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Cover : Airbus Military A400M comes into land at Getafe, Spain (photo Airbus)

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Simon, Dubai

COMMENTARY

Not battle ready

Notwithstanding the furore in Parliament over the source of leaked letter written by army chief Gen VK Singh to the prime minister, it is the contents of the letter - detailing the poor defence preparedness of the armed forces - that ought to send alarm bells ringing. The fundamental question is why, despite being the world's largest arms importer, India's defence forces are so woefully unprepared. And a large part of the answer has to be corruption. In that context the army chief's allegation of a bribe offer made directly to him - defence minister AK Antony doesn't deny that the general had apprised him at the time - is surely significant.

Given the extent of the malaise it's clear that only a thorough structural overhaul can rectify the situation. What complicates matters is the existence of vested interests cutting across the political class, the defence forces and the bureaucracy that want the status quo to sustain. Add to this the lacklustre output of the government's own Defence Research & Development Organisation. Its failure to ensure that the defence forces aren't saddled with obsolete weaponry is the main reason for India's increasing foreign defence procurement bill.

Greater indigenous defence manufacturing and procurement would not only guard against dubious deals with foreign suppliers but also boost self-reliance. Gone are hoary Cold War days when India, though officially non-aligned, could depend on the USSR for its defence needs. Modern-day geopolitics demands that India meet a majority of its military requirements internally. Greater collaboration between defence PSUs and domestic private defence companies - with a liberal licensing regime for the latter - is the need of the hour. In this regard, the American defence industry serves as a good model. India also has an odd policy of capping FDI in defence at 26%. Permitting even 100% FDI would do no harm - it would help build India's domestic industrial base and would certainly be preferable to importing weapons wholesale. Besides, if India starts producing state-of-the-art defence hardware, the sale of such equipment would provide it strategic heft with buyer nations.

But most of all, reforms and anti-corruption measures must be motivated by national security. India faces a host of conventional and unconventional security threats. While state-sponsored terrorism is a perennial concern, we need defensive capabilities to match the Chinese and Pakistani drive for military modernisation. The leak of Gen Singh's letter has focussed attention on some serious shortcomings. We can ignore these only at our own peril.

From: The Times of India

Crisis in our skies

India is one of the few countries where air passenger traffic has been rising year after year. More airports are being opened across the country. With a number of airlines in operation, competition is intense and the resulting fare war has, over the years, made flying an affordable option to many new air passengers. But, at the end of the day, none of the airlines seems to be making a profit. Perhaps only Indigo — the low-cost, no-frills, airline — has been able to keep its head above the waters. At the other end of the spectrum lie Air India and Kingfisher. For Air India, being a national carrier is both an asset and a liability. Kingfisher's malaise has more to do with extravagance and poor management. Today, the employees of both these airlines have resorted to strikes, protesting against the non-payment of salaries for months. The Prime Minister had himself to assure Air India pilots that their dues would be cleared over a period of time, and the Kingfisher Chairman, Vijay Mallya, had to meet unions and pilots to give them a fresh timetable for payment of salary arrears.

So what's wrong with the airlines, or even the aviation industry in such a growth centre as India? Why is the sector booming in China but not here? The airlines, speaking in one voice at least on this, insist that it is the lack of a positive, coherent aviation policy since the opening up of the skies that has led to this crisis. Though traffic is growing, the cost of operations has risen sharply. Aviation fuel accounts for nearly 50 per cent of the costs, and its price increase over the past two years has been substantial, eating into already low margins. Air fares have not risen correspondingly because of competition and the need to raise the load factor. Airport charges, particularly after the advent of privately developed greenfield airports, have also increased manifold. For Air India, the unwise and as yet incomplete merger of Indian Airlines and Air India has remained an albatross, while the now-on, now-off aircraft acquisition programme has led to a huge debt and interest burden. The Centre's decision to allow airlines to directly import fuel has been a welcome measure. But it is too little too late. The Civil Aviation Ministry must discuss all the issues affecting the economics of the industry threadbare and come up with a positive aviation policy to revive the sector without giving anybody a bailout or compromising on safety. The airlines, too, must set their houses in order and take employees into confidence, without leaving them in the lurch.

From: The Hindu

India in the South China Sea

External Affairs Minister SM Krishna's response to China's so-called warning to India on the question of oil exploration in the South China Sea in collaboration with Vietnam is in keeping with India's consistent position. The area (Blocks 127 and 128) where India's ONGC *Videsh* is to start drilling is not in Chinese territorial waters. The Vietnamese Foreign Ministry reiterated the fact on the day when National Institute for South China Sea Studies President Wu Shicun made an unsubstantiated claim that Blocks 127 and 128 were, without doubt, in Vietnamese territorial waters "and China knows it fully well." Yet it keeps objecting to India's role in line with how Beijing, of late, has been flexing

Sikorsky

its muscles against its neighbours. But India has asserted its right to play its due role because the waters under question are the "property of the world".

The actual reason is not the oil exploration pact that India and Vietnam have signed, which is a purely economic activity. China's worry is that India is gradually expanding its presence in East Asia where Beijing has been lording over with small countries. These countries, most of them members of the Association of South-East Asian Nations (ASEAN), are in favour of India playing its role in a big way in the strategically significant region. India too has increased its efforts for better relations with these countries as part of its 'Look East' policy. This is upsetting for China, as India's expanding presence in the region does not fit in with the Chinese scheme of things.

The authorities in China should remember that times have changed and today no nation, even if it is a super power, is in a position to impose its will on others. China has every right to pursue its goal of becoming the super power of the future, but this does not mean that it can make others in its immediate neighbourhood, in particular, to act in accordance with its dictats.

From: The Tribune

The 'game-changer'

Agni V, India's most powerful long-range ballistic missile, has lived up to the hopes of its creators at the Defence Research & Development Organisation. In its maiden flight on 19 April 2012, the missile demonstrated that it could accurately take a dummy warhead weighing slightly over one tonne to a distance of over 5,000 km. India already has nuclear-capable missiles that can reach all of Pakistan and Agni V is clearly intended to provide a similar deterrent capability with respect to China. More test flights will be necessary before the missile is inducted into the country's strategic arsenal. VK Saraswat, Scientific Adviser to the Defence Minister, has called the missile "a game-changer" that can perform different roles, from carrying multiple warheads to providing anti-satellite capability and even launching tiny satellites into orbit. Like its progenitor, Agni III, this missile has a two-metre diameter (as compared to the one-metre diameter of Agni I and II). Agni III and V are therefore the first Indian missiles that can potentially be equipped with several warheads each (known as Multiple Independently Targeted Re-entry Vehicles or MIRV). MIRVs, however, pose their own technological challenges, especially the need to considerably shrink the size and weight of nuclear warheads. Despite China's earlier start, its ballistic missiles are still thought to be equipped with single warheads, not MIRVs. This suggests that developing an operational MIRV capability is not easy and will take time for both countries. Which is just as well because mutual security — as the superpowers discovered during the Cold War — does not lie in going down that path.

Both China and Pakistan possess formidable nuclear-armed missiles of their own. The former is in the process of replacing its liquid-fuelled ballistic missiles with more modern solid propellant ones. From bases in Qinghai and Yunnan provinces, these missiles can reach all of India. In addition, in 2004, China launched the first of its second-generation Type 094 *Jin*-class nuclear-powered submarines that will carry JL-2 solid-propellant ballistic missiles. Islamabad too has a number of long-range missiles in its armoury. An assessment carried out by an Indian strategic studies group found that Pakistan had a "credible deterrent structure" organised around the solid-propellant Shaheen-1 and -2 missiles. However, responsible possession of nuclear-armed missiles for the purposes of deterrence also requires working assiduously to remove sources of friction that can erupt into open conflict. It is also important that India and China start talking to each other on nuclear matters.

From: The Hindu

Demilitarising Siachen

Pakistan Army Chief Gen Ashfaque Parvez Kayani has a point when he says that there is no logic in deploying troops at the Siachen glacier where soldiers lose their lives more because of the extremely harsh weather than in an exchange of fire between the two sides. Therefore, in his opinion, a way should be found for the demilitarisation of Siachen. He blames India for first sending troops to Siachen in 1984 but, at the same time, admits that the two countries were close to reaching an agreement on the glacier issue not long ago. During the composite dialogue process, which got snapped by the 2008 Mumbai terror attack, the two countries had almost agreed to demilitarise Siachen, but Pakistan refused to accede to India's demand for the demarcation of the point where the armies of the two countries were positioned at that stage. If Pakistan accepts India's viewpoint, troop withdrawal need not be a problem, and this will lead to the saving of billions of rupees and prevention of loss of human lives due to the intolerable weather conditions there.

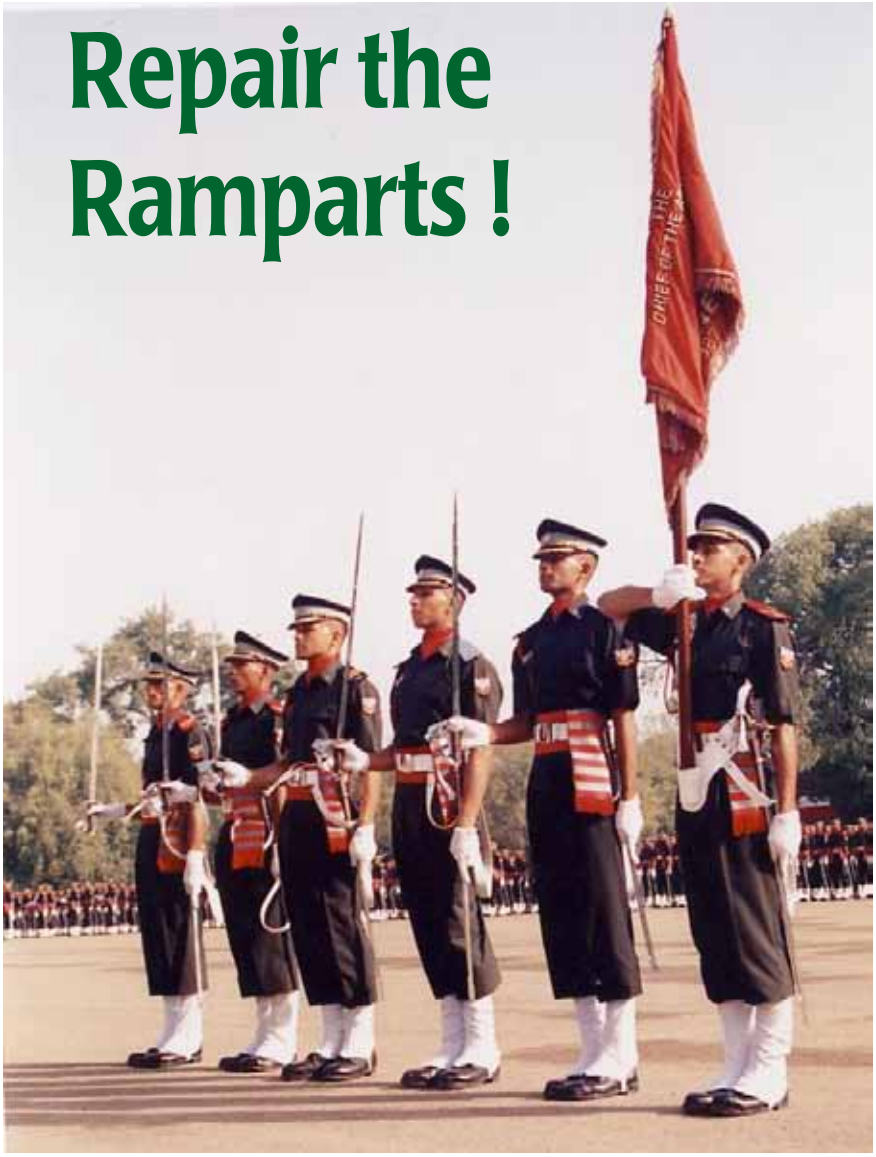
Former Pakistan Prime Minister Nawaz Sharif's advice to his country that it should take the lead and unilaterally withdraw its forces from the glacier is worth the effort. This, Mr Sharif believes, may force India to follow suit. General Kayani should give serious thought to the idea when he realises that this may lead to a reduction in the defence budget, and that the security of a country has no meaning if development gets ignored.

In any case, it is interesting that for the first time the Pakistan Army Chief has come out publicly with the view that the defence budget of his country needs to be reduced to save money for economic growth. This is not a tall order when India and Pakistan have intensified their efforts to develop great stakes in commerce and industry by providing as much concessions as possible for the cause of peace and growth. Actually, this is the best alternative available when wars have failed to provide solutions to the issues coming in the way of normalisation of relations between the two neighbours.

From: The Tribune

Boeing

Repair the Ramparts !



The last few months have witnessed much media battering which has sullied reputation of the armed forces. Sadly, the damage done to a grand edifice, and the wound inflicted on the psyche, self-esteem and esprit de corps of a million and a half young officers, soldiers, sailors and airmen go deep and may not mend soon. Equally mortifying to the nation was yet another reminder, through a leaked letter, that the Emperor has no clothes, and this in then presence of the Chinese leadership in our capital.

The ability to introspect is not a national strength, but we must face the reality that the continuing drama, as it unfolds, reveals merely the symptoms of a cancer whose roots are embedded in our polity, and which has entered the national security system. In a democracy such as ours, the answers will come, not from shrill TV anchors haranguing emotional and intemperate veterans, but from the political leadership. As we seek a panacea, let us examine some facets of this hydra-headed disease.

A major contributory factor has been political detachment and indifference towards matters relating to national security, because this is not an issue that can win or lose votes for the politician. Such is the intensity of political activity in the country that, even with the best intentions, it leaves the Raksha Mantri (RM) inadequate time for defence and strategic affairs. This writer has often sat across the minister's table to brief him on an important issue, only to be interrupted by the incessant ringing of his four mobiles and three telephones in rapid succession. These were, no doubt, urgent calls relating to business of Parliament, party or constituency, but once the allotted time was up, one had no choice but to leave the RM's office, knowing that the Defence Secretary would be summoned later to fill in the blanks.

The Ministry of Defence (MoD) is unique in that it demands of the Minister not just a comprehension of complex security issues and expeditious decision-making but also frequent interaction with the military hierarchy. A degree of familiarity with the senior military leadership coupled with some self-assertion would enable the Minister not only to seek their expertise and advice, but also to provide guidance and exercise political supervision with the friendly but firm hand required in a democracy. Unfortunately such a level of comfort has rarely prevailed in South Block. The armed forces leadership and the country's political establishment are simply ill at ease with each other and a yawning chasm has developed between them. This gap is bridged by the bureaucrat but since the latter's exposure to national security issues and knowledge-span is limited, drift and delay is inevitable.

The politician should have, by now, realised that he is not dealing with British Blimps or Prussian *Herrenvolk* but proletarian armed forces. The Indian officer corps is increasingly drawn from the middle and lower strata of the Indian middle-class, whose first instinct is to defer to civil political authority. Had the RM and the chiefs established an equation of mutual respect and confidence, the current crisis could have been resolved behind the closed doors of his office. It is now obvious that dialogue in South Block has been taking place, first on files, and then via the media. No wonder there are "leaks" galore.

The next important factor is the almost total reliance that the RM places, in the current system, on MoD bureaucracy for advice, routine decision-making, problem resolution and crisis management. While the comfort level in this relationship may be higher, the delegation of "civilian control" to the bureaucracy, while excluding the armed forces from these functions, amounts to dereliction of responsibility by the political establishment.

While many accusations against the bureaucracy, of obduracy, stonewalling and even malice, are often exaggerated, one thing that they have certainly achieved

Agusta Westland

with great deliberation is to stubbornly resist all attempts at change. The writer is currently serving on a task force on national security reform. As the sole relict of a similar task force constituted by the NDA government in 1999 I have an eerie sense of d*éjà vu* as, 13 years down the line, I hear, with a sinking feeling, the same logic and arguments being used to stall yet another attempt at reforms. The warning signs have been flashing for quite some time, but if we still decide to make like ostriches then we should be prepared to find ourselves neck-deep in trouble.

The estrangement between the Service Headquarters (SHQ) and MoD has not just created an atmosphere of bitterness and mutual recriminations but also led to systemic dysfunctionalities. Two examples from the recent controversy are enough to demonstrate the level of stasis. Firstly, in the midst of all the rant about corruption surrounding supply of Tatra trucks, no one has thought of asking the MoD why after importing thousands of these trucks over 40 years, our vast defence industrial complex has not been able to produce an indigenous version? The ammunition shortages revealed by the Army Chief's letter refer to the reserves which the Service is supposed to maintain in order to fight a war of 30-45 day duration. Since wars do not always give notice of their approach, how is it that the defence establishment - RM, Defence Secretary and COAS - did nothing about these shortages all these years?

A critical factor, and the root of much of the corruption we see all around, is the fact that political parties, across the board, see the arms import business as a veritable "golden goose" for election funding. This may explain the lackadaisical pursuit of indigenisation as well as of corrupt individuals. We have witnessed, since the 1980s, virtually every single major defence contract getting embroiled in allegations of corruption and kickbacks, often made by commercial rivals. The net result of these controversies is that the modernisation plans of the armed forces have slowed down drastically, and the nation's capability to produce weapons has stagnated. Dare we hope for a bold consensus across party-lines - in the larger interests of the nation's safety and security - that would declare defence purchases "holy cows" and off-limits for political exploitation?

The final factor that needs to be addressed is the steep and calamitous decline in ethical standards of the armed forces. There is obviously a deep subliminal urge, among officers, to "keep up with the Joneses" in other sections of India's rapidly prospering society. This has led some of us in the senior hierarchy of the armed forces to adopt ostentatious customs and lifestyles either by misusing official funds or by adopting other unethical means. Such is the change in mores that till it became an overnight "scam", the owner of a swank *Adarsh* apartment certainly evoked more admiration than someone living in a downmarket 3 BHK flat.

Blaming this decay in our polity and our society is not a good enough excuse; the armed forces used to be the exemplars of rectitude, ethics and morality for Indian society. After all, we invented phrases such as "officer-like conduct" and "an officer and a gentleman". Moreover the current pay, allowances, perks and pensions allow serving and retired personnel to live in dignity and reasonable comfort. It is time for deep introspection at the senior levels of the military, about the ethical moorings of our officer corps. The rot can only be stemmed if we can teach our young officers to develop disdain for filthy lucre, and show them, by example, how to live in Spartan and soldierly dignity.

Admiral Arun Prakash (Retd)

IRKUT

India's External Affairs Minister SM Krishna and his Pakistani counterpart Hina Rabbani Khar prior to a meeting in New Delhi.

