too deep and the ice had become harder than concrete. It couldn't have been blown up using explosives. We flew in electric ice cutters and radars that can detect heat signatures at a depth of 20 metres. My instructions were clear that the rescue operations would continue till the time

we found survivors or the bodies.” Soldiers in Siachen have faced hardships because of the government’s repeated failures to provide them with special clothing and equipment to endure the punishing heights, but Singh said the deficiencies had been made up entirely.

**The Pioneer**  
**18 Feb, 2016**

## **China deploys missiles in disputed South China Sea: Taiwan**

Taiwan said Wednesday that China had positioned anti-aircraft missiles on a disputed South China Sea island, as Australia's foreign minister began talks in Beijing expected to deal with tensions over China's moves to assert its maritime claims.

Taiwan's Ministry of National Defense said in a statement it had "grasped that Communist China had deployed" an unspecified number of missiles on Woody Island in the Paracel group. The Philippines said the development increased regional tensions.

The move would follow China's building of new islands in the disputed sea by piling sand atop reefs and then adding airstrips and military installations. They are seen as part of Beijing's efforts to claim virtually the entire South China Sea and its resources, which has prompted some of its wary neighbors to draw closer to the U.S.

The most dramatic work has taken place in the Spratly Island group, where the militaries of four nations have a presence, although similar work has also gone on at Woody and other Chinese holdings in the Paracels.

"The military will pay close attention to subsequent developments," the Taiwanese ministry statement said. Relevant parties should "work together to maintain peace and stability in the South China Sea region to refrain from any unilateral measure that would increase tensions," the statement added.

U.S. network Fox News also said China had moved surface-to-air missiles to the Paracels, identifying them as two batteries of the HQ-9 system, along with radar targeting arrays. The missiles have a range of about 200 kilometers (125 miles), making them a threat to all forms of civilian and military aircraft.

Called Yongxingdao by China, Woody island is also claimed by Taiwan and Vietnam. Along with an artificial harbor, it boasts an airport, roads, army posts and other buildings and recent satellite imagery appears to show it is adding a helicopter base likely dedicated to anti-submarine warfare missions.

Taiwan and China claim almost the whole 3.5 million-square-kilometer (1.35 million-square-mile) South China Sea, including the Paracel chain. Vietnam and the Philippines claim much of the ocean, as well. Brunei and Malaysia have smaller claims.

Home to some of the world's busiest sea lanes, the ocean is also rich in fisheries and may hold oil and natural gas reserves under the seabed.

China's move is likely to rattle Vietnam the most because of its proximity to the Paracels and because of a history of maritime tensions with China that spiked in 2014 with a standoff after China moved a massive oil rig into disputed waters.

Neither Bishop nor Chinese Foreign Minister Wang Yi mentioned the South China Sea directly during opening statements ahead of their talks.

In comments Monday to Japanese broadcaster NHK, Bishop said Australia — like the U.S. — does not take sides on the issue of sovereignty, but urges all parties to "exercise restraint, de-escalate tensions and not act in a way that would inflame the situation."

"Australia has called on all parties to cease reclamation, construction work and any militarization of the islands," Bishop said.

China regards Australia and the U.S. as unwelcome outside interlopers in regional waters. Wang and Bishop engaged in a testy exchange in December 2013 after Australia criticized China's unilateral declaration of an air defense zone in the East China Sea.

Ahead of Bishop's visit, President Barack Obama and the leaders of the 10-member Association of Southeast Asian Nations called Tuesday for the peaceful resolution of the region's maritime disputes.

Obama told a news conference that disputes must be resolved by legal means, including a case brought by the Philippines challenging China's sweeping claims over most of the South China Sea.

China has refused to take part in the proceedings, but Obama said parties to the U.N. law of the seas are obligated to respect the ruling, expected later this year.

Obama also accepted an offer to make a May visit to Vietnam, further strengthening a reconciliation between former foes driven largely by concerns over China.

Chinese Foreign Ministry spokesman Hong Lei reiterated Tuesday that China considered the legal proceedings initiated by the Philippines to be illegitimate and said they would "never be accepted by China."

China was deploying "necessary national defense facilities" on its territory, Hong said. He said Australia should remain unbiased and refrain from doing anything to undermine regional stability.

Philippine Defense Secretary Voltaire Gazmin said the deployment of missiles on Woody Island "increases tensions in the South China Sea."

In Vietnam, about 100 people gathered to commemorate the start of a brief but bloody 1979 invasion by Chinese forces chanted "down with the aggressors," and "Hoang Sa, Truong Sa," the Vietnamese terms for the Paracel and Spratly islands.