The 'soft side' of hard power

General Ashfaq Parvez Kayani's recent remarks about peaceful co-existence with India and suggestions for demilitarising Siachen and reducing the defence budget of both countries can will be regarded, with cynicism, as a master stroke for sending across a message that there is a change in the mindset of the Pakistan army which might push the Indian side into seriously thinking about some sort of agreement on Siachen. However, practitioners of military strategy, diplomacy and real politik would be able to comprehend this better.

If one were to simply look at the content and not the overall context, they reveal an oft hidden facet of a soldier. Former US President Dwight Eisehower rightly summed this dimension saying "I hate war, as only a soldier who has lived it can, as one who has seen its brutality, its futility, its stupidity. Every gun that is made, every warship launched, every rocket fired, signifies in the final sense a theft from those who hunger and are not fed, those who are cold and not clothed."

A few weeks down the line this statement of Kayani would probably be obliterated in case he were to make a more macho one. There is a natural tendency for historians, academics and the media to not depict the hidden dove in a soldier and instead only project his hawkish side.

Beyond the contemporary, if one were to look at the coverage of the 1971 Indo-Pak war, the focus is predictably on the political ramifications of the conflict. This is quite natural as there were some crucial spin offs which had an indelible impact on the region. Firstly, South Asia saw the birth of a new country, Bangladesh. Secondly not too long after the war, India and Pakistan signed the Simla Agreement and finally many believe that it was this war which drastically changed the mindset of the Pakistan Army vis-a-vis India.

But amidst macro-analysis of the geo-political implications of this war for India, Pakistan and the newly carved out state of Bangladesh, there are some other facets which have been relegated to the sidelines and treated as mere foot notes. There is no better illustration of this point than the fact that never has much space been devoted to some of the interesting 're-unions' between soldiers of Indian and Pakistani Army who had served together in the undivided (British) Indian Army.

While there is absolutely no doubt that these re-unions did not take place in the most pleasant of scenarios and while they may not have had much of a bearing on the relationship between both countries. Yet, the revival of old friendships in the aftermath of the war did not damage the relationship either.

Being one of the editors of the book, *Warriors after War: Indian and Pakistani Retired Military Leaders Reflect on Relations between the Two Countries, Past, Present and Future'*, which is a collection of interviews with retired army officials from both India and Pakistan. I got an opportunity to interact with retired army officials from the Indian side. Some anecdotes, again from the Indian side, are especially interesting. While the issues highlighted through these anecdotes are known, the efficacy with which they highlight the renewing of connections between friends and acquaintances, during 1971, is something which is impossible to overlook.

Lt. General SK Sinha, former Governor of Jammu and Kashmir and in-charge of POWs during the 1971 war, during the course of his interview listed numerous anecdotes to highlight the point. Sinha, for example, knew Lt. Gen. AK Niazi, who had served with him in the old Indian Army before 1947. Niazi, who was then a captain in the Rajput Regiment and Sinha, who was then a captain in the Jat Regiment, had served together in Indonesia. Niazi was not the only one whom Sinha had known pre-partition. Another officer who was a POW was Musharraf Hussain. Hussain had been an officer in the Indian Navy. He and the latter had lived together in the armed forces officers' mess on Zakir Hussain Road in Delhi in 1946. Hussain later opted for the civil service and in 1971 was the Chief Secretary of East Pakistan. He had also surrendered to the Indians and was kept in the camp at Bareilly. Interestingly, Sinha also facilitated the delivery of Hussain's letters to the latter's wife who was in West Pakistan. He even made an exception to help Hussain. Says Sinha, "as a special case I would have his letter dispatched to Pakistan through the Egyptian embassy which was looking after Pakistan's interests in India in the absenceof its own."

Renewing of old associations did not end here. Sinha narrated another interesting episode: "After the Simla

Agreement in 1972, we returned the prisoners of war without extracting any agreement to resolve the Kashmir issue. A month after the prisoners went back to Pakistan, I was surprised to receive a letter from Mohammad Nawaz, Cabinet Secretary in Pakistan. He had also been in the Indian Army and we had been staff officers together in 15 Corps Headquarters at Batavia, now Jakarta, in 1946. He wrote that he had received good reports about me from the prisoners who had returned. He said he decided to write to thank me and also to renew our old association'.

Sinha reminisced some other interesting points about how efforts were made to entertain these POWs. 'We arranged for their recreation and sports, poetry readings (mushaira) and cinema programmes were organised for them. We arranged a cricket match at Roorkee between Pakistani officers and our officers guarding them at the camps.'

Major General Ashok K. Mehta (who had served with the 5th Gorkha Rifles (FF)) also narrated how Pakistani POW's were given *bada khanas* much to the "chagrin of many Indian cadets."

Apart from reunions there were others too which reiterated the inherent professionalism of a true soldier. Lt. General JFR Jacob, who was given the responsibility for the planning, logistics and conduct of the operations in Eastern Command in 1971, and who also directly negotiated with General AAK Niazi of the Pakistan Eastern Army on the instrument of surrender drafted by him but unconfirmed by Delhi, has numerous anecdotes to narrate. One stood out however, about how General Manekshaw called him to enquire whether Indian troops were looting Pakistani stores, and to check this if it were true. Said Jacob in his interview "General Manekshaw called me telling me that he had heard rumours that Indian troops were looting Pakistani Army stores. I replied that I had not heard of any such instance. In the end Manekshaw told me.. to go to Dacca the very next day. On reaching there I took up this issue with the commanders and asked them whether the rumours of looting were true or not. The commanders assured me that all such allegations were false. Even though I was satisfied that the charge of looting was a rumour, I reiterated my view that Indian troops should withdraw at the earliest opportunity, otherwise there was a danger that they would become unpopular."

While enough has come out with regard to the conflict, it is imperative to ensure that the humane side of 1971 gets its rightful place in history, though this may not have any bearing on policy making and future geo-political developments. It is an important layer of Indo-Pak history, which ought not to be obliterated since it very effectively reinforces the point that while partition may have led to geographical division, it could not obliterate ties which existed at the individual levels between the peoples–including army personnel–of both countries.

Apart from bringing to the fore instances of soldiers not forgetting basic human values and their personal friendships during times of conflict, the other point I would like to make is that for far too long there is a tendency to blame the baggage of the 'pre-partition' generation–whether civil or military–has been dubbed as the primary cause of tensions between both the countries, neglecting numerous other factors. While this may be partially true, it is a bit simplistic to apportion all the blame to the pre-partition generation. One way of countering this would be to have many more conversations with surviving individuals of the pre-partition generation who have positive experiences to narrate. This would certainly help in bringing to the fore unexplored, but significant, layers of Indo-Pak history which would help in blunting at least some of the propaganda.

Finally, after having made use of oral history I would like to make the point that it is imperative to make a more efficient use of this extremely handy approach and not just dismiss it as a 'soft' approach. While there is no doubt that oral history has major problems, the primary one is the lack of transparency in the process of data collection. There is also no doubt that it helps in bringing out certain aspects which are neglected or not given adequate space by academics or journalists, on the pretext that they are irrelevant. After all in spite of being dubbed a 'soft approach', only oral history is able to bring out the 'soft side' of hard power during hard times

Tridivesh Singh Maini

General Ashfaq Parvez Kayani, Pakistan Army Chief, with Senior Army Commanders at HQ Force Command Northern Areas.

"Security concerns" : CAS

Air Chief Marshal NAK Browne, Chief of the Air Staff, stated on 19 April 2012 at Bangalore that the IAF was enhancing its strength "in the face of unresolved differences over international borders with Pakistan and China which continue to cause security concerns." The CAS made this statement while delivering the Sixth *Air Chief Marshal LM Katre Memorial Lecture* organised by Karnataka Branch of the Air Force Association. Elaborating upon the plans to strengthen capabilities of the IAF in the northern frontiers the CAS said that the two airfields in Ladakh (Nyoma and Kargil) would be made fully operational soon. "We have plans to deploy a Su-30MKI fighter squadron along with a transport squadron at Nyoma air base. Kargil will be prepared to receive the newly acquired C-130 Super Hercules and C-17 Globemaster III with strategic heavy lift capabilities to enhance special operations", he added.

Seen during his visit to France on 24 May, Air Chief Marshal NAK Browne, Chief of the Air Staff IAF along with CO of the Rafale Squadron at St. Dizier Airbase, after his sortie in the Rafale. Also in the picture are General Jean-Paul Paloméros, Chief of Staff, French Air Force and Col Jean- Pierre Moontegu, Base Commander.

Air Chief Marshal Browne also reiterated the objective of establishing of 42 combat squadrons by 2022, up from the present 34 squadrons. While the existing squadrons of MiG-29s, Jaguars and Mirage 2000s are being upgraded, the current fleet (MiG-21/27) will be systematically replaced with Rafale MMRCAs, HAL-produced Light Combat Aircraft and the Su-30MKIs, as also the Fifth Generation Fighter Aircraft. Meanwhile airlift capacity of the IAF is to be increased three-fold over the next decade. Besides, the helicopter fleet will be expanded with induction of more Mi-17s, Apache attack helicopters and heavy lift Chinooks.

Referring to flying training of IAF personnel in context of the planned force enhancement, the CAS said the present intake of 450 cadets will be increased to 750 to meet the IAF's growing needs and improve the training infrastructure. Stage II training facilities at Hakimpet near Hyderabad will be shifted to a new training base at Deesa in Gujarat "in the near future".

CCS approves purchase of Pilatus PC-7 Mk.II, contract signed

On 3 May, 2012 the Cabinet Committee on Security (CCS), chaired by Prime Minister Manmohan Singh gave approval for procurement of 75 Pilatus PC-7 Mk.II basic training aircraft from the Swiss company. The approval has been delayed by nearly a year owing to various allegations concerning flaws in pricing calculations. The programme is worth around $ 600 million (Rs 3000 crores).

The delivery of PC-7s to India will begin within 15-18 months after contract (reportedly signed on 24 May 2012 at New Delhi) prior to which IAF flying instructors will reportedly receive conversion training on the type in Switzerland, to hasten the process. The IAF has faced acute flying training difficulties after its HPT-32s were grounded in July 2009 following a series of fatal accidents. The IAF has over the past three years adopted what may be termed an 'adhoc approach', giving 20-25 hrs of flying in Kiran Mk.I jet trainers before trifurcation of pilots to various streams. This was clearly a short term solution but compounded by the fact that the Kiran Mk.Is themselves were running out of airframe life. A direct consequence was disbandment of the *Surya Kiran* aerobatic team whose Kiran Mk.IIs were also deployed for Stage II flying training before cadets moved to the Hawk Mk.132 advanced jet trainers at Bidar.

Once the Pilatus PC-7 Mk.IIs are received, the IAF will revert to the accepted pattern of Stage I training on this basic training aircraft, while Stage II will be performed on Kiran Mk.IIs (to be supplanted by the HJT-36 IJT) and then Stage III on Hawks.

Rubin Submarines

IAF Commanders' Conference 2012

Defence Minister AK Antony inaugurated the first bi-annual IAF Commander's Conference for 2012 at Air Headquarters (Vayu Bhawan) in New Delhi on 10 April. The Minister was introduced to Air Force Commanders and Principal Staff Officers (PSOs) at Air Headquarters by Air Chief Marshal NAK Browne, Chief of the Air Staff.

Defence Minister AK Antony photographed with Chief of the Air Staff, Defence Secretary and Air Force Commanders at the Air Force Commanders' Conference at Air Headquarters in New Delhi on 10 April 2012.

The Air Chief emphasised, "I am aware of the challenges each one of you is facing in your respective Area of Responsibility (AOR) and also the good work which your Commands are doing in these testing times. Please keep up the good work. In all the forums where I have had the chance to interact with our air warriors, including visits to your Command, I have shared my vision for the IAF. To my mind we need to focus on maintaining high operational readiness, empower our 'people'- our biggest resource and persevere in our capability enhancement programmes."

Mirage 2000 fleet operational again

After being grounded for over a month following two crashes in close succession, the IAF's Mirage 2000 fighter fleet was cleared for operations in end-April. At the annual Commanders' conference on 9 April, Air Chief Marshal NAK Browne had said that the Mirage 2000 fleet was undergoing "systematic technical checks and would resume flying operations by the end of April". French original equipment manufacturers Dassault Aviation and engine producer Snecma have been involved with the probe into the crashes, reportedly caused because of some engine related problems.

As per flight safety statistics, the IAF's Mirage 2000s have had "a much better flight safety record" compared to other fighters including MiG-21/27s and Jaguars. Recently contracted have been two deals worth over Rs 17,500 crore for the progressive upgrade of IAF's 51 (now 49) Mirage 2000s by French companies Dassault Aviation (aircraft manufacturer), Thales (weapons systems integrator) and MBDA (missile supplier). While the first two fighters have been sent to France for upgrade, the rest will be retrofitted with new avionics, radars, mission computers, glass cockpits, helmet-mounted displays, electronic warfare suites, weapon delivery and precision-targeting systems in India by Hindustan Aeronautics Ltd. "under transfer of technology".

Third batch of upgraded An-32REs received

On 12 March, after upgrade at the Aircraft Repair Plant 410 in Kiev, Ukraine, a third batch of five An-32REs have been delivered to the Indian Air Force. The aircraft, comprising tail numbers K2677, K2680, K2715, K2720 and K2735, were officially handed over in a ceremony at Kiev-Zhulyany airport before departing for India the same day.

Under the contract signed on 15 June 2009, all 105 (since reduced to 104) IAF An-32 *Sutlej* aircraft are being modernised to the An-32RE standard. After completion of the first 40 in Ukraine, the remainder will be upgraded in India at No.1 Base Repair Depot, Air Force Station Chakeri (Kanpur). The first batch (K2676, K2670, K2681 and K2696) flew back to India in June 2011, while the second batch (K2689, K2704, K2707, K2708 and K2719) left Kiev on 19 September, 2011. A fourth batch (K2668, K2682, K2692, K2734 plus one) arrived at Zhulyany on 11 December, 2011.

LTIPP 2012-2027 and other policy/plans

On 2 April, 2012, the MoD cleared the long awaited Long-Term Integrated Perspective Plan (LTIPP) for 2012-2027 and the Five-Year Defence Plan (2012-2017) besides effecting a key change in the offset policy, now including transfer of technology (ToT) aspects (*see articles in this Issue*). The Defence Acquisition Council (DAC) met under chairmanship of Defence Minister AK Antony and considered perspective plans of the

The corridor of power: Parliament House, New Delhi.

defence forces, the meeting attended by the COAS Gen VK Singh, CAS Air Chief Marshal NAK Browne and CNS Admiral Nirmal Verma. While the LTIPP is a broad vision document, the 12th Defence Plan deals with specific requirements and modernisation plans of the Defence Forces.

The DAC also approved revised Defence Offset Guidelines (DOG) wherein it recognised ToT as eligible for discharge of offset obligations, which has been a major demand of foreign companies. "Investment in kind in terms of ToT must cover all documentation, training and consultancy required for full ToT (civil infrastructure and equipment are excluded). The ToT should be provided without licence fee and there should be no restriction on domestic production, sale or export,'' according to the new guidelines.

"Maintain probity and transparency in all defence deals"

With Bharat Earth Movers Limited (BEML) under the CBI scanner for supply of Tatra trucks and other controversies, Defence Minister AK Antony on 19 April, 2012 sternly warned the eight defence PSUs to maintain probity and transparency in all their dealings. "There should be no compromise on transparency in dealings with clients and users," Antony said in an hour-long meeting with PSU chiefs, including BEML chairman VRS Natarajan and his counterparts from Hindustan Aeronautics, Bharat Electronics, Bharat Dynamics and the four shipyards (MDL, GRSE, GSL and HSL). Asking them "to set benchmarks" in terms of probity, the minister said that the PSUs should ensure "timely delivery of products, quality assurance and product support to their primary customers", who essentially are India's 1.3 million strong armed forces.

Enhancement of Defence Budget ?

On 8 May, Defence Minister AK Antony informed the Rajya Sabha that he would seek "a hike" in the Defence Budget of 2012-13, owing to "new ground realities and the changing security scenario". According to sources, the Army's evolving doctrine and "proactive strategy" has to be considered in enhancing the Defence budget and speeding up several plans. Mr Antony confirmed that "in the 12th Plan (2012-17) also, we will build (a) new offensive Mountain Corps, with two specialised Mountain Divisions for high altitude areas". Other major acquisitions during the Plan are commissioning of the Navy's new aircraft carrier INS *Vikramaditya*, and indigenous nuclear submarine INS *Arihant* armed with nuclear-tipped missiles, early next year. "The Navy will be getting five new warships every year from now onwards". The IAF will be strengthened with 270 Su-30MKIs, 126 MMRCAs and thereafter fifth-generation fighters (FGFAs) to be built with Russian collaboration. "I feel that India's defence budget will have to be enhanced" Antony stated.

NSC Task Force visits HAL

The National Security Council has formulated a Task Force under the Chairmanship of Ravindra Gupta, earlier Secretary to the Government of India, whose terms of reference entail suggesting of measures for "enhancing indigenisation in defence by increasing Indian private sector participation; strengthening the legal and regulatory framework for the Indian defence industry; absorption and upgradation of technologies in the Indian defence industry; strengthening the existing mechanism for finalising staff quality requirements (SQRs) with a view to fostering competition and reducing single-vendor cases; but also penalising vendors found non-compliant with defence procurement; particularly from the vigilance angle."

In this connection the Chairman Ravindra Gupta accompanied by SN Sisodia, Lt. Gen (Retd.) HS Lidder, Prof. PV Indresan, Prof. R.Venkata Rao, Maj. Gen. RK Malhotra, JS Bhalla and Lt. Col. DPK Pillay visited HAL, Bangalore on 16 April 2012 to interact with HAL's management.

HAL apprised the team members of the current production plans and new programmes. The Task Force was of the view that "HAL should think global and enhance self-reliance so that dependence on other countries is reduced". The team also suggested that HAL should have its own Aerospace University to foster talent. Concentration on the civil market and development of Unmanned Aerial Vehicles (UAV) were also suggested. The team was of the opinion that HAL should endeavour to become part of the global supply chain. The Task Force also emphasised on the importance of self-reliance through design and development of aero-engines. The Task Force, while acknowledging the fact that HAL is the pioneer in the aviation field in India, suggested that it should take further lead in expanding the aviation sector beyond its current areas of operation.

Army Commanders' Conference

The Army Commanders' Conference was held in New Delhi from 16 April with an inaugural address by the Defence Minister. Chief of Army Staff, Gen VK Singh in his address highlighted that the regional situation needs to be monitored closely: "the Indian Army needs to be operationally prepared at all times". The situation has improved in J&K and North East but a strict vigil by the Army is needed as the summer is fast approaching. Speaking on transformation, he emphasised that it is required "to be pursued with vigour, to ensure an evaluative improvement, so that the Army becomes a better organisation to do the task entrusted to it."