Analysts say China's military moves in the South China Sea are primarily aimed at intimidating the Philippines and Vietnam, while solidifying its hold on the islands and boosting its ability to project force.

That is meanwhile strengthening those in the U.S., especially in the Pentagon, who "will want to more vigorously challenge China," said Thomas Berger, an expert on the region at Boston University.

The new bases are also highly vulnerable to U.S. attack in a conflict and the U.S. will continue to defy Beijing by sailing its Navy ships inside China's claimed territorial waters, said Edward N. Luttwak, a China expert and military strategist based in the U.S. state of Maryland.

"China, under President Xi Jinping, continues to work hard to endow the U.S. with allies all around its periphery," Luttwak said.

**Deccan Herald**  
**18 Feb, 2016**

*Daring dragon: Beijing deploys anti-aircraft missiles*

## **China arms disputed island**

**TAIPEI/WASHINGTON: China has deployed an advanced surface-to-air missile system to one of the disputed islands it controls in the South China Sea, Taiwan and United States officials said, ratcheting up tensions even as US President Barack Obama urged restraint in the region.**

Taiwan defence ministry spokesman Major General David Lo told Reuters on Wednesday the missile batteries had been set up on Woody Island. The island is part of the Paracels chain, under Chinese control for more than 40 years but also claimed by Taiwan and Vietnam.

A US defence official also confirmed the "apparent deployment" of the missiles, first reported by Fox News.

China's foreign minister said reports by "certain Western media" should focus more on China's building of lighthouses to improve shipping safety in the region. "As for the limited and necessary self-defence facilities that China has built on islands and reefs we have people stationed on, this is consistent with the right to self-protection that China is entitled to under international law so there should be no question about it," Wang Yi told reporters in Beijing.

The Chinese defence ministry told Reuters that defence facilities on "relevant islands and reefs" had been in place for years, adding that the latest reports about missile deployment were nothing but "hype".

China claims most of the South China Sea, through which more than \$5 trillion in global trade passes every year, and has been building runways and other infrastructure on artificial islands to bolster its title.

The United States has said it will continue conducting "freedom of navigation patrols" by ships and aircraft to assure unimpeded passage through the region, where Vietnam, Malaysia, Brunei, the Philippines and Taiwan have rival claims. Admiral Harry Harris, the commander of the US Pacific

Command, said the deployment of missiles to the Paracels would not be a surprise but would be a concern, and be contrary to China's pledge not to militarise the region.

"We will conduct more, and more complex, freedom of navigation operations as time goes on in the South China Sea," he told a briefing in Tokyo. "We have no intention of stopping."

News of the missile deployment came as Obama and leaders of the Association of Southeast Asian Nations (ASEAN) concluded a summit in California, where they discussed the need to ease tensions in the South China Sea but did not mention of China's assertive pursuit of its claims there.

China's increasing military presence in the disputed sea could effectively lead to a Beijing-controlled air defence zone, analysts said.

"(The missile deployment) reinforces the view that China intends to exert growing control in these international waters, including potentially by declaring an Air Defence Identification Zone," said Rory Medcalf, Head of the National Security College at the Australian National University.

Mira Rapp-Hooper, a South China Sea expert from the Center for a New American Security, said it was not the first time that China had sent such weapons to the Paracels.

"I do think surface-to-air missiles are a considerable development," she said.

A US Navy destroyer sailed within 12 nautical miles of Triton Island in the Paracels last month, a move China condemned as provocative.

China last month said it would not seek militarisation of its South China Sea islands and reefs, but that did not mean it would not set up defences. "Woody Island belongs to China," said Ni Lexiong, a naval expert at the Shanghai University of Political Science and Law. "Deploying surface-to-air missiles on our territory is completely within the scope of our sovereign rights. We have sovereignty there, so we can choose whether to militarise it."

**The Hindu**

**18 Feb, 2016**

## **U.S. had cyber-attack plans for Iran's Fordo**

In the early years of the Obama administration, the United States developed an elaborate plan for a cyber-attack on Iran in case the diplomatic effort to limit its nuclear programme failed and led to a military conflict, according to a forthcoming documentary film and interviews with military and intelligence officials involved in the effort.

The plan, code named Nitro Zeus, was designed to disable Iran's air defences, communications systems and key parts of its power grid, and was shelved, at least for the foreseeable future, after the nuclear deal struck between Iran and six other nations last summer was fulfilled.

### **Contingency plan**

Nitro Zeus was part of an effort to assure President Barack Obama that he had alternatives, short of a full-scale war, if Iran lashed out at the United States or its allies in the region. At its height, officials say, the planning for Nitro Zeus involved thousands of U.S. military and intelligence personnel, spending tens of millions of dollars and placing electronic implants in Iranian computer networks to "prepare the battlefield," in the parlance of the Pentagon.