Government fast-tracks acquisition of defence equipment

In wake of national indignation on "the tardy and convoluted processing system for acquisition of defence equipment," the Government on 17 April, 2012 approved a slew of measures for fast-track acquisition of weapons as well as to boost infrastructure and development along the borders for faster mobility of troops and equipment. Significantly, these steps include seeking the Planning Commission's sanction for 14 strategic railway lines, mostly along the western and eastern fronts, for "quick troop mobilisation and logistics sustenance in times of conflict."

An empowered committee has also been constituted under Defence Secretary Shashikant Sharma to examine the "detailed project reports'' of the Army's proposed "capability development plan on the Northern Borders'', involving requirements worth Rs 26,155 crore that is slated for completion by 2020-2021. There is already an ongoing Rs 9,243 crore project for "infrastructure development in the Eastern Theatre'' by 2016-2017.

This is critical since China can reportedly position around 30 Divisions along the Sino-Indian borders within 30 days to outnumber Indian forces by at least 3:1. China has undertaken massive infrastructure development all along the 4,057-km Line of Actual Control and has in fact, recently held air and land combat exercises in the high-altitude Qinghai-Tibet Plateau (*see article in this Issue*).

It is not coincidental that the 'fast tracking' effects have followed the 'leak' of a highly confidential letter by the COAS to Prime Minister Manmohan Singh on 12 March, 2012, which referred to critical operational gaps in the face of two "inimical neighbours'' and the "reality of large land borders''. However, on the positive side, there is progress as a 4th regiment of BrahMos supersonic cruise missiles at a cost of Rs 4,100 crore and two regiments of the Pinaka multi-barrel rocket launchers for Rs 2,136 crore, are being raised.

DAC clears procurement of M-777 howitzers

On 11 May 2012, the Defence Acquisitions Council (DAC) chaired by Defence Minister AK Antony cleared the long pending procurement of 145 M-777 155mm ultra-light howitzers for the Indian Army from the US under the Foreign Military Sales (FMS) programme. The procurement is reportedly worth $ 647 million, these 'air-mobile' howitzers meant for rapid deployment particularly in high altitude areas including Arunachal Pradesh in the North-East and Ladakh in the North-West.

Canadian M777s in action in Afghanistan

The 155mm/39-calibre ultra-light howitzers, with laser inertial artillery pointing systems and an almost 30-km range, will equip five regiments that can be deployed to strengthen "threatened sectors" with rapidity. These howitzers, which are currently being used by US and other ISAF troops in Afghanistan, will certainly be useful in supporting Special Forces in operations in "out-of area contingencies''.

The actual contract for the howitzers, which are manufactured by BAE Systems (who took over the erstwhile Bofors), will follow after requisite approvals from the Finance and Defence Ministries and finally the Cabinet Committee on Security.

US-India discussions on Raytheon Javelin anti-tank missiles

The US Assistant Secretary of State in the Department of political military affairs, Andrew Shapiro met with Senior Government of India officials on 15 April to discuss various issues, including transfer of knowhow needed for licence building the FGM-148 Javelin anti-tank missile in India. The Javelin contract, potentially a billion-dollar (Rs 5,000 crore) one for US companies, Raytheon and Lockheed Martin, has to be cleared by Shapiro's office.

"In clearing any transfer of high technology like the Javelin, Shapiro's primary consideration is strategic: would technologically enabling India enhance long-term US strategic

interests, without threatening America's lead in military technology"? Pressure from US senators and representatives complicates Shapiro's decision-making but US legislators are reportedly willing to back technology transfer to India, "if that is what it takes to get orders from the world's biggest buyer of foreign weaponry".

Exercise 'Bold Kurukshetra'

The Singapore Armed Forces (SAF) and Indian Army (IA) conducted their eighth bilateral exercise *Bold Kurukshetra* at Babina, in Central India during March 2012. More than 750 soldiers from the SAF and the IA participated in the exercise, executing joint planning, training as well as integrated manoeuvres which included live firing of infantry combat

vehicles, tanks and mortars. Singapore's Chief of General Staff and Head of the SAF Armoured Force witnessed the live firing and interacted with troops during the exercise.

Exercise *Bold Kurukshetra* is held annually which underscores the growing defence relationship between Singapore and India. Apart from joint exercises, the IA and SAF also interact regularly through visits, courses, seminars and other professional exchanges. India-Singapore relations are multifaceted and have historical linkages. Exercise *Bold Kurukshetra* will "further cement the defence relationship and add impetus to the ongoing defence cooperation. Maintenance of enhanced military-to-military contacts is mutually beneficial to the strategic interests of both the countries."

Naval Commanders Conference 2012

The Naval Commander's Conference 2012 was conducted at New Delhi 8-10 May 2012 inaugurated by Defence Minister AK Antony who complimented the Indian Navy "on its all round performance". The Naval Commander's discussed several important issues, including operational readiness, coastal security, infrastructure development, information & cyber security as also foreign cooperation initiatives.

The necessity for the Indian Navy to incorporate quantum enhancement in technology, ranging from nuclear propulsion to advanced weapon platforms and networked systems, was highlighted by the CNS, especially the recent induction of INS *Chakra* (*see special article in this Issue*), impending arrival of the aircraft carrier, INS *Vikramaditya* and first of the P-8I Long Range Maritime Patrol aircraft.

The CNS expressed satisfaction at the modernisation and capability enhancement of the Indian Navy, which was proceeding as per the 'Maritime Capability Perspective Plan'. The CNS highlighted the fact that 4-5 major warships and submarines were likely to be commissioned every year over the next five years and that Naval Aviation was poised for major growth in the years ahead. Considering the ongoing expansion programme of the Indian Navy, a new 'Safety Organisation' to enhance safe operations of ships, submarines and aircraft was also discussed.

Nine MRMR aircraft for Indian Navy

Formal approval has been given for the acquisition of nine medium-range maritime reconnaissance (MRMR) aircraft for the Indian Navy. On 20 February the Defence Acquisitions Council approved the acquisition for aircraft "to be operated in the maritime patrol, anti-submarine and anti-surface warfare roles."

The mandatory Request for Information (RFI) for the MRMR had been sent out a year back to Airbus (A319), Alenia Aeronautics (ATR72MP), Boeing (P-8), Bombardier (Dash 8-Q400), Dassault (Falcon 900MPA), EADS CASA (C295MPA), Embraer (EMB-145MP), Lockheed Martin (C-130) and Saab (Saab 2000). After evaluating their responses, the Navy will be inviting proposals from selected companies (the shortlist has not been officially revealed).

The aircraft will form part of Indian Navy's three-tier maritime surveillance grid, the outermost layer of which will be covered by the LRMP Boeing P-81 Poseidons on order, the mid-layer patrolled by the MRMR aircraft, whilst the closest to shore areas will be covered by Dornier 228s and unmanned air vehicles such as the Israeli Heron and Searcher II.

INS 'Teg' Inducted

The latest warship to be inducted by the Indian Navy is INS *Teg* (F45), built at Yantar shipyard in Kaliningrad Russia, which was handed over on 27 April 2012. Named after the single-edged curved sabre traditionally wielded by Sikh warriors, INS *Teg* is the first of three guided missile frigates commissioned as a follow-on order to three *Talwar*-class frigates (*Talwar, Trishul* and *Tabar*) already in service with the Indian Navy. The *Teg*, along with her sister sister ships INS *Tarkash* and INS *Trikand*, is modified from the earlier ships of the class, most significantly with the inclusion of the Indo-Russian BrahMos supersonic cruise missile, carried in a bank of 8 vertical-launch cells. The *Talwar*-class itself is derived from the Russian *Krivak-III* design, with certain modifications required by the Indian Navy.

Sea trials of the INS *Teg* were conducted in the Baltic Sea between 5 March and 7 April with all on-board systems on INS *Teg* including armament tested in presence of Indian Navy officers. India's order for the three new *Talwar*-class ships had been placed with Russia in 2006 for $1.6 billion, and INS *Teg* is the first of these three to be commissioned. INS *Tarkash* and INS *Trikand* are at various stages of construction and are expected to be commissioned within the next two years.

Aircraft Carrier 'Admiral Gorshkov' on sea trials

Sea trials of the aircraft carrier *Admiral Gorshkov* were to begin on 25 May. The 44,000-tonne carrier, which is being completely retrofitted for the Indian Navy, will first sail to the White Sea and then on to the Barents Sea. "After the sea trials are done, we plan to hand over the carrier to India by 4 December, 2012" according to a spokesman of the Sevmash Shipyard.

The *Admiral Gorshkov's* main power generators are being tested and finishing touches given to the crew living quarters : "the crew training was completed in March". To be commissioned as the INS *Vikramaditya*, this Project 1143.4 class aircraft carrier was sold to India in 2004 but the delivery has been protracted because of differences over its escalating costs.

During his visit to India in March 2010, Russian Prime Minister Vladimir Putin had signed a supplementary agreement,

amending the cost of reconstruction and modernisation of the aircraft carrier. Accordingly, the contract is now estimated at $2.33 billion. With a service life of 30 years, the carrier is equipped with STOBAR (short take-off but arrested recovery), a system used by Russian carrier-borne aircraft for take-offs and landings from the decks of aircraft carriers.

Maiden flight of LCA Navy (NP-1)

LCA Navy NP1 made its maiden flight on 27 April 2012 (*see detailed report in this Issue*) prior to which it had completed its Ground Vibration Test (GVT), Structural Coupling Test (SCT) and extensive system integration tests with the powerplant. The aircraft carried out five engine ground runs (EGR) for the entire operating envelope successfully. NP-1 had also undergone five low speed taxi trials (LSTT) and two high speed taxi trials (HSTT) at Bangalore HAL airport and reached a ground speed of about 220 kmph.

Along with Hindustan Aeronautics Ltd (HAL) who are principal partners with Aeronautical Development Agency (ADA) there has been direct association with more than 100 agencies ranging from the Air Force and Navy, DRDO, CEMILAC, DGAQA, CSIR, PSUs, Private/Industrial Sector to academia,

PS Subramanyam, Director LCA at ADA hands over LCA Navy model to Rear Admiral Devinder Sudan, ACNS (Air) at Naval Head Quarters.

spread all over India. The key responsibility of LCA Navy design, build, integration and testing is with various Divisions of HAL. ADE has played a lead role in Design and Development of the Integrated Flight Control System in unison with NAL Bangalore for testing and integration of Flight Control Laws to ensure safe functionalities for various phases of flight.

Meanwhile ADA has established a world class Telemetry and Monitoring facility at the National Flight Test Centre (NFTC) within HAL Airport to enable conduct of flight test activities at Bangalore. Intuitive on-line monitoring and control of the aircraft are carried out by the Test Director and various System designers. To facilitate proving the aircraft for carrier borne applications, a Shore Based Test Facility (SBTF) is being established at the Naval Air Station, Goa replicating an aircraft carrier with a ski-jump for launch and arresting gear for deck recovery. The take off area is ready, with landing readiness scheduled for end of 2012, "as per schedule".

Third Indian Navy UAV squadron

Stepping up surveillance and reconnaissance in the Gulf of Mannar, Palk Straits and the Palk Bay, the Indian Navy has deployed a third Unmanned Aerial Vehicle (UAV) Squadron, this time in Tamil Nadu. INAS 344 will be operated from INS *Parundu*, the naval air station in Uchipuli, Tamil Nadu.

INAS 344 was commissioned on 11 April 2012 and according to Captain AB Bellary, Commanding Officer, INS *Parundu*, INAS 344 would comprise four Israeli-built Searcher and Heron UAVs, and manned by 12 officers and 50 sailors. Infrastructure for the operation of the UAV squadron has been created and the commissioning done by Vice Admiral Anil Chopra, FOC-in-C Eastern Naval Command on 11 April 2012. The UAVs in the new squadron "will transmit real time pictures of maritime targets thus greatly enhance surveillance in the region."

The two earlier UAV squadrons INAS 342 as 343 are based at Kochi in Kerala and Porbandar in Gujarat, the latter being established in January 2011, which also comprises two each Israeli-made Searcher and Heron UAVs. This unit carries at coastal surveillance in the Arabian Sea along the coast of Gujarat.

INS 'Dweeprakshak' commissioned at Kavaratti

INS *Dweeprakshak*, the newest Naval Base of the Indian Navy was commissioned at Kavaratti in the Lakshadweep archipelago on 30 April by Vice Admiral KN Sushil, FOC-in-C Southern Naval Command. The event marked an important mile stone in the Navy's resolve to incrementally augment the security infrastructure at the strategically important Lakshadweep Islands.

Vice Admiral KN Sushil unveiling the commissioning plaque. Captain SM Hanchinal the first Commanding Officer is on his left.

"Lakshadweep islands form the maritime frontiers of our country on the Western side" Vice Admiral KN Sushil noted and that the commissioning of a full fledged Naval Base was "another milestone in the commitment of the Indian Navy to maintain effective coastal surveillance and defence capability." The Admiral also complimented the crew of the INS *Dweeprakshak* and exhorted them to do their utmost in the discharge of their responsibilities. He also informed the gathering that radar stations and other surveillance measures were in place for shipping traffic monitoring and intelligence gathering.

Coast Guard Station 'Androth' commissioned

Indian Coast Guard Station *Androth*, the third Coast Guard Station in the Lakshadweep and Minicoy islands, was recently commissioned by VAdm KN Sushil, FOC-in-C Southern Naval Command. The station is part of ongoing efforts by the Coast Guard to "strengthen coastal security in the island territories, and would be monitoring sea-lanes of communication passing close to the islands, undertake surveillance in the Indian Exclusive Economic Zone (EEZ), and also prevent maritime crimes such as piracy and poaching of maritime resources."

The Coast Guard already operates two stations in the strategically important islands at Kavaratti and Minicoy. A District Headquarters was also commissioned at Kavaratti on 10 December by Defence Minister AK Antony, as part of a comprehensive security review undertaken post-26/11. Additionally, the Coast Guard is also in the process of setting up a chain of static sensors with Automatic Identification System along the entire coastline of the country to enable effective monitoring of shipping and fishing traffic. A Coast Guard Air Station at Minicoy is also planned.

Navy to issue "massive tender" for helicopters

Expanding its size and scope of operations, the Indian Navy is to issue one of the world's largest tenders for naval multirole helicopters (NMRH) with the intention of procuring more than 75 such helicopters to be worth over $ 4 billion. The Navy recently asked global helicopter vendors to provide details about naval multirole helicopters and is planning to shortly issue a global Request for Proposal (RFP) in this regard.

The Navy needs these new NMRHs for anti-submarine warfare, Special Forces' operations and anti-surface warfare. The Indian Navy is currently in the process of procuring 16 multirole helicopters for which the European NH-90 and American Sikorsky S-70 'Bravo' are short listed to replace the present fleet of Sea King helicopters which were inducted in two different phases 3 decades back.

IONS 2012 at South Africa

The IONS Symposium 2012 was held at Cape Town, South Africa in April 2012, the Indian Navy represented by Admiral Nirmal Verma, Chief of the Naval Staff. On first day of the conference, the CNS chaired the panel discussion, the theme for which was 'Indian Ocean–Centre Stage for the 21st Century'. Admiral Verma, highlighted contributions being made by the Indian Navy in addressing issues of collective maritime security including anti-piracy operations. He also stressed the necessity for IONS to formulate a set of deliverables such as Standard Operating Procedures on issues related to maritime security that would make it easier for member nations to come together in times of a crisis.

Jet Airways, CFM celebrate 3 million flight hours

Jet Airways and CFM International have celebrated the achievement of 3 million total engine flight hours by the airline's fleet powered by CFM56-7B engines. Jet Airways began operation in May 1993 with four CFM56-3-powered Boeing 737s. Since then, Jet Airways has carried more than 136 million passengers and is today, one of the most respected airlines in the world and the largest private domestic carrier in India. Jet Airway's fleet includes 59 Next-Generation 737-700/-800/-900 aircraft powered by CFM56-7B engines. "Jet Airways is an impressive airline," said Jean-Paul Ebanga, President and CEO of CFM International. "We are honoured that they have chosen CFM to be such an important part of their operations and we extend our warmest congratulations to everyone at Jet Airways on a job extremely well done," he added.

Meanwhile, GE Capital Aviation Services Limited (GECAS), the commercial aircraft leasing and financing unit of GE, delivered a Boeing 737-900ER aircraft to Jet Airways in early May to expand the airline's fleet.

$1 bn overseas borrowing for airline industry

India's debt-laden airlines would be allowed to borrow up to $1 billion from overseas to meet their working capital requirements, according to a Finance Ministry spokesman. The move will enable Indian carriers, which are likely to post a record loss of $2.5 billion in 2011-12, to get lower interest loans and so provide an additional source of low-cost capital to the airline industry to help it tide over their current financial crunch.

The Finance Minister Pranab Mukherjee had proposed the move to permit external commercial borrowing (ECB) in his budget speech. "In order to increase access to ECBs, the Reserve Bank of India would consider relaxation in the average maturity period for ECBs above $20 million from five to three years. The ECBs made under this provision would have a maximum ceiling of $1 billion for the entire civil aviation sector. The limit for individual airline companies would be $300 million. This limit can be availed either in a lump sum or in tranches depending upon the utilisation of the limit during the one year when the facility is available," the Minister said.

$30 billion to be invested in airports

The Government's investment in the airport sector is likely to go up from $10 billion during the 10th and 11th Five-Year Plans to $30 billion over the next decade. "The airports developed on public-private-partnership (PPP) handle around 60 per cent of passenger traffic in the country. The Government has planned to invest $30 billion in the next 10 years," according to Dr Syed Nasim Ahmad Zaidi, Civil Aviation Secretary. "While the first phase of airport modernisation and development plan focused on better connectivity to the metro cities, in the second phase the focus would be on connecting metros to tier-II and tier-III cities. At present, there are 127 airports in the country. Out of these, six metro airports are handling 70 per cent of the traffic which leads to congestion, delays and wastage of precious jet fuel which also leads to high pollution".

Dr. Nasim Zaidi.

Sikorsky S-92 'Legacy of Heroes' in New Delhi

Sikorsky Aircraft's S-92 *Legacy of Heroes* (LOH) demonstration helicopter visited New Delhi on 10 April, "hosting customers and recognising local heroes while at Delhi International airport." Visitors to the Sikorsky S-92 *Legacy One* helicopter had the chance to experience it, interact with the pilots and crew, and sign a portion of the aircraft, thus becoming part of an interactive "postcard" to the world (*Vayu* editors are part of this). The tour is on an extended visit in India, with visits to Mumbai as well.