The U.S. intelligence agencies developed a cyber plan to disable the Fordo nuclear enrichment site, which Iran built deep inside a mountain near the city of Qum. The attack would have been a covert operation, which the President can authorise even in the absence of a continuing conflict.

Fordo has long been considered one of the hardest targets in Iran, buried too deep for all but the most powerful bunker-buster in the U.S. arsenal. The proposed intelligence operation would have inserted a computer "worm" into the facility with the aim of frying Fordo's computer systems — effectively delaying or destroying the ability of Iranian centrifuges to enrich uranium at the site. It was intended as a

follow-up to “Olympic Games,” the code name of a cyber-attack by the United States and Israel, which destroyed 1,000 centrifuges and temporarily disrupted production at Natanz, a far larger but less protected enrichment site.

Under the terms of the nuclear agreement with Iran, two-thirds of the centrifuges inside Fordo have been removed in recent months, along with all nuclear material. The facility is banned from any nuclear-related work and is being converted to other uses, eliminating the threat that prompted the attack plan, at least for the next 15 years.

The existence of Nitro Zeus was uncovered in the course of reporting for *Zero Days*, a documentary film slated to be shown at the Berlin Film Festival. Directed by Alex Gibney, who is known for other documentaries including the Oscar-winning *Taxi to the Dark Side*, the documentary describes the escalating conflict between Iran and the West in the years leading up to the agreement. — **New York Times News Service**

**The Hindu**  
**18 Feb, 2016**

### **People’s Daily slams U.S. for Korea crisis**

Chinese state media has slammed the U.S. for setting the stage for the North Korean crisis, which has deepened after Pyongyang launched a satellite using ballistic missile technology, in the aftermath of a nuclear test.

A commentary in the *People’s Daily*, the official organ of the Communist Party of China (CPC), accused Washington of using the nuclear issue “as an excuse” for starting formal talks with South Korea on placing the Terminal High Altitude Area Defence (THAAD), an anti-missile system, on North Korea's door step.

Analysts say the talks have ignited Chinese concerns, because the radar, which is part of the THAAD system, has a 1000 km range.

Depending on where it is deployed, the THAAD system can easily pry into Chinese airspace and potentially neutralise overflying Chinese ballistic missiles in a future conflict scenario.

“The possible THAAD system in South Korea will directly threaten China’s strategic and security interests and lead to a security imbalance in northeast Asia and the Asia-Pacific region, which could spark strategic rebalancing across a wider range,” the write-up observed.

The commentary cited three points to make its case regarding Washington’s intent. First, the article stressed that it was not North Korea but the U.S. that sparked the nuclear crisis on the Korean peninsula.

Second, with the U.S.- South Korea Mutual Defence Treaty as cover, Washington has risked peninsular security with a spill-over effect on northeast Asia and the Asia-Pacific region at large. Third, the commentary accused the U.S. of pursuing double standards.

“The U.S. is a stakeholder of the peninsular issue, yet it applies entirely different policies to the northern and southern parts.

On the one hand it put enormous pressure on North Korea, but on the other offered a guarantee of safety to South Korea. Such acts will by no means ease the tension.”

The daily, citing “lack of contact” with Pyongyang that allowed tensions to spiral, then went on to doubt Washington’s core sincerity in resolving the North Korean crisis. “The stance that the U.S. holds on the peninsular issue is clearly self-contradictory.”

The commentary warned the U.S. that it should learn that “when you lift a rock, it could land on your own feet”.

**The Times of India**  
**18 Feb, 2016**

## **Radioactive material stolen in Iraq**

Iraq is searching for a “highly dangerous“ radioactive material stolen last year, according to an environment ministry document and officials, who fear it could be used as a weapon if acquired by Islamic State.

The material went missing in November from a storage facility near the southern city of Basra belonging to US oilfield services company Weatherford. The material, which uses gamma rays to test flaws in materials used for oil and gas pipelines, is owned by Istanbul-based SGS Turkey . An official said the device contained up to 10 grams of Ir-192 “capsules“, a radioactive isotope of iridium. The material is classed as a Category 2 radioactive source by the International Atomic Energy Agency , meaning if not managed properly it could cause permanent injury to a person in close proximity to it for minutes or hours.

**The Times of India**  
**18 Feb, 2016**

## **Isro's NEMO orbiter will scan country's air for pollutants**

The Space Applications Centre (SAC) of Indian Space Research Organisation (Isro) and space flight laboratory (SFL) of University of Toronto's Institute for Aerospace Studies are collaborating on developing the Next Generation Earth Monitoring and Observation and Aerosol Monitoring (NEMO-AM) satellite. This is among Isro's most important high-performance nano-satellite missions for the country. The nano-satellite will monitor suspended particles and aerosols that have made the air of major Indian cities like Delhi, Ahmed abad, Lucknow, Amritsar and Allahabad among the most polluted in the world. The tiny particles and aerosols in the exhaust of vehicles, emissions from industrial chimneys and even dust particles from construction work fill the air we breathe. These aerosols and particulate matter of size 2.5 micrometers (PM2.5) enter our lungs and restrict the free flow of air. SAC is providing the necessary software for instruments that are to be made in Canada. The nano-satellite, which will be of 2x2x1 feet dimension and weigh 15kg, will be placed 500 km above the earth. SAC director Tapan Misra said the NEMO mission is designed to cover, each day , up to 50,000 sq km area of the country's 32.87 lakh sq km. “The NEMO-AM will be integrated in July-August next year at SAC in the presence of a team from Canada SFL. The satellite will be tested and launched in the subsequent month,“ said Misra. The NEMO-AM satellite with its powerful imaging sensor analyses the sunlight reflected from the earth's surface. The NEMO-AM satellite with its powerful imaging sensor analyses the sunlight reflected from the earth's surface. This light, which passes through the earth's atmosphere before reaching NEMO will be analysed by the satellite from different angles to determine the nature of suspended particles and aerosol concentration in the ambient air of India cities.

**The Pioneer**  
**18 Feb, 2016**

## **NASA invites ISRO for likely collaboration**

As American space agency NASA looks forward to sending astronauts to Mars, it has invited the Indian Space Research Organisation (ISRO) for a possible international collaboration. Several space agencies of different countries are also expected to attend the meeting in Washington next month. “We are looking to send astronauts to Mars. In order to do that, you need certain robotic missions to begin with. Early next month, there will be a meeting in Washington. The ISRO has also been invited for the meeting to discuss the future collaborations for the mission to Mars. We think it will be more of an international consortium.

“There are potential opportunities to collaborate in future,” said Jakob van Zyl, Associate Director, Jet Propulsion Laboratory.

**Deccan Herald**  
**18 Feb, 2016**

## **Cabinet nod for gravity wave observatory**

*By Kalyan Ray*

*LIGO-India project has been pending for the past 5 years*

**New Delhi, dhns: A week after the discovery of gravity waves involving a large team of Indian scientists, the union cabinet on Wednesday has given its approval "in-principle" to set up an Indian gravity wave observatory.**

The move will aid scientists undertake cutting-edge research in astronomy. The LIGO-India project (Laser Interferometer Gravitational-wave Observatory in India) will establish a state-of-the-art gravitational wave observatory in India in collaboration with the LIGO Laboratory in the US run by Caltech and MIT.

Piloted by the Department of Atomic Energy and Department of Science and Technology, the Rs 1,260-crore proposal, known as LIGO-India project, has been pending for the past five years.

The clearance from the Union Cabinet chaired by the Prime Minister Narendra Modi is, however, only in-principle as DST and DAE are likely to submit an updated proposal after recalculating the project cost and finalising the site. This may take several months.

Scientists shortlisted four sites in Maharashtra, Karnataka, Rajasthan and Madhya Pradesh where environmental surveys are being carried out. Almost 300 acres of land is required to set up the Indian observatory for which the USA will provide the main detector.

LIGO-India will also bring considerable opportunities in cutting-edge technology for the Indian industry which will be engaged in the construction of eight-km long beam tube at ultra-high vacuum on a levelled terrain. The scientists already have shared their requirement with the industry, which is upbeat about the project.

The site will have to be free from human disturbances shaking the earth. There should not be any railway line, airport, mining activity of heavy-industry nearby, but also it should not be too far off, making it inaccessible for researchers.

The Indian observatory would be managed by Inter-University Centre for Astronomy and Astrophysics, Pune, Institute for Plasma Research in Gandhinagar and Raja Ramanna Centre for Advanced Technology, Indore. However, there is a consortium involving 16 Indian institutions as of now that would carry out the scientific research involving the Indian LIGO detector.

**Deccan Herald**  
**18 Feb, 2016**

## **India, US scientists to analyse Mars data**

**NEW DELHI:** Scientists of Indian and American space agencies will meet in Bengaluru from February 22 to 25, discussing and analyzing findings of their respective satellites orbiting the Mars as well as exploring cooperation for future missions to the Red Planet.

Coinciding the meeting of the Mars Working Group set up jointly by the National Aeronautics and Space Administration of America and the Indian Space Research Organization in Bengaluru, US astronaut Sunita Williams may visit New Delhi between February 25 and 26 for engagements with students and space policy thinkers.