"Sikorsky helicopters have been operating in India for some time; in fact, the first helicopter inducted into the Indian Air Force in 1954 was a Sikorsky (S-55). When search-and-rescue crews across the world need the ultimate in flexibility and performance, they turn to the Sikorsky S-92 helicopter, and when Sikorsky needed the best facility to build cabins for the S-92, we turned to India," said Air Vice Marshal (Retd) Arvind Walia, Executive Vice President, India & South Asia, Sikorsky.

Airbus and CAE simulator for second pilot training centre

Airbus has signed an agreement with CAE Simulator Training in Hyderabad to set up a second Indian pilot and maintenance crew training centre. The centre will be located in Noida near New Delhi. CAE Simulator Training is a joint venture between InterGlobe and Canada's flight simulator company CAE, the agreement following a ceremony in Noida in November 2011. The centre will be fully operational by 2013, and will have a capacity to train up to 5,000 crews annually, making it one of the biggest training facilities of its type in the region.

At Noida is the second Indian pilot training facility in addition to the Airbus Training India (ATI) centre which was opened in Bangalore in 2007. The new facility will be spread over a 3.5 acre site and initially house up to six full-flight simulators with a capability to expand to eight simulator bays. Advanced training technology will be used such as CAE Simfinity multimedia classrooms, computer-based training and brief/debrief facilities.

Camille Mariamo, Managing Director Commercial Training & Simulation, Middle East & India Region, CAE (on left) with Dr Kiran Rao, Airbus Executive Vice-President Sales and President, Airbus India.

Dr. Kiran Rao, Airbus Executive Vice-President, Sales and President Airbus India, stated that "India remains one of the fastest-growing aviation markets in the world and in the long-term requires more aircraft and additional pilots and maintenance crews to fly them. India is a strategically important market and a strategic partnership like the new training centre will help India's aviation sector to grow and to prosper."

GoAir "keen" to fly global routes

Domestic airline GoAir "is not averse" to expanding its operations to international routes, subject to revision of certain eligibility norms, even while retaining its focus on growing services in the country. "I might apply with a request for a revision in the norms," said Giorgio De Roni,

Chief Executive Officer, Go Airlines (India), referring to the Government stipulation that domestic carriers could go abroad only if they have a minimum of 20 aircraft. Some foreign airlines with less than 20 aircraft, he added, were however allowed such operations. While stating that GoAir respected the regulatory framework, he said the Government stood to gain by permitting the domestic carriers to operate on international routes as the move would "bring more foreign tourists, foreign exchange and have a positive impact on allied businesses."

Air India's Boeing 787s to be powered by GE's GEnx engines

Air India's 27 Boeing 787 Dreamliners on order will be powered by GE's GEnx engines, under a GE Branded Services Agreement is which GE Aviation will provide technical upport as Air India offers maintenance, repair and overhaul services for GEnx-1B engine and further advances its plans to become a global MRO service provider. Air India will be licensed to perform maintenance and overhaul work on the GEnx-1B engine and provide other GEnx customers with MRO services. Air India has been overhauling jet engines for more than four decades, during which time, the carrier has handled various jet engine models and acquired expertise in overhauling jet engines at low cost while maintaining high standards of quality. The new facility will cater to the Boeing 777 and 787 wide body fleet of Air India, as well as conduct third party work for customers situated all across the globe. Air India is also the launch customer for the GEnx TRUEngines programme, which means the carrier will follow GE-issued engine manuals, services bulletins and other maintenance recommendations.

Eurocopter AS350 B3e, EC135 and EC155 sales in India

Eurocopter India, a subsidiary of Eurocopter, has made its first sales for 2012 in India. Comprising light and medium class helicopters, the bookings included an AS350 B3e, an EC135 and an EC155. Four out of five units delivered in 2011 in India were Eurocopter's AS350 B3, whose stronghold in the single-engine helicopter market looks set to continue its dominance, with its first booking of 2012 being another AS350 B3e sold to G.R. Constructions for business aviation use. Eurocopter India has also signed agreements with two undisclosed customers for an EC135 and an EC155, both of which will also be used for corporate travel.

The EC155 can sent 9 passengers

"Business aviation is one of the key segments that is driving the growth of the helicopter market in India," noted Eurocopter India CEO, Xavier Hay. "These bookings mark a good start to the year. We will continue to work on developing other segments as well, such as emergency medical services, law enforcement, utility and aerial work".

Embraer's Legacy 650 certified in India

Embraer's large-sized Legacy 650 Executive Jet has received type certification from the Directorate General of Civil Aviation in India. "The Legacy 650 at Aviation at Hyderabad was a significant event since it is the sixth Embraer Executive Jet model to gain Indian certification," said José Eduardo Costas, Vice-President, Marketing and Sales, Asia Pacific. "The 2012 version of the Legacy 650 maked its debut in Hyderabad while on the first leg of its worldwide demonstration tour which began in March 2012. Launched in 2009, the Legacy 650 is the latest executive jet offered by Embraer. All of Embraer's Executive Jets in production today - the entry-level Phenom 100, light Phenom 300, super-mid-size Legacy 600, large Legacy 650 and ultra-large Lineage 1000 - are now certified in India," he added.

CAE to install an ATR FFS in India

CAE will install an ATR 42/ATR 72 full-flight simulator (FFS) at its commercial aviation training centre in Bengaluru, to be ready for training in the summer of 2012. "This new ATR training capability further extends CAE's broad and deep commitment to the aviation community in India and the region," said Jeff Roberts, CAE's Group President, Civil Simulation Products, Training and Services. "Positioning this resource close to our ATR customers' base of operations will enable them to be more efficient while continuing to train the pilot skills and decision-making that enhances safety and effectiveness," he added.

CAE will relocate the ATR 42/72 FFS from its training centre in Brussels (Belgium), which is modeled for the ATR72-500 and ATR42-300 configurations. The CAE training centre in Bengaluru is the first independent training centre to earn approval as a fixed-wing Type Rating Training Organisation (TRTO) by the Directorate General of Civil Aviation (DCGA). The centre also offers instructor-led 'wet' and 'dry' training for the Airbus A320 series and Boeing 737 aircraft.

Meanwhile, CAE has sold two CAE 5000 Series A320 FFSs with third-generation CAE Tropos-6000 visual systems and an APT for installation at the joint venture of InterGlobe Enterprises and CAE. The FFSs and the APT will be ready for training by the end of 2012 at the new training centre in the National Capital Region.

New Aviation Bill to replace obsolete Aircraft Act of 1934

Given the rapid growth and changes in the aviation sector, the Government is preparing a draft legislation to replace the Aircraft Act which was framed in 1934, according to Civil Aviation Ministry officials. "The existing legislation was formed in 1934 and is aircraft-centric. The aviation scenario has changed and moved beyond aircraft to include airports, safety and security. The proposed legislation would be made aviation-centric".

The draft Bill is nearing completion and shall be shortly circulated for consultations. The legislation would also include economic, safety and security regulation, apart from passenger safety, grievance redressal and issues related to compensation. "The Directorate General of Civil Aviation or the proposed new super regulator would draw their powers from the proposed Bill once it becomes an Act," the official added. The proposed legislation, called the Civil Aviation Bill, would seek to plug gaps arising out of exponential growth in the sector. The existing legislation does not have provision for aircraft procurement models such as sale and leaseback or the air navigation systems. From 49 million passengers flown in 2003-04, the number has nearly trebled to 143 million during 2010-11. In the meantime, four of the country's biggest airports have been privatised.

Beleaguered AI to get Rs 30,000 crore boost—but pilots go on strike

On 13 April 2012 (Baisakhi day), the beleaguered national carrier Air India received a fresh lease of life in the form of additional infusion of Rs 30,000, crore in tranches till 2020 and clearance on induction of 27 Boeing 787 Dreamliners. Apart from approving the long-pending Turn Around Plan (TAP) and Financial Restructuring Plan (FRP) for the Government-owned carrier, the Cabinet also decided to formally hive off Air India's MRO (Maintenance, Repair and Overhaul) business and Engineering Services as two wholly-owned subsidiaries to unburden the cash-strapped carrier of excess staff.

The release of various tranches of equity will, however, be subject to achievement of various laid-down milestones stressed, Civil Aviation Minister Ajit Singh. For example, a couple of set targets for Air India include upscaling on-time performance from the current 71 per cent to 90 per cent, passenger load factor of about 73 per cent and improving yields.

DRDO plan new technology areas

"The exponential growth in technological capability of the country in vital areas of Defence, Atomic Energy and Space during the last decade has provided a strategic edge to the country and helped to boost its image", stated Dr VK Saraswat, SA to RM, Secretary Def R&D and DG DRDO while delivering the National Technology Day Oration in New Delhi.

Dr VK Saraswat, SA to RM, Secretary Def R&D and DG DRDO

Emphasising the need to develop green, sustainable technologies, he said that "the aim of all technological progress had been to improve the quality of life and instill a sense of confidence in people. Earlier, technology was driving the way wars were fought but in future, security needs of the country will drive technology" he added, giving examples of emerging threats like cyber warfare and insurgency. "Low Intensity Conflicts that involve dealing with our own brothers and sisters necessitate development of suitable technologies that are non-lethal".

Speaking on future technology areas, he said that surveillance systems like mini and micro Unmanned Aerial Vehicles (UAVs), intelligent systems like swarms of robots, etc were needed to be developed. There will be more and more convergence of bio, nano and information technologies, he added. While lauding the efforts of DRDO scientists and technologists for many recent successes like the successful flights of Interceptor Missile, Agni 4, Agni 5 and LCA Navy, he also charted out the future road map for the organisation. He said there are many emerging areas that need to be mastered such as hypersonic technology, stealth and anti-stealth technologies, underwater communication technology, polymer electronics, quantum computing, robotics and allied technologies to develop unmanned fighting vehicles. The work on many of these technologies was already going on in DRDO. Talking about self-reliance, Dr Saraswat said "self-reliance means independence from controls".

Rustom-2 UAV test flights

The Aeronautical Development Establishment (ADE) have disclosed that maiden test flight of the indigenously developed UAV Rustom-2 would take place in February 2014. "The Rustom-2 UAV will be comparable to the American 'Predator' drone, with its state-of-the-art capabilities". Rustom-2 weighs 1.8 tonnes and will have a capacity payload of 350 kg, a wing span of 21 metres and an endurance of more than 24 hours. Rustom UAVs could be deployed for military missions including reconnaissance and surveillance, target acquisition, target designation, communications relay, battle damage assessment and signal intelligence. Regarding the indigenous content of the Rustom drone, ADE have stated that all parts, except for cameras and sensors, have been developed in-country, thus saving about 40 per cent of cost.

DRDO spokesmen have also indicated that solar-powered Unmanned Air Vehicles (UAVs) and VTOL UAVs will be key future developments. The solar-powered UAVs will have high-endurance and operate at altitudes up to 30,000 ft. Ship-borne vertical take-off and landing UAVs, would be employed for reconnaissance on the high seas. DRDO also plans to develop stealth technology for its UAVs and combat drones in future.

14th flight of Rustom-1

Meanwhile, the Rustom-1 made its 14th successful flight on 8 April at Kolar reaching an altitude of 11,500 ft and speed of above 140 kmph during in 130 minutes of flight. PS Krishnan, Director ADE stated that "the flight was successful in view of all the parameters achieved by the UAV, which weighed around 690 kg."

Highlights of the flight were the use of lean mixture control system in the engine for flights at high altitudes; increased take-off weight, max altitude of 11,500 ft. and an extended range of about 50 kms. "The waypoint track was perfect and so were take-off and landing etc. This UAV has the potential to carry out military missions like reconnaissance and surveillance, target acquisition, target designation, communications relay, battle damage assessment and signal intelligence. This UAV can attain a maximum altitude of 22000 ft and endurance of 12-15 hours with an operating range of 250 kms when fully developed" said PS Krishnan.

Maiden flight of second CABS AEW&C aircraft

Maiden flight of the second aircraft for the indigenously-developed Indian Airborne Early Warning and Control System (AEW&C) took place on 4 April 2012 at San Jose dos Campos in Brazil. The necessary mission systems and components including dummy AAAU (Active Antena Array Unit) are installed onboard an Embraer EMB 145I aircraft, which marks an important milestone in the AEW&C programme as this aircraft will be delivered in June 2012 to India. The other mission systems will then be integrated on to the aircraft with mission system flight trials likely to commence from November 2012.

DRDO to build 'reusable missiles'

After successful launch of the Agni V ICBM, the DRDO plan to develop reusable rockets "which will combine the technologies of both ballistic and cruise missiles". As part of plans to develop reusable ballistic missiles, the Defence Research and Development Organisation will test the indigenously developed scram jet engine next year, as per Dr V K Saraswat. "We have propulsion technology, re-entry technologies, we have the technology which can take a re-entry system which will deliver a payload and have yet another re-entry system which will bring the missile back when it re-enters the atmosphere on its return journey," he said.

"We have demonstrated the performance of a scramjet engine operating at Mach six speed," he said. On the maximum range of the Agni V, the DRDO chief said that with moderate modifications, "it can be extended to any range which is of our interest".

ISRO launches Risat-1 satellite

On 26 April, ISRO successfully launched into orbit a microwave Radar Imaging Satellite (Risat-1) from the spaceport in Andhra Pradesh. At exactly 0547 hrs, the Polar Satellite Launch Vehicle C19 (PSLV-C19) at 44.5 metres height and weighing 321 tons, lifted off ferrying the 1,858 kg Risat-1 after unshackling itself from launch pad No.1. The ISRO-made Risat-1 is the heaviest payload so far launched by a PSLV since 1993. At around 17 minutes into the flight, PSLV-C19 delivered Risat-1 into a polar circular orbit at an altitude of 480 km and an orbital inclination of 97.552 degrees.

The rocket that launched Risat-1 in to space is ISRO's four stage PSLV's upgraded variant called PSLV-XL. The letters XL stand for 'extra large' as the six strap-on motors below can carry 12 tonnes of solid fuel as against the base version that has a fuel capacity of nine tonnes. The PSLV's four stages are fuelled with solid and liquid propellants. The first and third stages are fuelled by solid fuel while the second and fourth stages are powered by liquid fuel (see also '*Women Space Scientists'* in this Issue).

The indigenous Risat-1, with a life span of five years, would be used for disaster prediction and agriculture forestry and the high resolution pictures and microwave imaging could also be used for defence purposes as it can penetrate through clouds and fog.

Indian Rotorcraft's helicopter production facility in Hyderabad

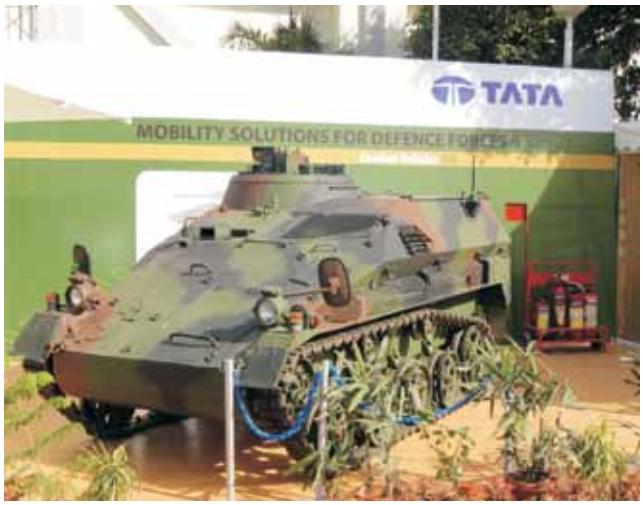
A ground breaking ceremony was held recently by Indian Rotorcraft at Hyderabad's International Airport, marking the start of construction of a new helicopter production facility, this in the presence of Ratan N Tata, Chairman, Tata Sons, Bruno Spagnolini, CEO, AgustaWestland and other dignitaries. Indian Rotorcraft is a joint venture company formed by Tata Sons and AgustaWestland, a Finmeccanica company that will assemble, customise and flight test new helicopters for the world market. The joint venture will initially start to produce the 8-seat AW119Ke light helicopter, with production commencing from mid-2013.

As Mr. Ratan Tata said "The project is integral to our plans in the aerospace sector and we look forward to an enduring and successful partnership with AgustaWestland for fostering growth of the Indian aerospace sector." Bruno Spagnolini added, "We are very pleased through our joint venture with Tata Sons to be playing an important role in development of the Indian aerospace industry. Not only will this new facility be able to build helicopters for the Indian market but it will supply helicopters to AgustaWestland customers around the world."

The facility is being built on a 10 acre (40,000 m2) site adjacent to the Hyderabad International Airport and will include a 9,000 m2 (97,000 ft2) building incorporating a main assembly building, flight hangar, office accommodation and several helicopter landing pads. The facility will be capable of producing up to 30 helicopters per year and is designed to be further developed for other helicopter types, right up to the 16-tonne AW101.

Tata Motors to develop FICVs

Tata Motors is considering investing about Rs 600 crore to develop and build Futuristic Infantry Combat Vehicles (FICVs) for the Indian Army. "The development cost of FICVs could be about Rs 300 crore and a manufacturing plant for the same could be about Rs 250 crore or above," said Ravi Pisharody, President (commercial vehicle business unit). He, however, added that the setting up of the plant would depend on the company getting orders from the Government. Apart from Tata Motors, Larsen & Toubro (L&T), Mahindra Defence and OFB are in the competition for an order for 2,000 FICVs to the defence forces.



The process is at the request for information (RFI) stage and the companies are yet to receive request for proposals (RFPs).

Tata Motors, with an order book of Rs 250-300 crore, is also working on landmine-protected vehicles to states including Maharashtra and Jharkhand. The firm is in the exploratory stage of entering the Middle East market for its defence vehicles. At present, it exports products to Sri Lanka, Nepal, Some African nations and the US agencies in Afghanistan.

Tata Motors agreement with DEFTECH

Tata Motors and DRB-HICOM Defence Technologies Sdn Bhd (DEFTECH), a subsidiary of DRB-HICOM Berhad, Malaysia, have signed a Cooperation Agreement to enable both DEFTECH and Tata Motors to develop, promote and market Tata Motors high mobility 4x4 trucks with payloads ranging from 2.5 tonnes to 5.0 tonnes, for the Armed forces of Malaysia. In the initial stage, DEFTECH will be working on two of Tata Motors models, LPTA 715 and LPTA 1623. These vehicles are suitable in various configurations including as troop carrier, command post, ambulance, reconnaissance missions, as an armoured carrier communication shelter and others.

With Tata Motors' expanded portfolio in multi-axle range like 12x12, 8x8 & 6x6, the company has started supplying to leading Missile OEMs across the world and has also established itself as a supplier of specialist vehicles for UN peacekeeping missions.

GD UK and Tandon Group partnership

General Dynamics UK has signed a teaming agreement with the Tandon Group to jointly pursue opportunities in the security and defence markets in India. Together, the companies will deliver indigenous systems integration capability which new relationship builds on General Dynamics UK's existing track-record of partnering with Indian companies to meet Indian requirements. Through a partnership with Hindustan Aeronautics Limited for example, General Dynamics UK supports the Indian Air Force's Hawk aircraft fleet in an effort that includes substantial transfer of intellectual property.

DHS Systems links with Bharat Electronics

Mr. Andrew Cowling, Managing Director, DHS Systems International.

DHS Systems International, the world's third-largest deployable shelter manufacturer, has signed a long-term arrangement with Bharat Electronics Limited, Navi Mumbai unit, and has already supplied 24 shelters to BEL for use by the Indian Army. The company aims to generate revenue of Rs 100 crore in the next three years from the defence and healthcare sector in India and also put up a manufacturing facility by 2015. DHS has over 64 shelter models, some of which were displayed during Defexpo 2012, including the J shelter which is the biggest and measures 1,250 square feet.

Deployable Rapid Assembly Shelters (DRASH) can serve as fully functional hospitals, command posts, communications centres, battalion aid stations etc., in as less as 5 to 30 minutes (depending on the size). Under the agreement, DHS will also partner with BEL as a sub-contractor in bidding for tenders for supply of shelters to the defence forces. BEL will also provide logistical support to DHS by training armed forces in using the shelters, as well as maintaining and repairing these shelters.

DCNS India contract with SEC Industries on Scorpene equipment

DCNS India has signed a contract with SEC Industries worth Rs 310 crore for local manufacture of equipment for P75 Scorpene submarines. The contract covers manufacture of equipment like hull hatches, cofferdam doors, knuckle hoses, ballast vent valves, high pressure air cylinders, weapon handling and storage system. In the coming years, SEC will manufacture equipment under a transfer of technology (TOT) provided by DCNS India which will be progressively delivered to Mazagon Dock Limited (MDL), for integration onboard the P75 Scorpene submarines.

"The contract with SEC is part of the indigenisation programme implemented by DCNS India under the P75 Mazagon Purchased Materials (MPM) contracts. Through this will to manufacture in India, we are developing strong industrial partnerships and capabilities for the P75 and future programmes. Together with our partners, we are positioning ourselves for the long-term", declared Bernard Buisson, Managing Director of DCNS India.

The concerned equipment are highly specific because of physical constraints faced onboard the submarines. As for the recent deliveries from Flash Forge, the local production will follow DCNS' strict quality standards "to ensure the submarines optimal performances with maximum safety over the long-term."

AeroEuro Engineering India and Altair in partnership

AeroEuro Engineering India (a joint venture between PL Engineering and GECI India) and Altair Engineering, a provider of simulation, advanced computing and enterprise analytics solutions, have announced a MoU to jointly promote innovative technology-driven aerospace projects. The collaboration emphasises on delivering world-class aerospace related engineering services projects leveraging AeroEuro aerospace domain expertise and using Altair HyperWorks CAE/CFD software technology solutions and Altair ProductDesign's Aerospace domain expertise. The partnership will focus on providing new aerospace opportunities for India, GCC countries and ASEAN-based customers and the partnership will be effective initially for a period of one year.

Kalyani Group plans to develop 155mm howitzer

Bharat Forge, a Kalyani Group company, is planning to be the first private sector player to indigenously develop a towed gun artillery system to meet the Army's long-pending requirements. The firm has already committed Rs 100 crore towards development of these guns to be designed as per the armed forces' specifications of 155 mm/52 calibre artillery systems. The total investment to bring these into commercial production is expected to be in the range of $ 40 million. While Kalyani is confident of developing the guns over the next 18-24 months, the firm is hopeful that it will be allowed to 'compete on an equal footing.' Bharat Forge has been a supplier of various systems to the Indian Army for nearly 30 years.

Bell Helicopter new facility in India

John L. Garrison, President & CEO, Bell Helicopter

Bell Helicopter has opened a new office in New Delhi for its operations in India. "Bell Helicopter is investing in India. We believe there are tremendous growth opportunities in terms of sales and manufacturing. This is an important day for Bell Helicopter as we celebrate our continued commitment and partnership with our customers in India," said John L. Garrison, President & CEO, Bell Helicopter.

Bell Helicopter has had presence in India for nearly 20 years, opening a liaison office in 1995, and there currently are more than 100 Bell aircraft operating throughout India. There are two Bell Helicopter Customer Service Facilities in the region. Deccan Aviation, located in Bangalore, and Air Works, located in Mumbai.

Kishore Jayaraman is President of Rolls-Royce India

Rolls-Royce has appointed Kishore Jayaraman as President of Rolls-Royce in India and South Asia. He has earlier had a distinguished 23 year career with General Electric, latterly as CEO, GE Energy-India Region. Michael Shipster, Director International, Rolls-Royce stated "Kishore is an experienced industry professional with valuable knowledge and expertise. India is an important market for Rolls-Royce, with great potential built on a long and distinguished history across all of our business sectors. He takes over from Anil Shrikhande, whom we thank for his commitment and contribution during his time with Rolls-Royce in India. In appointing a leader with Kishore's experience in India we are reinforcing our commitment to this important region and I am very pleased to welcome him to Rolls-Royce."

Bombardier engineering service office in Bangalore

On 18 April, Bombardier Aerospace officially inaugurated its Engineering Service Office at Bangalore, which currently employs some 20 people. The new Engineering Service Office, which will house approximately 50 aerospace engineers by the end of 2013, will support Bombardier Aerospace's in-production and in-development aircraft programmes by providing assistance to both the company and the more than 400 engineers at its partners' offices in the areas of complex engineering structure design, advanced stress analysis and project management services.

Cassidian appoints Peter Gutsmiedl as first India CEO

Cassidian has appointed Peter Gutsmiedl as first Chief Executive Officer (CEO) of its India operations. Based in Bengaluru, the heart of India's aerospace and defence industry, he will lead the next phase of Cassidian's engagement with India. Before assuming this new position, Gutsmiedl gained 22 years of experience in various senior and Board level roles at Cassidian which is the security and defence company of EADS.

Commenting on the appointment, Bernd Wenzler, Chairman of the Supervisory Board of EADS DS India Ltd., said: "India is of utmost importance for us and we intend to create a long-lasting strategic partnership with this fast growing country. Appointing a top manager like Peter Gutsmiedl as first India CEO reflects our strong commitment to further deepen cooperation with this nation. His track record makes him the perfect choice to grow our business in close cooperation with Indian companies."

Welcoming his new responsibility, Gutsmiedl stated: "I am looking forward to my new task of plugging India firmly into Cassidian's global value chain. We have started to establish a deep industrial footprint here in collaboration with public and private Indian entities such as HAL, DRDO, Larsen & Toubro and others. Cassidian's Engineering Centre in Bengaluru provides an excellent base, both for delivering tailor-made equipment to local customers and for supporting our global initiatives from India."

Gutsmiedl has been very involved in the success of Cassidian programmes related to Eurofigher Typhoon, Tornado, F-18, F-4, A400M, AWACS, EuroHawk and several UAV programmes. Before his move to India, he was Head of Engineering at Cassidian Air Systems. He also served as Head of Programme Management for Strike Aircraft & Airborne Mission Systems.

L&T and Samsung-Techwin team for artillery programme

Larsen & Toubro Limited (L&T) and Samsung Techwin South Korea would be cooperating in the Indian Army's tracked self propelled artillery programme. A proposal to develop the 155mm/52 calibre tracked, self propelled artillery,with L&T as the lead partner,had been submitted last year to the Ministry of Defence. Samsung Techwin is the OEM for the Korean K9 Thunder self propelled howitzer, "which is the largest and most successful of the155mm/52 calibre self propelled artillery systems in the world today." A large number of K9 systems have been produced and are in service in S. Korea and other countries around the world.

M.V. Kotwal, Member of the Board, L&T and President, Heavy Engineering, with Hyunkwang Cho, Executive Vice President, Samsung's Defence Programme Division.

SELEX Galileo to support services and training for Indian Navy

SELEX Galileo has signed a contract with the Indian Navy to provide support and service solutions through to 2022 worth Euro 25m. The agreement will see SELEX Galileo supporting the avionics facility at the Centre for Avionics Repair and Software Development (CARES) at the Naval Aircraft Yard at Kochi. In addition to support, the deal will see the Company carry out a comprehensive update of the CARES facility to meet future test requirements.

"The CARES facility is seen as a benchmark repair facility within the Indian Navy, and we're proud to be behind this success" said Alastair Morrison, SVP Radar & Advanced Targeting for SELEX Galileo, adding "to carry out this new contract we'll be working with Indian suppliers to develop Test Programme Sets (TPS) for the upgrade and will be transferring technical expertise to Indian Navy personnel. It's all part of our strategy to partner with India in the long term." The contract follows on from SELEX Galileo's previous agreement with the Indian Navy which saw the Company supporting the CARES facility from its opening in 2001. Since then, the CARES facility has been expanded to provide support for a whole range of Indian Navy aircraft.

HAL ToT contract with Alkan

Alkan release Unit type 2037 has been selected by HAL for the ALH-WSI and all future armed helicopters being manufactured and designed by HAL. A Transfer Of Technology agreement has been signed to enable HAL to locally manufacture and overhaul the 2037 Release Unit.

As Alkan CEO Armand Carlier stated, "This agreement demonstrates the confidence placed in Alkan products and organisation. We are very proud of this long term partnership with HAL, I am personally following the management of such a project and believe this TOT is the first stone of a long future collaboration in India. We are happy to support the growth and expertise of the impressive Indian aerospace Industry".

ITT Exelis and Tatas alliance on 3rd Gen night vision devices

ITT Exelis and Tata Advanced Systems Limited have formed a strategic alliance to support Generation (Gen) 3 night vision requirements in India. Under a memorandum of understanding, Exelis and Tata Advanced Systems will partner to supply manufacturing capabilities in India, maintenance and life-cycle support for Gen 3 night vision products. To start with, Exelis will provide TASL with the latest Gen 3 night vision image intensifier tubes, kits and other materials required to build night vision devices in India, to expedite the delivery of the systems to customers in India. This will be followed by manufacture of high precision components and sub-assemblies of the devices by Tata Advanced Systems.

Vijay Malik, General Manager (Defence and Security) at TASL with Micheal Lee, Director of Contracts for night vision business at ITT Exelis.

BrahMos Block III successfully tested

On 28 March 2012, the BrahMos Block III version with advanced guidance algorithm was flight tested from the ITR Balasore. The missile flew through the designated 290 kms distance at Mach 2.8 and achieved "high precision with steep dive once again". The Network of telemetry stations and down range ships confirmed that the missile followed the pre designated flight path.

Dr. Shivathanu Pillai told *Vayu* that "it was a text book launch achieving 100% results". The flight was witnessed by senior officers from the Armed Forces. The CEO & MD BrahMos, along with S Som, Project Director, BrahMos and Rear Adm. S Mohapatra, Executive Director were present during the launch.

New Griffon 8000TD Hovercraft for ICG

Following a £34million contract to supply the Indian Coast Guard with twelve 8000TD hovercraft, the first of these was delivered to the Indian Coast Guard in Mumbai on 31 March 2012.

This contract is the largest order for UK hovercraft and provides some 3 years of work for the company, including

extensive training both in the UK and India, where their product support distributor MSC Mumbai will deliver a full spares/ maintenance programme.

"The 8000TD is a popular craft for Coast Guard operations, as it can be configured to carry passengers, vehicles and equipment for disaster relief or medical evacuation. At 21.3m in length and with a payload of 8 tonnes, it can reach speeds of 45 knots and is powered by two Iveco diesel engines".

Mahindra MoU with Rafael Advanced Defence Systems

Mahindra and Mahindra and Rafael Advanced Defence Systems signed a Memorandum of Understanding on 30 March 2012, leading to the formation of a JV in India to develop and manufacture products such as Anti Torpedo Defence Systems, Electronic Warfare Systems, Advanced Armouring Solutions and remotely operated weapon stations for Futuristic

Infantry Combat Vehicles (FICV). Importantly, the Foreign Investment Promotion Board (FIPB) has been approached for the creation of a 74:26 company.

Eurocopter EC725 offered to the Indian Coast Guard

Eurocopter has offered the Indian Coast Guard its twin-engine EC725 helicopter to fulfil the maritime patrol and search & rescue (SAR) tasks. Officials from Eurocopter believe that "with its all-weather capability, range, heavy-lift capacity and complete systems package, the EC725 delivers the combat search and rescue (CSAR) performance as required by India and also has full in-country product support from Eurocopter's Indian subsidiary".

Rainer Farid, VP Sales and Customer Relations South Asia, Eurocopter at their stand at Defexpo 2012.

The twin-engine EC725/EC225 rotary-wing aircraft family is in the 10-11 tonne weight category and features "high-performance navigation and mission systems including a unique digital four-axis autopilot that enables helicopters to land and take off safely especially in brown-out or white-out combat situations resulting in pilots having no visual reference". The EC725 is also "great for tactical transport" as it has a large cabin with seating for 25 persons. Till date, around 240 EC225s and EC725s have been ordered and Eurocopter is looking to increase the EC225/EC725 annual production rate by 60 percent over the next two years to meet market demand.

Saab and Pipavav to form CSEG

Saab and Pipavav will jointly form the *Combat System Engineering Group* (CSEG) in India, to analyse Combat System design and architecture and work closely with the design group of Pipavav to undertake modeling and simulation and prepare system integration requirements for naval ships constructed by Pipavav, starting with the NOPV, Naval Offshore Platform Vehicle programme. "This will ensure world

class design with risk reduction and ship deliveries on time and budget". The Indian Navy has a major shipbuilding and modernisation programme over the next decade which includes a major effort in system engineering of warships and submarines. "With Saab's worldwide experience, CSEG will fulfil this critical technology gap".

"This is an excellent start to our naval commitment in India and shows Saab is a responsible, high technology partner for the Indian Navy and Indian defence industry. Over time I see large business opportunities," said Gunilla Fransson, Head of Business Area Security and Defence Solutions of Saab.

Rossell India to form JV with CAE

Rossell India Limited have announced receipt of approval from the Indian Foreign Investment Promotion Board (FIPB) to form a joint venture company with CAE to provide synthetic training solutions for the Indian defence market. Rossell India Limited will hold 74 percent share of the joint venture company with CAE holding a 26 percent share.

The joint venture will focus primarily on providing training solutions for defence procurements where India is acquiring foreign platforms. The Indian MoD is seeking to further develop the indigenous capabilities of Indian industry and this joint venture company "will fully qualify to meet this objective under the Indian offset criteria for defence programmes".

Wipro and Saab offer Protection & Counter Measure Systems

Wipro, the global IT services company have signed a wide ranging agreement with Saab of Sweden to develop, manufacture and market latter's Land Electronic Defense Systems (LEDS), providing full spectrum protection countermeasures to cover passive and active responses in India. Under this agreement, Wipro and Saab will jointly pursue opportunities for these systems in India. "The agreement with Wipro is part of our endeavor to create a strong and enduring industrial production base for Saab," said Jan Widerstrom, Chairman, Saab India.

Data Patterns Group and SELEX Galileo in agreement

Announced on 30 March at Defexpo 2012, Data Patterns Group and SELEX Galileo, a Finmeccanica Company, have signed a 'Head of Terms' agreement with a view towards forming a Joint Venture (JV) later this year. The joint venture will be located in Chennai and focus on a broad range of defence electronic products and state-of-the-art technology developments.

"This joint venture will bring a technology value to India's growing defence programmes" S Rangarajan, CEO of Data Patterns Group told *Vayu*, adding "SELEX Galileo is a leading global player and we are happy and proud to form a joint venture with them. This synergy will strengthen our capabilities to address our defence requirements with today's technology solutions."

Fabrizio Giulianini, CEO of SELEX Galileo reiterated that "this Joint Venture will establish a centre of excellence for key technologies in the defence electronics sector. It is a truly value adding JV on both sides and will create an effective partnership that will foster and sustain the long term prospects of both companies."

BEL in MoU with DEAL

Bharat Electronics Limited (BEL) have signed an MoU with Defence Electronics Applications Laboratory (DEAL), Dehra Dun. The MoU was signed by I V Sarma, Director (R&D) BEL and R C Agarwal, Director, DEAL.

Anil Kumar, CMD BEL with Dr. V K Saraswat before signing of the MoU between BEL and DEAL.

The MoU is for "development of Indian Automatic Identification System (IAIS) for coastal security, one of the Satellite Data Terminals which will be jointly developed by DEAL and BEL. IAIS will be used for Satellite-based data communication in secure mode."

N Suresh, General Manager BEL-Panchkula, said that the Panchkula Unit of BEL will manufacture the Satellite Data Terminals for INSAT3C and future satellites like GSAT6, GSAT7 and HUB baseband services.

Indo-Russian PAK-FA/ FGFA 5th generation combat jet for induction in 2019.

The Indian Armed Forces Long-Term Integrated Perspective Plan (2012-2027)

As reported in *Vayu's Daily* of 29 March 2012, released on the first day of Defexpo 2012, the CIDS (Vice Admiral Shekhar Sinha) had said that "the role of the private sector is slated to grow in the Defence sector according to the *Armed Forces Long-term Integrated Perspective Plan* that will soon be made public by the Union Government." The Admiral stated that the 15-year Perspective Plan would also specify new requirements such as EW (electronic warfare) which was now part of mainstream Defence planning as this would help industry plan its collaborations and investments. He believed that product support was "not adequate" and joint development and collaboration among defence labs and industry was inevitable as technologies had to be developed "quickly."

Five days later, on 2 April 2012, the Defence Acquisition Council (DAC), headed by Defence Minister AK Antony, cleared the 15-year Long-Term Integrated Perspective Plan (LTIPP), which although a broad vision document, prescribes the acquisition road map for the armed forces over the next 15 years (2012-2027). According to a Defence Ministry official, the DAC gave in-principle approval to the LTIPP 2012-2027 and Five-Year Defence Plan 2012-2017. This also directs that "requirements of the armed forces should increasingly be met through indigenisation and robust involvement of the private sector."

The LTIPP for 2012-2027 was drawn up after an elaborate process spread over two years which involved the MoD, Headquarters of the Integrated Defence Services and three Services Headquarters. Following the DAC approval, the unclassified version of the LTIPP has been promulgated in the form of a *Technology Perspective Capability Road Map* to enable the DRDO, the defence public sector undertakings and industry to map out their research and development activities. This then covers the 'vision' for the 12th, 13th and 14th Defence Plans.

Since the Indian Armed Forces LTIPP itself has not been officially released, its essential features have been copiously incorporated in the *Technology Perspective Capability Road Map*, which is already in the public domain and mirrors the vision of the military planners. In the extracts that follow is enunciated the quintessence of the measures purportedly leading to India's reinforced Armed Forces by the year 2027.