Besides, the Nasa's Jet Propulsion Laboratory Director, Charles Elachi, is also currently on a visit to New Delhi. The Nasa JPL is working with the ISRO to jointly develop a synthetic aperture radar satellite that will allow scientists to study natural disasters and global environmental changes.

The third meeting of the Nasa-ISRO Mars Working Group in Bengaluru will focus on observations and science analysis made by the Mars missions of the two agencies - including Mars Orbiter Mission of India and MAVEN of the US, which arrived at the orbits of the Red Planet within days of each other in September 2014.

The Nasa Deputy Administrator Dava Newman will travel to the ISRO to open the event and hold discussions with his counterparts.

The NASA Planetary Science Division Director, James Green, will lead the US delegation in technical discussions related to Mars findings and collaboration with the ISRO team, the American Embassy in New Delhi stated in a press release issued on Wednesday. The US and India, according to the press release, will also hold Space Security Dialogue on February 24 in New Delhi, discussing the long-term sustainability and security of the outer space environment. The US government's Assistant Secretary of State for Arms Control, Verification, and Compliance Frank Rose would lead the US delegation.

Amandeep Singh, Joint Secretary (Disarmament and International Security Affairs) in the Ministry of External Affairs, is likely to lead the delegation from India.

**The Statesman  
18 Feb, 2016**

### **Koodankulam kaput**

On 30 January, Alexander M Kadakin, Ambassador of the Russian Federation to India, conveyed to RS Sunder, Director of Koodankulam Nuclear Power Plant project, "President Vladimir Putin by his decree No. 29 dated 29 January 2016 has awarded you the Order of Friendship for your great contribution to the implementation of KKNPP project." Sunder said in modesty, "The credit should go to Russian scientists as well." Buoyed by the award, Sunder worked through day and night and re-started the 1,000 MW first unit of the plant, shut down since 24 June 2015 allegedly for annual maintenance, at 3 am on 31 January generating 7 MW of power which peaked to 252 MW at 11.44 pm. It worked in fits and starts for the next three days. On 4 February Sunder said the plant was generating 715 MW power and would hit the full capacity of 1,000 MW "in a day or two." The plant went kaput at 10.34 pm the same night.

The brand new Russian plant was erected jointly by the Nuclear Power Corporation of India Limited and Atomstroyexport of Russia. It was connected to the grid on 22 October 2013 and commercial operation began on 31 December 2014. During the 800 and odd days of grid connection the reactor worked for 372 days, tripped 20 times and was off the grid for about 470 days. The actual power produced is 3,222 million units, just 18 per cent of its rated capacity. The reactor was commissioned for one year's warranty period operation on 30 December 2014 but was shut down on 24 June 2015, much before the expiry of the warranty period.

The original agreement for two 1,000 MWe VVER reactors between India and the USSR was signed in November 1988 and a supplemental agreement with Russia was signed in June 1998. The two reactors were taken up as a single project and evaluated as such. Work on the project began in March 2002 with the construction of the twin domes and a small port on the Koodankulam sea-front. Reactor and other core equipment arrived at the site by mid-2005 and both units were to begin commercial operation in December 2007. Not much progress was made in the next four years. Although the people in general and the fishermen's community in particular were opposed to the project right from the beginning, active public protest at Idinthakarai, adjacent to the project site, began only in August 2011 after the Fukushima disaster and lasted about 11 months. It hardly hampered the project work and cannot be blamed for the inordinate delay in commissioning the plant.

When the Atomstroyexport formally handed over the KKNPP-1 reactor to NPCIL for one-year warranty operation on 30 December 2014, there was no mention of the second unit. Construction of the two units was taken up simultaneously but because of the supply of sub-standard equipment by Russia and both the governments' eagerness to show some result before signing an agreement for the third and fourth units, the second unit was cannibalised to make the first unit work. In the process, the second unit has been virtually abandoned. The government has so far spent about Rs 25,000 crore on the first phase of KKNPP. At full capacity, the plant should have been producing 48 million units of electricity a day. The actual production so far has been less than 20 per cent of the rated capacity. If this is the result in the first year of operation of a brand new plant when production should be at its optimum, it only shows that KKNPP, besides being an ecological catastrophe, is also an economic disaster. Units 3 and 4 are estimated to cost Rs 45,000 crore.