Transfer of technology

The revised offset policy recognises investment in 'kind,' in terms of transfer of technology, to cover all documentation, training and consultancy required for such transfer. Investment in 'kind' is being interpreted as an effort by the original manufacturer to assist India in building infrastructure. The transfer of technology should come without licence fee and there should be no restriction on domestic production, sale or export. Under the offsets clause, foreign vendors are required to invest at least 30 per cent of their contract value in India in the fields of civil aerospace, homeland security and training.

Increasingly, many defence needs can be met by leveraging the commercial technology explosion and utilising commercial products such as computers, software, electronics, and communications. As military capability moves toward information-based warfare and as the information age continues to experience a technology explosion in the civilian economy, there will be an abundance of opportunities to leverage commercial technology and products for military use. We should monitor commercial technology

and product developments and adopt or leverage them for enhancing military capability. The defence forces, defence planners, scientists, and engineers should be brought together to explore ways to take advantage of the opportunities offered by rapid commercial technology advancements. Technological superiority has to become the principal characteristic of our military advantage. Three important concerns will influence our choices for technology investments: leveraging the technology explosion, enabling the Information-based Revolution in Military Affairs (RMA) and asymmetric threats.

A broad-based programme

The development of technology to meet our future joint war fighting needs should aim at a broad-based programme spanning all defence-related sciences. Our strategy should thus be to ensure that we are able to develop and transform superior technology into affordable and decisive military capability. The five essential aspects to be kept in mind during development are:

Affordability: Technology projects must focus on increasing the effectiveness of a capability whilst decreasing cost, increasing operational life and incremental improvements through planned upgrades.

Timeliness/Accelerated Transition: The emphasis should be to ensure that the time taken for the transition of technology to usable capability is minimised.

Dual Use: The development of technology that is amenable to being applied to both military, as also commercial use would not only contribute to building a common industrial base, thus enlarging the utility and consequently the cost of such technology, but lead to cost effectiveness due to economies of scale.

Technology Base: The capability to undertake basic and applied research across a wide-ranging canvas is essential to generate applications and technologies of tomorrow. The development of a strong technology base is critical to focus such research towards throwing up options for the long-term, focused towards meeting the needs of the future warfighter.

The planning processes

Proposals for acquisition of capital assets flow out from the defence procurement planning process. This planning process will cover the following long-term, medium-term and short-term perspectives.

- 15 years Long-Term Integrated Perspective Plan (LTIPP)
- 5 years Services Capital Acquisition Plan (SCAP)
- Annual Acquisition Plan (AAP)

Based on the Defence Planning Guidelines, Headquarters Integrated Defence Staff (HQ IDS), in consultation with the Service Headquarters (SHQs), formulated the 15 year Long-Term Integrated Perspective Plan (LTIPP) for the Defence Forces. The Five-Year Defence Plans for the services would also be formulated by HQ IDS, which would include requirements of the five-year Services Capital Acquisition Plan (SCAP). The SCAP should indicate the list of equipment to be acquired, keeping in view operational exigencies and the overall requirement of funds. The planning process would be under the overall guidance of the Defence Acquisition Council. Its decisions, as approved by the Defence Minister, will flow down for implementation to the Defence Procurement Board (DPB). While LTIPP and SCAP would be approved by the DAC, the AAPs would be approved by the DPB. The AAP would be a subset of the SCAP.

HAL's Light Combat Helicopter (LCH) will be inducted into the Armed Forces within the next few years.

Modular Design: Considering the rapid rate of obsolescence of technology, the life of systems has reduced considerably. The life of warfighting platforms is, however, much longer and thus there is a mismatch requiring at least one major upgrade of weapons and systems during a platform's life.

This aspect needs to be factored in at the design stage itself so that systems produced firstly have growth potential and secondly are modular in design so that upgrades/replacements can be undertaken without the need for major structural changes on the platform.

Information-based RMA

The information age has given rise to a new information-based Revolution in Military Logistics (RMA) galvanised by advances in information technologies and information processing capabilities hitherto unknown. India maintains a significant advantage in the development of information-based technologies. To succeed across the full spectrum of operations, we should develop innovative new concepts for conducting operations, test them through demonstrations and rigorous experimentation and rapidly transition the enabling technologies into revolutionary war-winning capabilities.

Our vision for the 21st century should be the warfighter who is fast, lean, mobile and prepared for battle with total battle

space situation awareness and information assurance. Our military strategy should be based on information superiority and real-time intelligence from 'sensor to shooter'. The information age has given rise to a new information-based in military affairs (RMA) galvanised by advances in information technologies and information processing capabilities hitherto unknown. India maintains a significant advantage in the development of information-based technologies. To succeed across the full spectrum of operations, we should develop innovative new concepts for conducting operations, test them through demonstrations and rigorous experimentation and rapidly transition the enabling technologies into revolutionary war-winning capabilities.

Our acquisition process needs streamlining. We must reduce development time and acquisition costs for fielding critical technology to rapidly meet defence forces needs and remain viable in a constrained resource environment. Increasingly, advanced technology is becoming available in international markets, requiring Department of Defence (DoD) to accelerate the development process as never before.

Technological superiority

Rapidly transitioning technology from Science & Technology (S&T) to an operational capability is crucial. To speed up the technology transition process important mechanisms of S&T Development Technology demonstration and experimentation should be established to ensure the transition of innovative concepts and superior technology to the defence forces with speed and at affordable costs. Technology demonstration should be the key element in the S&T programme to determine the military utility of proven technologies, expedite technology transition, provide a sound basis for acquisition decisions, and develop the concept of operations that will optimise effectiveness.

Future Infantry Soldier: The Indian Army has ambitious plans to upgrade the jawan's combat kit and link their equipment with a central command and control system.

In peace, technological superiority is a key element of deterrence. In crisis, it provides a wide spectrum of options to the national command authorities and commanders in the field. In war, it provides an edge that enhances combat effectiveness, reduces casualties, and minimises equipment loss. Focus on defence modernisation and availability of affordable military technology to the defence forces and ensuring that it undergoes rapid transition are critical national security obligations which need be fulfilled by Defence S&T Strategy.

Based on current technology trends world-wide as well as within the country, the Mission Capability requires to be translated into a comprehensive R&D priority to achieve the requisite technology objectives. These would broadly dictate the short, medium and long-term basis for the technology road-map to be followed to address, identify and plug the gap in our current and future capabilities in the field of Electronic Warfare. The objectives have been formulated on a generic basis so as to afford the R&D agencies and laboratories sufficient latitude for researching key thrust areas. Apart from the above, the user peculiarities too would shape adoption of technologies in specific sensor/equipment. Therefore, it is intended to cover a wide range of activities keeping in mind the current and evolving threat scenarios that would impinge on our combat capability.

Target manoeuvring is another key limitation that imposes additional lateral acceleration and diverts propulsion requirement on missile interceptor technology. Current TBMs may manoeuvre unpredictably during re-entry because of missile dynamics or re-entry vehicle asymmetries and advanced re-entry vehicle could potentially take evasive manoeuvres, thus reducing the probability of successful intercept. Therefore, technologies that enhance interceptor manoeuvrability and improve interceptor probability of kill would allow a reduction in interceptor inventory and could significantly reduce Area Missile Defence costs.

Some of the technologies necessary to achieve the operational capabilities of MOBUA i.e. firepower, force protection, and manoeuvre already exist either on the shelf or are in the process of being developed in India and abroad. The challenge is to integrate these technologies into coherent interoperable systems optimised for MOBUA. The successful implementation of developed technologies will result in substantial improvements in our ability to effectively and efficiently accomplish their mission – whether in insurgency, low intensity conflict or full-scale war and particularly with reference to operations in built-up areas.

Combating terrorism

The operational capabilities and technologies required to combat terrorism reflect the dynamic and diverse nature of terrorism itself. Emphasising the critical priority of force protection, the technology investments addressed in this plan cover the full spectrum of *Computed Tomography* objectives: deterrence of terrorist incidents, employment of countermeasures, mitigating the effects of terrorist incidents, and incident recovery. The associated Research and Technology programmes must demonstrate and evaluate a wide range of many promising technology opportunities for improving our capabilities for combating terrorism.

Combating terrorism leverages optimal utilisation of limited resources and focuses on technologies that offer significant improvement in force protection capability. A RML will have to be an integral part of any technological advance used to bolster warfighting capability by the enhancement of readiness for joint operations. There is need to use technological breakthroughs to transform logistics into a distribution-based logistics system that substitutes logistics velocity for logistics mass. Technology has to be leveraged to fuse new organisational structures, concepts, transportation techniques, information systems, and logistics systems. This

would fundamentally reshape the way the services are projected into operations and sustained thereafter.

Evolutionary development is the preferred approach in order to quickly field required capabilities that provide an adequate solution in the near-term but offer clear potential for upgrade as technologies mature. Successful execution of the wide range of R&D efforts cited in this plan will greatly improve capability of the soldier and reducing the terrorist threat to the nation.

In the existing geo-political scenario, Indian armed forces will need preparations for operating in the NBC threat scenario. Unless, our 'joint' capabilities are substantially in a focused manner with a clear vision for harnessing the existing and the emerging core technologies, the gap between the 'capability' and our 'ability to undertake assigned missions' would continue to grow.

State-of-the-art systems from Israel include advanced killer UAVs, anti-armour missiles, communication and electronic warfare systems and others.

Human systems interfaces

There is a requirement to look at Human Systems Interfaces and develop related technologies. Technology is needed to improve air force sustenance logistics in areas of supportability, deployment and affordability, which would facilitate the air force in having a flexible, agile and fast response logistics infrastructure to achieve the goals of agile combat support and lean logistics. R&D is needed to develop new techniques to ensure the

India's anti-ship and land attack capabilities will be massively enhanced once the 290 km Brahmos missile is fully integrated with the Sukhoi Su-30MKI

required support for future air/space based operations, some of which are:

(*) Automated Generation of Technical Data.

(*) Advanced material and cargo handling equipment.

(*) Miniaturised multi-function facilities for operating from bases with minimal support equipment.

Naval requirements

Future naval specific requirements could examine technologies necessary for next generation supply ships. The objective should be to look at the design of supporting ships at sea, which would reduce manpower needs and utilise technology instead. The following technologies should be addressed:

* Telecommunications and computing technologies for planning, tracking and controlling material movements.
* Modelling and simulation for operational decision support.
* Automatic Identification Technology (AIT) for marking and locating items.
* Automated stowage planning for both logistics ships and combatants.
* Automated onboard material handling.
* Packaging both for war fighter ready distribution and minimisation of waste materials and the use of inter-modal containers, which can be transported efficiently by truck/rail/ship and in some cases also by air.

Logistics delivery systems

Effective logistics support is the fusion of information, logistics and transportation technologies to provide rapid crises response, to track and shift assets even while enroute, and to deliver tailored logistics packages with replenishments directly at the strategic, operational, and tactical level of operations. There is requirement for a logistics system that is responsive, flexible and precise, and an environment where the military services and defence agencies work with the civilian sector to take advantage of modern business practices, commercial economies, and global networks.

Technologies should be pursued to enhance airlift, sealift and pre-positioning capabilities to lighten deployment loads, assist pinpoint logistics delivery systems and extend the reach and longevity of systems currently in the inventory. The combined impact of these improvements would be a smaller and more capable deployed force that would require less continuous support and have a smaller logistics footprint, and hence decrease the vulnerability of logistics lines of communication.

LTIPP (2012-2027): ways & means

Any future planning for the country's Armed Forces is, essentially, an attempt to find and implement ways and means to acquire and master the latest technology. What the armed forces need is to be determined by a thorough understanding of the existing and future strategic environment in which they have operate for the defence of the country.

The decisive factor, now and in the future, is technological superiority over the adversary which involves such elements as electronics, miniaturisation, material and computing which impact communication, sensors and guided weapons.

The Department of Defence must provide the right technology to the armed forces for information superiority. Technological superiority has to become the key characteristic of the country's military advantage.

The defence forces, defence planners, scientists and engineers must snyergise to explore ways and means to exploit commercial technology advancement.

The 21st century fighter has to be fast, lean and mobile with total battle space and situation awareness and information assurance. Hence the need for information-based RMA coupled with development of information processing capabilities unknown hitherto.

To counter the adversary using asymmetric means such as cyber warfare, actual operations and ballistic missiles against an NBC backdrop, our combat forces must be organised, trained, equipped and managed to cope with multiple missions.

As we develop superior technology, five essential aspects are to be kept in mind: Affordability (increase in operational life and planning upgrades), Minimum Time (targets to be achieved as fast as possible), Dual Use (to be an asset militarily and in civil use), Technology Base (provision for long-term use and Modular Design (to guard against rapid obsolescence and ensure upgradation and replacements).

To meet future challenges, the country should invest in research yielding evolutionary advances and potential for military application.

The challenges of the battlefield of the future require certain capabilities to be developed. These are Information Superiority, Electronic Warfare, Area Missile Defence, Combat/Identification, Precision Force, Military Operation in Build-up Areas (MOBUA), Combating Terrorism, Nuclear, Chemical and Biological Warfare Defence and Protection and Logistics Support. All these constituents are desired capability and self-explanatory.

In any preparation, as be the plan, for adequate military prowess and effective deterrence to foil aggression by an adversary, there has to be collaboration between the Department of Defence with the academia, DRDO, Defence PSUs, Private and Public Industry and international manufacturers. Most vital, in this context, is the much desired public-private partnership.

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The AGNI V is tested

India Goes Intercontinental

Agni V, the country's first Inter-Continental Ballistic Missile (ICBM), was successfully test-fired on 19 April 2012 from the Integrated Test Range (ITR) at Wheeler Island off the Odisha coast. The launch was reported to have been "flawless", with the indigenously developed composite rocket motors performing exactly as intended. Built at a reported cost of over $25 million, the Agni V is a three-stage missile fuelled with solid propellant. The missile followed the expected trajectory with the three stages of propulsion dropping and falling at appropriate times into the Bay of Bengal. The three propulsion stages, with their composite rocket motors performed well which have made India completely self-reliant in this field.

Besides the rocket motors, a number of new technologies were successfully tested in this launch. The redundant navigation systems, very high accuracy Ring Laser Gyro based Inertial Navigation System (RINS) and the most modern and accurate Micro Navigation System (MINS) ensured that the missile impacted the target point within a few metres of accuracy. The high speed onboard computer and fault tolerant software along with a robust and reliable bus guided the missile "flawlessly."

This longest range test launch in DRDO's history was delayed by inclement weather at the launch site, with Dr Saraswat explaining "we are not going to risk India's most important missile launch" as the reason for delaying the launch to the morning of 19 April. The test was made even more impressive by the resources deployed to track the missile's progress downrange. A series of ships were located along the path of the missile to track it using a variety of sensors, from radar to electr-optical, all highly accurate and transmitted back to the test center in real time. The ships themselves would later head back to port for a more thorough analysis of the collected data.

The Agni V, which is a nuclear-capable missile, has a strike range of over 5,000 kilometres and travels at 24 times the speed of sound, translating to an approximate flight time of 20 minutes. It is some 17 metres long, two metres wide and weighs around 50 tonnes. The missile can be configured to launch small satellites, including tactical battlefield satellites. It can also be adapted to shoot down enemy satellites in orbit but strategically has a capacity to carry a nuclear warhead weighing over one tonne. While DRDO scientists themselves are reluctant to term the missile as an ICBM, preferring instead to simply refer to it as a "long range ballistic missile," there is no doubt that the Agni V falls into the 'intercontinental' class of missiles by the conventional definition of the term. While refusing to explicitly confirm or deny the existence of an 'Agni VI' project, Dr VK Saraswat insisted that DRDO would endeavour to develop any weapons system that the nation might require.

The test launch was conducted from an open stand but there are plans to 'canisterise' the missile, making it more mobile and resistant to vagaries of the environment. It will be road mobile on a Transporter-Erector-Launcher (TEL) when it enters service with the Strategic Forces Command.

Only five countries (the United States, Russia, United Kingdom, China and France) so far possess technology similar to that of the Agni V. India will break into this exclusive ICBM club once the Agni V is ready for induction by 2014-2015 and after several more tests. Agni V will extend India's reach all over Asia, and into parts of Africa and Europe. The Agni series of missiles, including Agni V, is crucial for India's defence vis-a-vis China since Beijing has upped the ante in recent times by deploying missiles in the Tibet Autonomous Region bordering India. The Agni V will also allow India to possess a credible strategic nuclear deterrent, which is vital given the nation's "No First Use" nuclear doctrine.

Reactions to the launch from various foreign governments were mostly positive, with NATO Secretary General Anders Fogh Rasmussen stating that he did not think India's was a missile threat, nor a threat to NATO and its allies, despite India's advancement in missile technology. Mark C. Toner, a US State Department spokesman urged "all nuclear-capable states to exercise restraint regarding nuclear capabilities," but went

on to clarify that India "has a solid non-proliferation record."

Pakistani websites and news agencies prominently displayed news of the launch but reported that Pakistani officials showed little concern, with the foreign office spokesman Mozzam Ahmed Khan only saying that India had informed it of the test ahead of time in line with an agreement in place between the two countries.

Notably however, Du Wenlong, a researcher at China's PLA Academy of Military Sciences, told the *Global Times* (the English language version of the Chinese *People's Daily*) that the Agni V "actually has the potential to reach targets 8,000 kilometers away" and that "the Indian government had deliberately downplayed the missile's capability in order to avoid causing concern to other countries!"

From New Delhi, the Prime Minister Dr Manmohan Singh told Dr Saraswat over the telephone that the "successful Agni V test launch was another milestone in our quest to add to the credibility of our security and preparedness and to continuously explore the frontiers of science. The entire nation stands together in honouring the achievements of our scientific community."

Drs. Avinash Chander, VK Saraswat, and VG Sekaran exulting after the launch.

'Trimurti' of Indian 'Space' Women

Tessy Thomas

N Valarmathi

TK Anuradha

The gentle hand that rocks the cradle, also launches thunderous vehicles into space ! Yes, they are India's trio of women Space Scientists who have played vital roles in the recent successes achieved in space research and ballistic missile development. The trio (*Trimurti*) of women power in the field of space are Teresa 'Tessy' Thomas, N Valarmathi and TK Anuradha.

Named after Mother Teresa, 'Tessy' Thomas is a scientist with the Defence Research and Development Organisation (DRDO) and has played a key role in development of the country's most potent long-range nuclear-capable ballistic missile, the Agni-V. Arguably, she is one of the very few women working on strategic ballistic missiles in the world.

Born in a businessman's family in Alleppy, Kerala, 'Tessy' Thomas grew up near a rocket launching station and was fascinated by rocket and missiles. In time, she obtained her masters degree in guided missiles at Pune. Her husband is a Commodore serving in the Indian Navy. Addressing the Indian Science Congress in January 2011, Prime Minister Manmohan Singh had described 'Tessy' Thomas "as a woman making her mark in a traditionally male bastion and decisively breaking the glass ceiling". She is now appropriately known as an '*Agniputri*' !

N Valarmathi is Project Director for India's first indigenously developed Radar Imaging Satellite RISAT–1 which was launched recently. Passionately interested in communication systems, she joined the Indian Space Research Organisation (ISRO) in 1984 after a master's degree in engineering from Anna University, and is the first ISRO woman head of a remote sensing satellite project.

The third woman scientist in the celebrated Space trio is GSAT-12 Project Director TK Anuradha, who is satellite project director and has been with the Indian Space Research Organisation (ISRO) for three decades. She is an electronics engineer from Visvesvaraya College of Engineering, Bangalore and heads the GSAT-12 project at the ISRO Space Centre at Bangalore. The satellite was launched in July 2011 and has a life span of about eight years which will augment transponder capacity of the Indian National Satellite (INSAT) system. It is also expected to serve the Very Small Aperture Terminal (V-SAT) sector. VSATs are used to transmit data like point of sale transactions or to provide satellite internet access.

In fact, Anuradha is assisted by two other senior women scientists, Pramodha Hegde and KS Anuradha, from amongst the team of about 100 scientists involved in the programme at ISRO Bangalore and Ahmedabad.

Looking back – with faith

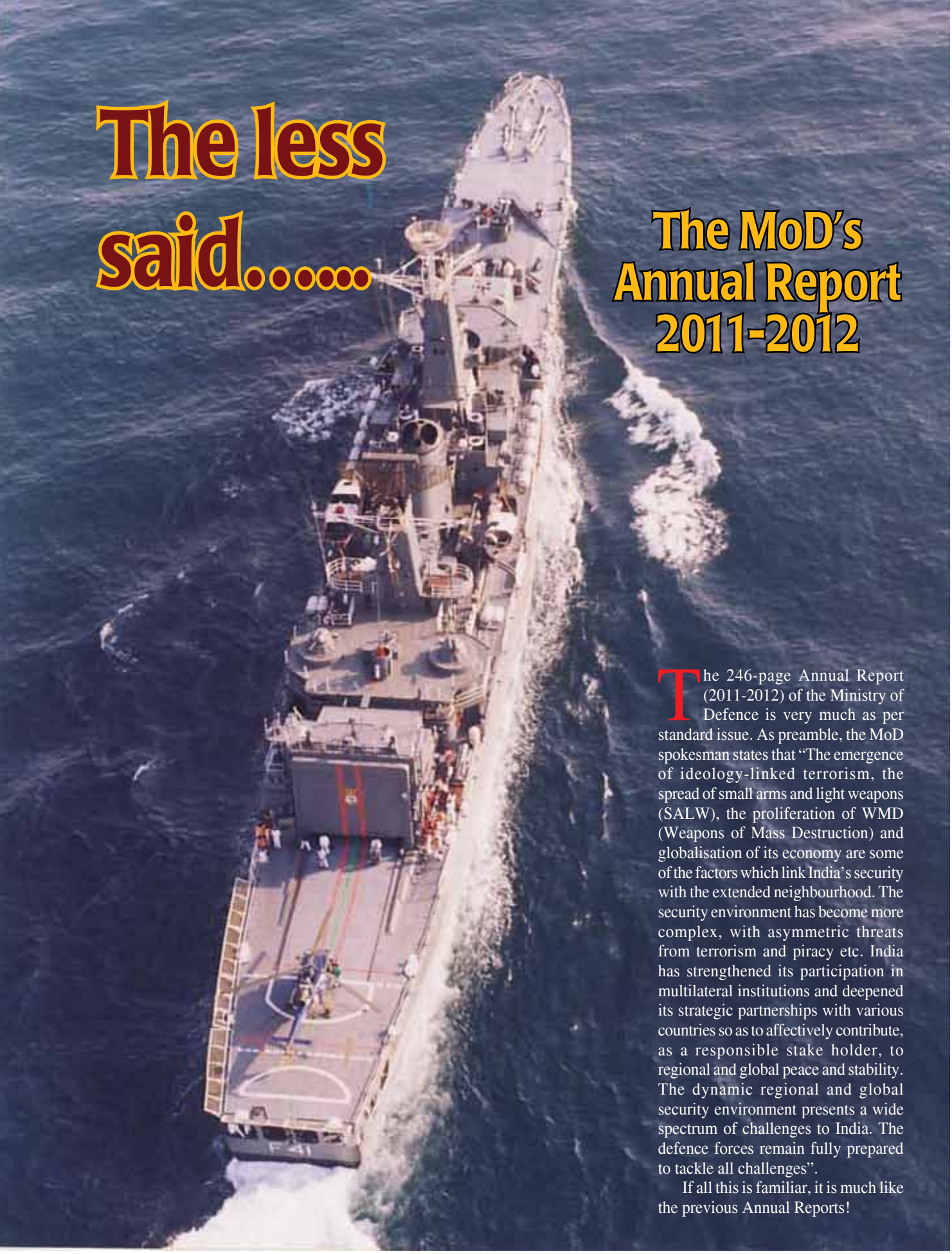
Five years back, the Agni-III, was launched from Wheeler Island off the Orissa coast on 12 April 2007, described then as "an important milestone on the road to India achieving a credible nuclear deterrent".

Designed and developed by the Advanced Systems Laboratory (ASL) in Hyderabad, a unit of the Defence Research and Development Organisation (DRDO), Agni-III had two stages, both powered by solid propellants. The ASL was formed on 28 September 2001, with special emphasis on developing large-sized rocket motors and composite products. Its then Director, Avinash Chander called Agni-III not just "a missile but a system for the future with which various configurations can be developed".

And so it has. In an interview soon after the successful launch of Agni-III, Avinash Chander stated that "range is a question of political requirement ... today our country is talking of 3000 kms but the next objective is a 5000 km Agni... we have the capability".

The less said.....

The MoD's Annual Report 2011-2012



The 246-page Annual Report (2011-2012) of the Ministry of Defence is very much as per standard issue. As preamble, the MoD spokesman states that "The emergence of ideology-linked terrorism, the spread of small arms and light weapons (SALW), the proliferation of WMD (Weapons of Mass Destruction) and globalisation of its economy are some of the factors which link India's security with the extended neighbourhood. The security environment has become more complex, with asymmetric threats from terrorism and piracy etc. India has strengthened its participation in multilateral institutions and deepened its strategic partnerships with various countries so as to affectively contribute, as a responsible stake holder, to regional and global peace and stability. The dynamic regional and global security environment presents a wide spectrum of challenges to India. The defence forces remain fully prepared to tackle all challenges".

If all this is familiar, it is much like the previous Annual Reports!

Even though there are differing views on state of the Army, the Report continues: "The Armoured Corps of the Army is undergoing rapid modernisation. The induction of T-90 and Arjun tanks is proceeding as per plans. An ambitious programme is afoot to modernise the entire fleet of BMPs. Artillery equipment is being acquired to enhance surveillance and firepower capabilities. Of special significance is progress in the plan to procure 155mm towed guns and one regiment of *BrahMos* missiles. Modernisation of the Infantry soldier is proceeding with the basic aim of enhancing lethality and protection of the individual soldier. Establishment of Defence Communication Network is underway."

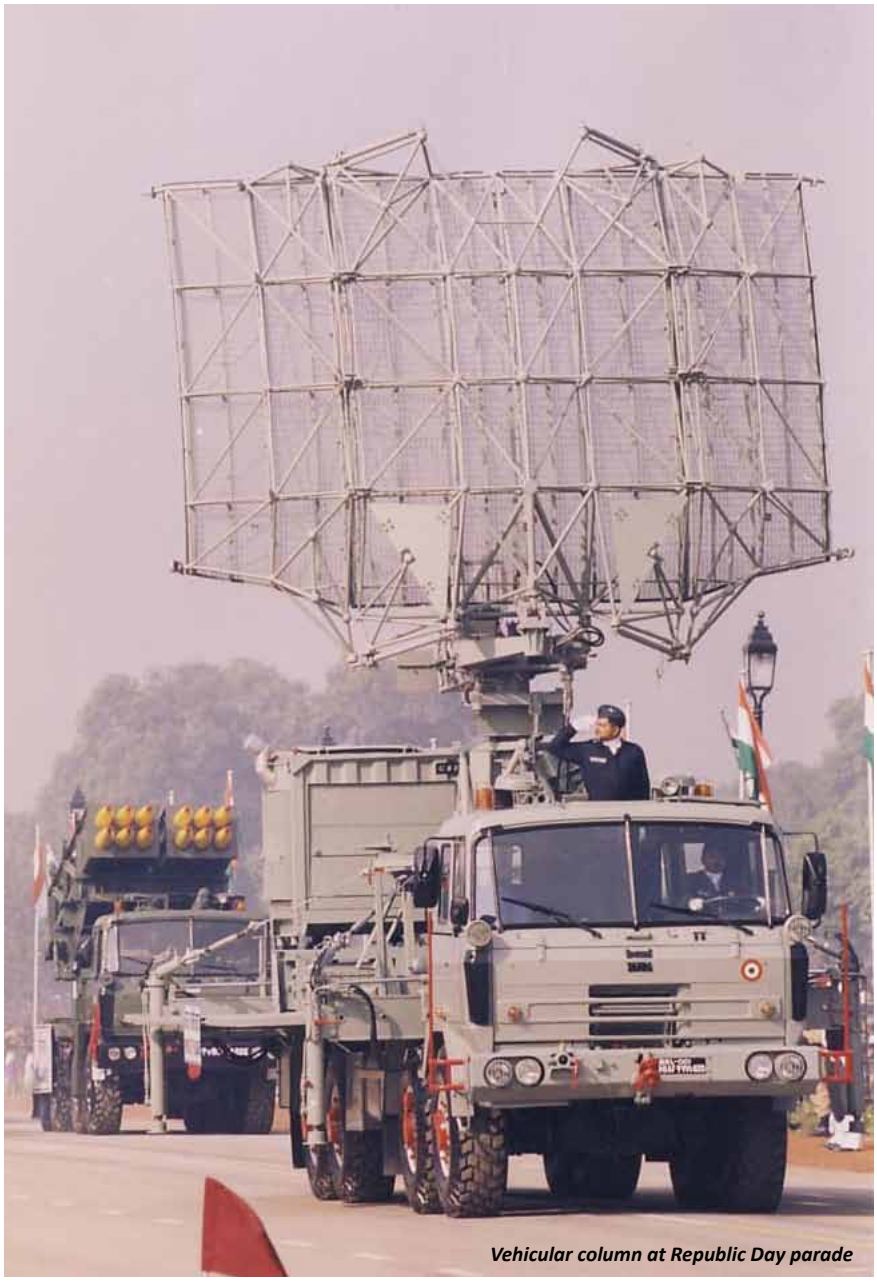
"Army Aviation is in the process of weaponising the ALH and acquiring Cheetal helicopters. Upgradation of the self-propelled Air Defence Gun Missile System Schilka and others are in progress."

The COAS had in his letter to the Prime Minister (which was 'leaked' to the media in March 2012), warned that air defence of the Army in the field was at an "alarming state."

The Report goes on to laud "the Indian Navy's maritime leadership role in the Indian Ocean Region (IOR) by dint of its multi-dimensional capabilities and active presence in the region. It is,

T-90 main battle tank.

Indian Navy Searcher UAV.



Vehicular column at Republic Day parade

Armed jeeps of the 1st Armoured Division.

indeed, significant that the modernisation programme of the Indian Navy is focused towards indigenous warship construction. 44 ships and submarines (out of 48 on order) are being built in Indian Shipyards." In the year under review, the Indian Navy took part in several exercises with foreign navies: *Varuna* 10, *Malabar*- 11, *Simbex*- II, *Slinex*-II, *Direx*, *Konkan*-11, *Habunag*-11 and *Naseem Al-Bah*r.

However, the Report makes no reference to the receipt of MiG-29Ks by the Navy in anticipation of the long-delayed aircraft carrier INS Vikramaditya.

The Indian Air Force is described as being "well-established on the path to becoming a credible aerospace force ready to face the dynamic technological global challenges through modernisation and able leadership. During the year, the IAF has put in place a blueprint for the entire overhaul of the air defence network, acquisition of frontline aircraft with state-of-the-art precision weapons and other enabling technologies. It has also bolstered its transport and helicopter fleets with induction of the C-130J special operations transport aircraft and Mi-17 V5 medium lift helicopters. The third AWACS aircraft was inducted in 2011, the first two having joined the IAF in 2009 and 2010."

The IAF took part in India-Oman Exercise *Eastern Bridge-Il* at Air Force Station Jamnagar in October 2011 and an India-Singapore Exercise at Air Force Station, Kalaikunda. An Advanced Landing Ground at Vijaynagar in the North East Region was made operational in November 2011.

"The Mirage 2000, MiG-29 and An-32 fleet are being upgraded to enhance their operational life."

But there is no mention about the steady reduction in combat squadrons and alarming situation because of the lack of a basic training aircraft, even three years after the HPT-32s were grounded.

"As for the Indian Coast Guard, this arm's aviation element consists of 52 aircraft which carry out regular surveillance of India's EEZ. Four Dornier 228 aircraft joined the ICG in 2011 and two Coast Guard Air Enclaves, at Kochi and Kolkata, were activated on 1 March 2011."

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..... the better !

India's Defence Budget 2012-2013

Flagship of the Indian Navy, INS Viraat in joint exercises at sea.

Come March and there is a palpable buzz in security and arms-acquisition circles in anticipation of how much more the country is prepared to set apart to buy new platforms, tanks, guns, electronic surveillance systems and ships to reinforce the sinews of the Army, Navy and the Air Force "for resolute defence of the country". While peaceniks take the event in their stride viewing additional expenditure on defence-related acquisitions as a necessary evil, hawks and arms manufacturers across the world get into proactive mode in their quest for new contracts in response to requirements following the allocation of funds in the Defence Budget. This annual exercise gives security experts and strategicians another opportunity to apply their minds as to what the Defence Forces should be acquiring – and priorities for the future.

130 mm medium guns of Indian Artillery.

The BrahMos supersonic cruse missile equips three Regiments, with a fourth to be formed.

This year the government announced a 17.6 percent hike in defence spending, allocating an additional Rs. 28,992 crore for 2012-13 on the ongoing year's Rs. 164,415 crore defence budget. The country will therefore spend Rs. 193,407 crore, or $ 38.6 billion on defence, which is about 11 per cent of the country's entire budgetary outlay for 2012-2013. Last year's budget had registered a hike of 11.59 per cent in defence spending. In contrast, China recently announced a $ 106 billion military budget, a triple digit figure for the first time. Pakistan has a defence outlay of $ 5.75 billion for 2011-12 which means a hike of 12 percent. India's defence spending of its gross domestic product (GDP) has gone up to 1.90 per cent of the GDP, slightly up from 1.84 per cent last year. China's military expenditure was reported at 2.01 percent of its GDP in 2010. In view of the current modernisation imperatives of the three Services, successive standing Committees of Parliament on Defence have recommended the allocation be increased to least 3-3.5 per cent of the GDP – but this is a distant dream, unless compelling scenarios dictate the change.

In the current FY's Rs.193,407 crore defence budget, about 41 percent (Rs 79,579 crore or $ 15.92 billon) has been earmarked for capital acquisition, the Air Force getting the major share of over Rs.29,853 crore ($ 5.97 billion) for modernisation. The Navy will get Rs. 23,865 crore ($4.77 billion). The largest capital head is for the acquisition of new aircraft for the IAF at Rs. 23,701 crore ($ 4.74 billion).

Indeed the acquisition of aircraft is high on the list of defence purchases, including 197 light utility helicopters (worth Rs 3000 crore) and 114 HAL Light Combat Helicopters for the Army; 126 Dassault Rafale MMRCAs ($20 billion), 75 Pilatus PC-7 Mk.IIs (plus 106 possibly produced by HAL under licence), 6 mid-air refuellers ($1.5 billion), 22 attack helicopters, 15 heavy lift helicopters, 6 more C-130J Super Hercules and 10 Boeing C-17s Globemaster IIIs for the IAF.

The Navy gets 8 Boeing P-81 Maritime Patrol Aircraft, the aircraft carrier *Admiral Gorshkov*, six *Scorpene* submarines, UAVs, 16 multi-role naval helicopters.

The Army's list includes a further 248 Arjun and 1650 T-90S MBTs, 66,000 assault rifles, body armour and ballistic helmets (under the *Future Infantry Soldier as a System* project) heavy machine guns, light utility vehicles, mine-laying vehicles and light specialist vehicles.

The Defence Budget was announced on 17 March, virtually on eve of DefExpo

MiG-29s of the IAF are presently being upgraded.

2012 and thus assumed still greater pertinence following the letter written just earlier by the COAS to the Prime Minister and 'leaked' to the media. This had disturbing revelations in that the Army's entire tank fleet was "devoid of critical ammunition to defeat enemy tanks, air defence was 97 percent obsolete, the infantry was crippled with deficiencies of crew-served weapons; the infantry lacked, night fighting capabilities, the elite Special Forces woefully short of essential weapons and that there were large-scale voids in critical surveillance."

Obviously jolted into action, Defence Minister A K Antony subsequently held urgent review meetings with the COAS and senior army officers to address this issue.

The budget brought into focus another important aspect in regard to India's standing as an arms importer amongst the leading countries of the world. The country has the dubious distinction of becoming the world's largest arms importer between 2007 and 2011, as reported by the Stockholm International Peace Research Institute (SIPRI). This is a consequence of India's importing about 70 percent of its total defence requirements.

This then remains a continuous worry: the 'largest arms importer' tag given to India is regrettably a consequence of dysfunctional defence research & development, production and acquisition. The only saving grace is that 80 percent of the country's warships are being built indigenously.

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The indigenous Pinka battle field rocket system.