Studies conducted by non-governmental agencies show that almost all components of the reactor were manufactured in the 1980s and rendered surplus due to post-Chernobyl cancellation of orders for more than two dozen reactors. The Russia made turbine had to be overhauled surreptitiously by a Hyderabad-based private contractor two years before its grid connection because it was found faulty. Even after the overhaul the turbine failed within hours of grid connection and kept the reactor shut for 59 days during August-September 2014. Normally a turbine is overhauled after working for five to 10 years. During the 365 days the turbine remained connected to the grid, there were 14 trips (shutdowns), two outages and one major accident in the fuel-water system which kept the reactor idle for 175 days. Non-performance of Unit 1 is causing production loss of 24 million units of electricity a day, financial loss of Rs 10 crore daily, besides the interest on the capital invested.

In an article published on 4 February, A Gopalakrishnan, former chairman of the Atomic Energy Regulatory Board, said, "In the Koodankulam case, there are serious flaws of one kind or other. The lack of transparency certainly raises doubts that the Department of Atomic Energy, NPCIL and the AERB together may be hiding some serious deficiencies from the public. This impression needs to be removed by honestly answering the doubts and questions raised by the public regarding the plant." The DAE and the NPCIL have repeatedly denied the issue of sub-standard and counterfeit components in KKNPP. Gopalakrishnan said a large amount of public funds had been spent on this reactor with very little benefit to people in return. "The reactor is known to have suffered continuous and unprecedented problems during the construction, erection and commissioning phases as well during the current operational period." Yet the NPCL serenades it as a great success and has signed for units 3 and 4, with units 5 and 6 in the pipeline. The tragedy is the AERB has approved it.

The growing travails of the nuclear power industry world-wide show that it is not the answer to India's energy needs. While countries like France and Germany are phasing out their nuclear power plants and other advanced countries have stopped constructing nuclear power plants, former Prime Minister Manmohan Singh of the UPA government, after signing the Indo-US nuclear agreement, set out to make India the world's largest importer of nuclear power reactors. Without waiting for competitive bidding process, he reserved three coastal nuclear power parks for three foreign suppliers of reactors: Jaitapur in Maharashtra for Areva of France, Mithi Virdi in Gujarat for Westinghouse of the USA and Kovvada in Andhra Pradesh for GE, also of the USA, and signed Memorandum of Understanding with them. Areva is yet to build the EPR reactor contracted for which is still in the drawing board stage and the French regulator, ASN, has threatened to decline approval. How can India having an Atomic Energy Commission and AERB commit itself to a reactor that has never been built? asks Gopalakrishnan. Koodankulam has been kept for Atomstroyexport of Russia to expand it to the level of the other three nuclear parks yet to take shape. The justification for the Indo-US deal was that America would transfer nuclear technology to India which lacks expertise in enrichment of uranium. Within two months of the deal the USA informed the Nuclear Suppliers Group that uranium enrichment technology should not be shared with nations that are not party to the Nuclear Non-proliferation Treaty. India which steadfastly opposed NPT found itself hoodwinked. The NDA government of Narendra Modi with its emphasis on "Make in India" policy has a golden opportunity to reconsider the Indo-US Nuclear Agreement and scrap the MoUs. With its abundant wind energy and solar power potential, India can well afford to keep Made in Russia and Made in USA reactors at bay and save the coastline for the future generations.

Deccan Herald  
18 Feb, 2016

## **Gravitational waves: A union beyond numbers**

**Energy equals mass times the speed of light, squared. Everyone knows the equation; this is it in action.**

**"It's astonishing; it really is." Jim Hough can't stop repeating the phrase. The veteran gravitational wave hunter from Glasgow University has come to the National Press Club in Washington DC to witness the announcement of the first direct detection of ripples in the fabric of space-time caused by the merger of two "intermediate-sized" black holes.**

The numbers look bald on paper, but it's when you try to imagine the scenario being described in those

numbers that you rock backwards.

Imagine two monster black holes spinning down on each other in space. One has a mass which is about 35 times that of our Sun, the other roughly 30. At the moment just before they coalesce, they're turning around each other several tens of times a second. And then, their event horizons merge and they become one – like two soap bubbles in a bath.

David Reitze, executive director of the Laser Interferometer Gravitational-Wave Observatories (LIGO), described it thus: “Take something about 150km in diameter, and pack 30 times the mass of the Sun into that, and then accelerate it to half the speed of light. Now, take another thing that's 30 times the mass of the Sun, and accelerate that to half the speed of light. And then collide (the two objects) together. That's what we saw here. It's mind boggling.

In that moment of union, the holes radiate pure energy in the form of gravitational waves, and lose mass equivalent to three times that of our Sun. Energy equals mass times the speed of light, squared. Everyone knows the equation; this is it in action. That tremendous release of energy, and the warping of space-time that results, is why the LIGO laboratories have been able to sense it, even though this staggering event occurred about 1.3 billion light-years from Earth. A thousand researchers from 80 institutions in 15 countries are celebrating this moment. The excitement this week, building up to the announcement in the US capital, has been palpable. It's easy to see why. The detection of the black hole merger was made at 09:50:45 GMT on 14 September. The laser interferometers operated by LIGO had only just come online after several years refurbishment to enhance their sensitivity. They weren't even in a formal science observation mode.

The researchers were still going through commissioning checks when the detectors picked up the signal – a disturbance equivalent to someone nudging the ultra-quiet equipment by minute fractions of the width of a proton, the particle at the heart of all atoms.

The LIGO lab at Livingston in Louisiana saw it first. The Hanford, Washington State, observatory 3,000km away sensed the bump seven milliseconds later. The distance to the event, the scientists are pretty confident about; the location, less so. Somewhere in the southern sky.

In some ways, it's difficult to know what to concentrate on. Is it the history-making detection of the waves themselves, or the detail of astrophysics they represent? This is the first direct observation of black holes, of black holes this size, and of them orbiting each other and merging.

And all the numbers are exquisitely in agreement with Einstein's equations. As predicted, the waves radiate at the speed of light – meaning the graviton, the putative particle that mediates gravitation, is massless (to the level that it's possible to tell). “Although Einstein's equations are famously complicated, they are the simplest equations he could have come up with, given all the constraints he had to satisfy,” commented Bernie Schutz from Cardiff University.

“It is remarkable that nature didn't add in even more complexity. But the equations are what they are, and they're beautiful.”

There will of course need to be further detections. The scientists think they may also have seen an event, much smaller, some weeks later, but this will need further assessment.

Looking to the summer, the LIGO labs will be running again after a period of downtime. When this happens, they'll be joined by a third observatory called Virgo, built near Pisa in Italy. Others are coming, too, in Japan and in India. With all these “ears on the cosmos”, it should be easier to identify where precisely in the sky the detected events are occurring.

And the European Space Agency is developing a gravitational wave observatory to put in orbit far from Earth. It will launch in the 2030s. Currently, it's not the grand mission that everybody had hoped for, because the US space agency got in a muddle over its funding some years back and dropped the project. The scale of the mission was therefore redrawn. Many now hope that this historic breakthrough will prompt Nasa to come back in.

**Glorious equations** “The compromise that was made, to build it in Europe so that the Americans didn't have to contribute, because they weren't going to, was not the best thing to do for the science; not for the size and the risk of doing that space mission,” observed MIT's Rai Weiss. “Consequently, many of us are trying to get the collaboration re-established.”

It is really only by going into space and measuring gravitational waves from even bigger events, away

from the noisy surface of the Earth, that researchers expect to see small chinks start to emerge in those glorious equations of Einstein.

It is inevitable on these occasions that talk turns to Nobel Prizes. No one is in any doubt that Thursday's announcement deserves one; the debate, as ever, is over who should receive it.

Obvious candidates include the American Kip Thorne, the Scotsman Ron Drever and the German-born Rai Weiss himself. They are regarded as the fathers of LIGO, having proposed the concept back in the 1980s.

But for Jim Hough, who started working on gravitational waves as a postgrad in the late 1970s, it would be appropriate if some of the glory went to the broad collaboration of researchers who made LIGO what it is. One thousand and four authors are listed on the breakthrough paper in Physical Review Letters. "The Nobel committee should have given a prize to the Large Hadron Collider itself for the detection of the Higgs boson. All those experimentalists worked so hard to do it, and they should have been rewarded for it," he told me. "But it's quite likely we'll see the same thing happening with gravitational waves, which would be a great pity in my view."

**The Asian Age**  
**18 Feb, 2016**

### **China to relocate humans to search for aliens**

Beijing, Feb. 17: China will move nearly 10,000 people to make way for the world's largest radio telescope which promises to help humanity search for alien life, state media reported today.

The 500- metre Aperture Spherical Radio Telescope ( FAST), nestled between hills in the southwestern province of Guizhou, is due to start operation this year.

Provincial officials have vowed to relocate 9,110 residents living within five kilometres of the listening device by September, the official Xinhua news agency said. The relocations will "create a sound electromagnetic wave environment", it cited a top regional official named Li Yuecheng as saying.

Residents will receive \$ 1,800 in subsidies for their troubles, with some getting extra support for housing, it said. FAST, built at a cost of 1.2 billion yuan, will dwarf the Arecibo Observatory in Puerto Rico as the world's largest radio telescope, which is some 300 metres in diameter. Xinhua earlier cited Wu Xiangping, directorgeneral of the Chinese Astronomical Society, as saying that the telescope's high level of sensitivity "will help us to search for intelligent life outside of the galaxy". In the past China has relocated hundreds of thousands of people to make way for large infrastructure projects such as dams and canals. Many complain of poor compensation.

The area surrounding the telescope is remote and relatively poor. Xinhua earlier said it was chosen because there are no major towns nearby. As well as upping investment in astronomy, Beijing is accelerating its multi- billiondollar space exploration programme, with plans for a permanent orbiting station by 2020 and eventually a manned mission to the moon.

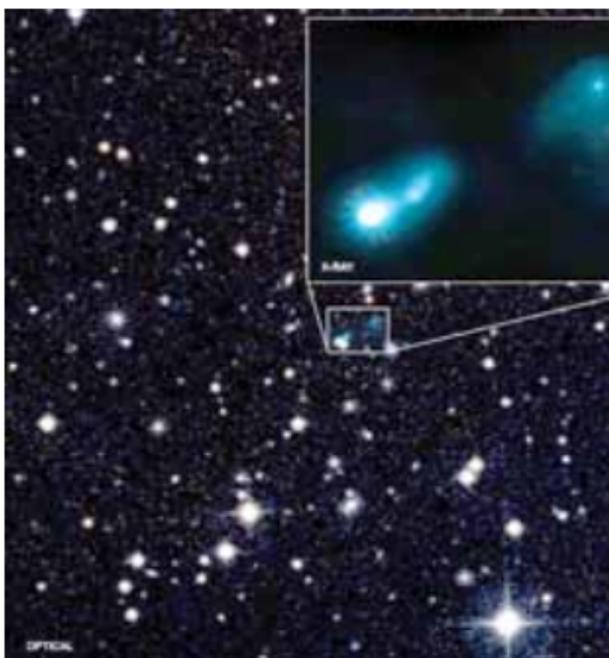
## बिग बैंग की चमक में ब्लैक होल दिखा

वाशिंगटन, (भाषा): वैज्ञानिकों ने नासा की चंद्र एक्स-रे वैधशाला का उपयोग कर एक अहम खोज की कि बहुत दूर स्थित एक सुपरमैसिव ब्लैक होल से निकला एक जेट या फुहार ब्रह्मांड के प्राचीनतम प्रकाश में चमक रही है।

वैज्ञानिकों ने कहा कि यह खोज दिखाती है कि पहले की समझ के विपरीत बिग बैंग के पहले कुछ अरब साल बाद शक्तिशाली फुहारों वाले ब्लैक होल आम थे।

वैज्ञानिकों के अनुसार इस फुहार से जो प्रकाश मिला है, वह उस समय निकला जब ब्रह्मांड केवल 2.7 अरब साल पुराना था, मौजूदा उम्र का पांचवां हिस्सा। उस समय बिग बैंग से निकले ब्रह्मांडीय पृष्ठभूमिय माइक्रोवेव विकिरण (सीएमबी) की तीव्रता की तुलना में बहुत ज्यादा थी। ब्लैक होल प्रणाली में पाई गई इस फुहार को बी3 0724प्लस409 का नाम दिया गया है। यह कम से कम 3 लाख प्रकाशवर्ष लंबी है। सुपरमैसिव ब्लैक होल से निकली बहुत ही लंबी फुहारों का पता लगाया गया है, लेकिन अभी यह चर्चा का मुद्दा है कि कैसे ये फुहारें एक्स-रे छोड़ती हैं।

ऐसा प्रतीत होता है कि बी3 0724 प्लस 409 में एक्स-रे तरंग दैर्घ्यों से सीएमबी में इजाफा हो रहा है। इस अध्ययन का नेतृत्व करने वाली जेएक्सए के इंस्टीट्यूट ऑफ स्पेस ऐंड ऐस्ट्रोनोमिकल स्टडीज (आईएसएस) की औरोरा सिमियोनेसक्यू ने कहा, “चूंकि हम यह फुहार उस



वक्त देख रहे हैं जब ब्रह्मांड तीन अरब साल से कम उम्र का था, निकटवर्ती ब्रह्मांड की तुलना में यह फुहार एक्स-रे में 150 गुना चमकीली है। चूंकि ब्लैक होल से इस फुहार के इलैक्ट्रॉन प्रकाश की गति के लगभग बराबर की गति से निकलते हैं, वे सीएमबी विकिरण के समुद्र से गुजरते हैं और माइक्रोवेव फोटोन से टकराते हैं जिससे फोटोन की ऊर्जा एक्स-रे बैंड तक बढ़ जाती है और इनका पता चंद्र से चल जाता है। इसका अर्थ यह हुआ कि 0724प्लस409 के इलैक्ट्रॉनों को लाखों प्रकाश वर्षों तक प्रकाश की गति के करीब की गति से गमन करना चाहिए।