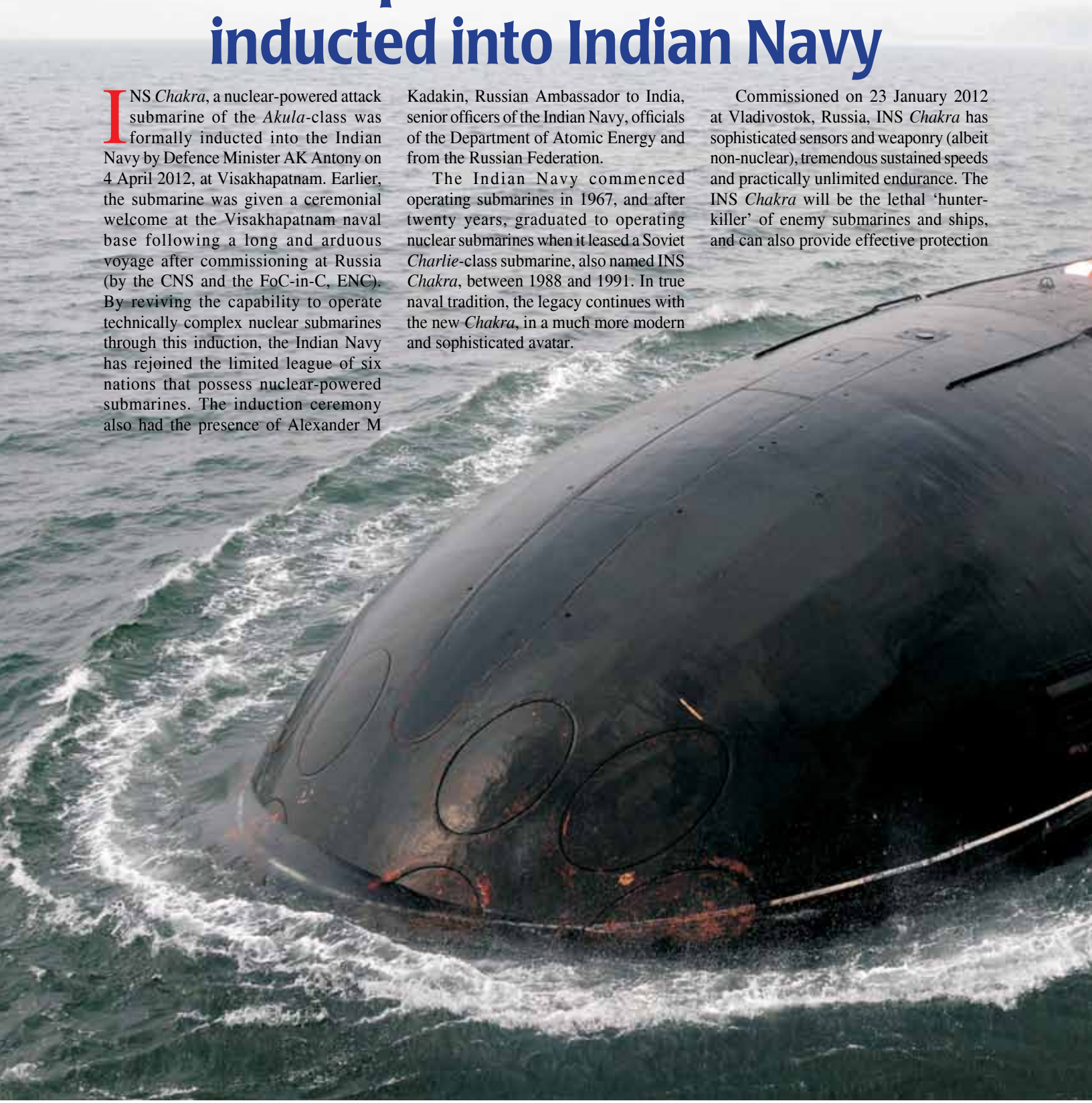
"Phenomenal Operational Flexibility"

Nuclear-powered INS 'Chakra' inducted into Indian Navy

INS *Chakra*, a nuclear-powered attack submarine of the *Akula*-class was formally inducted into the Indian Navy by Defence Minister AK Antony on 4 April 2012, at Visakhapatnam. Earlier, the submarine was given a ceremonial welcome at the Visakhapatnam naval base following a long and arduous voyage after commissioning at Russia (by the CNS and the FoC-in-C, ENC). By reviving the capability to operate technically complex nuclear submarines through this induction, the Indian Navy has rejoined the limited league of six nations that possess nuclear-powered submarines. The induction ceremony also had the presence of Alexander M Kadakin, Russian Ambassador to India, senior officers of the Indian Navy, officials of the Department of Atomic Energy and from the Russian Federation.

The Indian Navy commenced operating submarines in 1967, and after twenty years, graduated to operating nuclear submarines when it leased a Soviet *Charlie*-class submarine, also named INS *Chakra*, between 1988 and 1991. In true naval tradition, the legacy continues with the new *Chakra*, in a much more modern and sophisticated avatar.

Commissioned on 23 January 2012 at Vladivostok, Russia, INS *Chakra* has sophisticated sensors and weaponry (albeit non-nuclear), tremendous sustained speeds and practically unlimited endurance. The INS *Chakra* will be the lethal 'hunter-killer' of enemy submarines and ships, and can also provide effective protection



The INS Chakra off Visakhapatnam.

to fleet units. The Navy will also use the *Chakra* to train its men in the demanding task of operating nuclear submarines.

Over the years, nuclear-powered submarines have assumed far greater significance and virtually changed the complexion of maritime warfare. The Indian Navy entered the era of nuclear propulsion in 1988 with induction of the erstwhile INS *Chakra*, a *Charlie*-class SSGN (wherein SS denotes 'Submarine', G denotes 'Guided Missile' and N denotes 'Nuclear'). The three-year lease of the erstwhile *Chakra* was a landmark event in international cooperation and successful operation of this SSGN cleared the decks for the induction of the present INS *Chakra* into the Indian Navy.

Speaking on the occasion, Admiral Nirmal Verma said that the induction of INS *Chakra* is a major step towards a strong and versatile Navy, as mandated by the regional maritime security environment,

The Chief of Naval Staff, Admiral Nirmal Verma with Vice Admiral Anil Chopra, FOC-in-C Eastern Naval Command and officers of INS 'Chakra' on the nuclear submarine's sail.

and in keeping with the balanced growth of the Indian Navy in all three dimensions, thereby augmenting capability through acquisition of such 'Force Multipliers'. He expressed confidence that INS *Chakra* would increase the Navy's operational flexibility and help maintain a credible presence in the Indian Ocean Region (IOR), contributing towards effective Blue Water operations by the Indian Navy.

In his speech the Defence Minister stated, that "Today, the Indian Ocean Region has assumed great strategic significance. This region is home to a large population and some of the most dynamic and fast growing economies. Geo-strategically, India is the hub of this region. The disruption of sea-borne trade due to piracy, terrorism, or conflict can have serious repercussions on the economies and overall well-being of nations in the Indian Ocean Region. As peace and stability in the region are crucial to peace in the world at large, it is imperative that the Indian Navy maintains a strong, stabilising and credible naval presence in the region. At the same time, I wish to strongly emphasise that our naval presence is not at all directed against any nation, but only to act as a stabilising force and protect our strategic interests. Towards this end, the induction of INS *Chakra* is a step in the right direction. INS *Chakra* would no doubt play a major role in reshaping maritime operations of the Indian Navy in the years to come and ensure security, sovereignty and economic prosperity of the country."

Crest of the INS 'Chakra'.

Acknowledging that INS *Chakra's* arrival "reflected the high level of cooperation and strategic partnership between India and Russia", Antony said that over the years, "the Indian Ocean

Iconic picture from the past : Prime Minister Rajiv Gandhi with officers and sailors of the Indian Navy on the first INS 'Chakra', seen off Visakhapatnam in 1988.

Region has assumed great strategic significance, as it is home to a large population and some of the most dynamic and fast growing of economies, with India as the geo-strategic hub." He emphasised that for peace and stability in the region, it is imperative that the Indian Navy maintains a strong and credible presence that whilst not being directed against any nation, will act as a stabilising force and protect our strategic interests. Towards this, he said that the INS *Chakra* would no doubt play a major role in re-shaping maritime operations of the Indian Navy in the years to come, and ensure security, sovereignty and economic prosperity of the country. He underlined that INS *Chakra* symbolises both the success of the Russian submarine building capability and of the Indian Navy's competence in exploitation of technologically complex platforms. He congratulated the Indian Navy for successfully inducting INS *Chakra*, and also extended heartiest congratulations to the Commanding Officer of INS *Chakra* and the crew for their painstaking efforts during the challenging phases of training, acceptance and passage to India.

Belonging to the 'Attack' or 'SSN' genre of submarines, INS *Chakra* is commanded by Captain P Ashokan, an alumnus of the National Defence Academy, Defence Services Staff College and the Naval War College. Captain Ashokan has command experience of two *Kilo* class submarines besides operational experience of over 25 years.

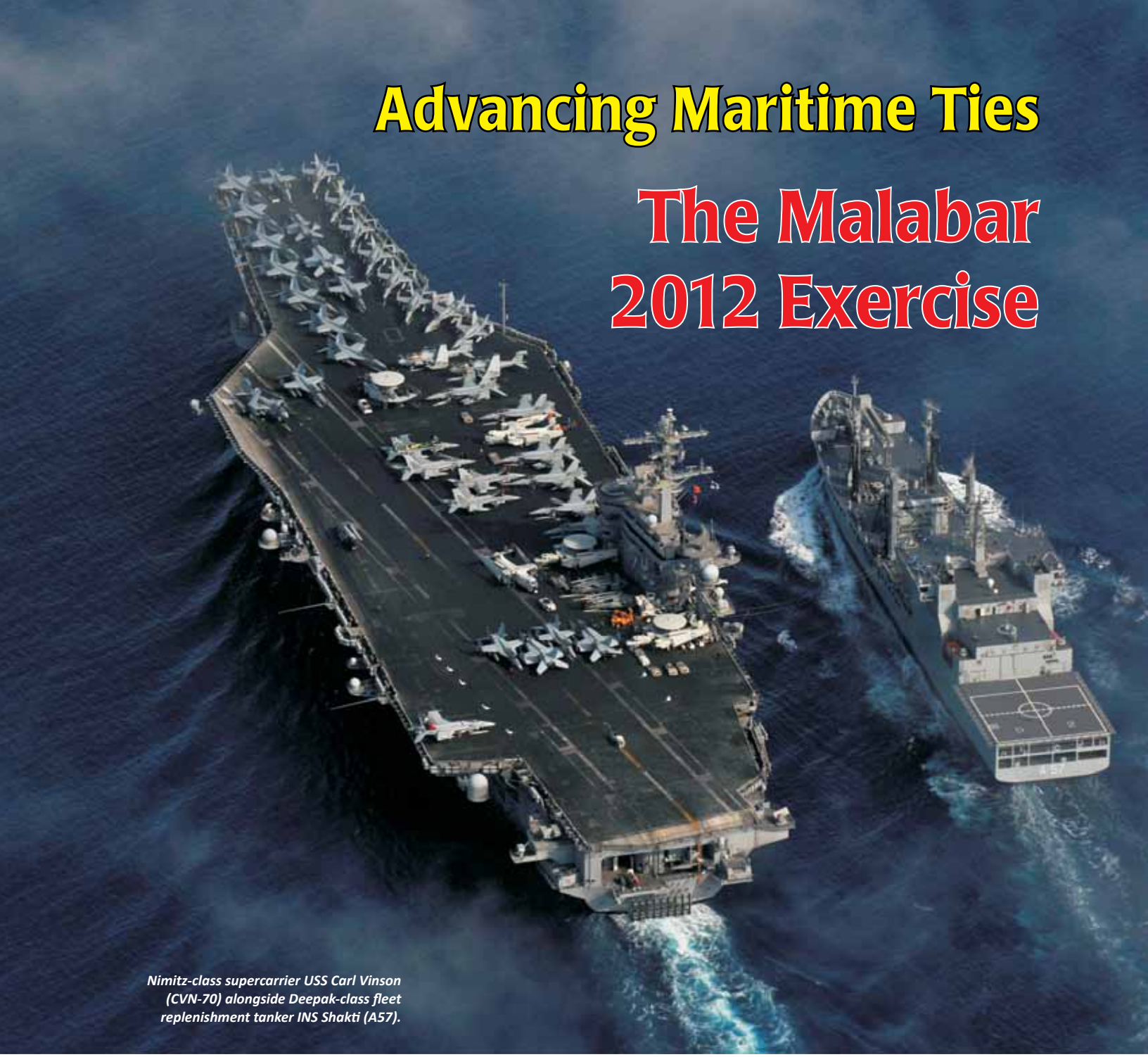
With a displacement of over 12000 tonnes, INS *Chakra*, powered by a 190 MW reactor has a maximum submerged speed of over 30 knots (55 kmph) and operating depths of over 500 metres. The submarine is manned by 80 crew members. The *Chakra* is equipped with an array of tactical missiles, cutting edge Fire Control Systems, sonars, contemporary optronic periscopes, communication and surveillance systems that give her "phenomenal operational flexibility and lethal potency."

With the extremely robust and reliable conventional *Sindhughosh* and *Shishumar*-class submarines also in its arsenal, the Indian Navy now has a nuclear submarine to enhance its overall underwater capability. The name *Chakra* is evocative of its relevance as the ultimate weapon coveted by any nation. Following its induction into the Indian Navy, INS *Chakra* will operate under control of the Flag Officer Commanding-in-Chief, Eastern Naval Command.

INS 'Chakra' with the distinctive housing for its towed sonar array seen to the aft.

Advancing Maritime Ties

The Malabar 2012 Exercise



Nimitz-class supercarrier USS Carl Vinson (CVN-70) alongside Deepak-class fleet replenishment tanker INS Shakti (A57).

Alongside guided-missile cruisers, destroyers and submarines, US and Indian naval forces began a 10-day long annual Malabar exercise on 7 April, 2012 in the Bay of Bengal to "advance their maritime ties and mutual security issues."

"The United States and India share common values and seafaring traditions. Our navies are natural partners, and we look forward to continuing to strengthen the bonds and personal relationships between our navies," according to the US 7th Fleet spokesman.

A regularly scheduled naval training exercise that has grown in scope and complexity over the years, *Malabar 2012* is the latest in a continuing series of exercises conducted to advance multinational maritime relationships and mutual security issues.

Among the vessels that took part near and off Chennai were the aircraft carrier USS *Carl Vinson* (from whose deck the body of slain Al-Qaida chief Osama bin Laden was allegedly disposed off in a sea burial) and Indian Navy's Guided Missile Frigate INS *Satpura*.

The guided-missile cruiser USS *Bunker Hill*, the guided-missile destroyer *USS Halsey*, a logistics ship, P-3C aircraft and a submarine also participated in the exercise from the American side. "The Indian Navy and the US 7th Fleet have a common understanding and knowledge of a

shared working environment at sea. This exercise helps to advance the level of understanding between our sailors and we hope to be able to continue this process over time," stated the US Navy spokesman.

The naval cooperation between India and the USA reflects the "long-term defence relationship between both countries," the Indian Navy spokesman re-iterated adding that over the years the two have collaborated over a wide spectrum of activities and exercises to advance the maritime partnership. Both on-shore and off-shore activities including professional exchanges on operations, such as counter-piracy, carrier aviation, maritime patrol and anti-submarine warfare were conducted over the 10-day exercise.

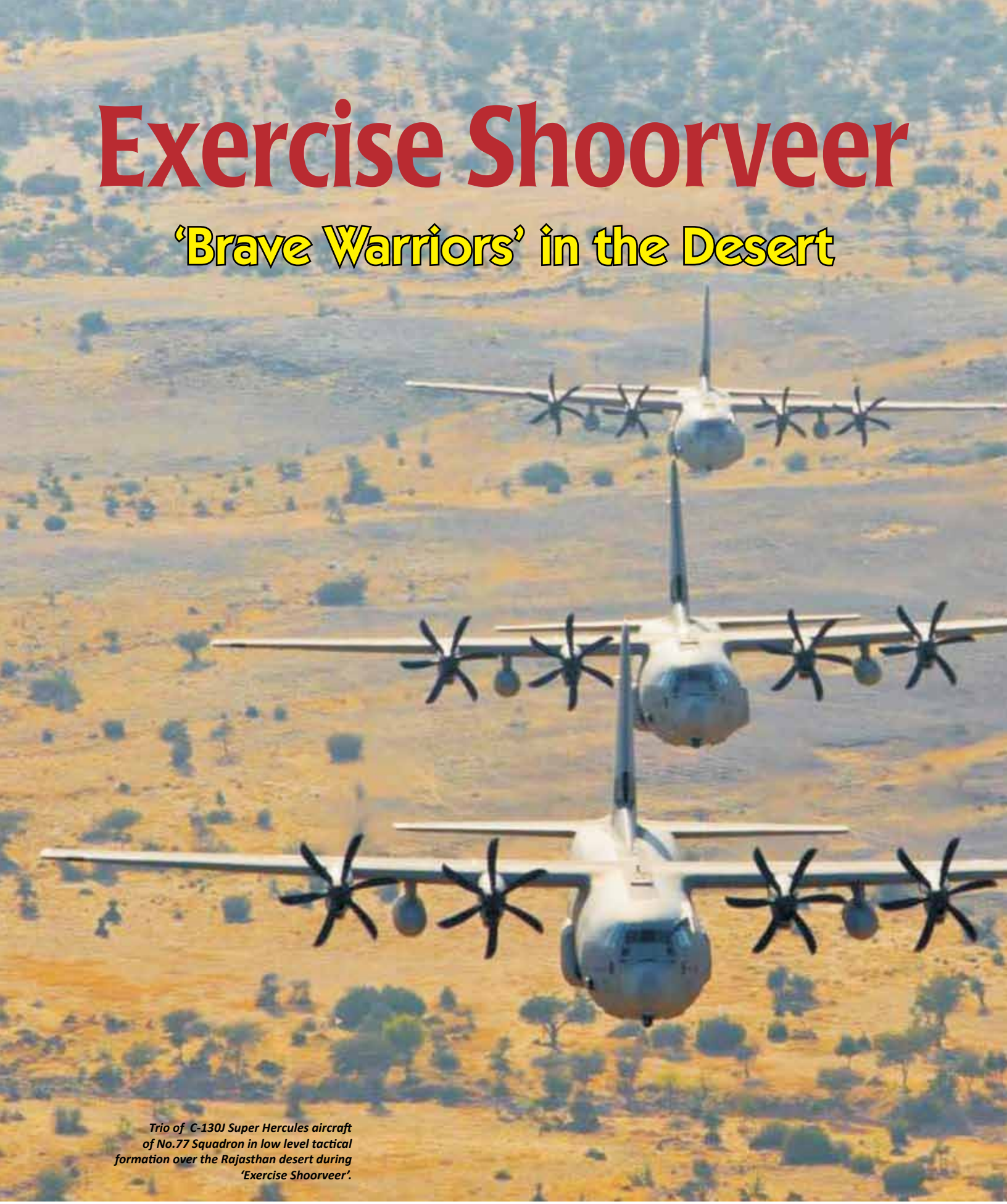
Phase I of the at-sea training was conducted in the vicinity of Chennai while Phase II was conducted in the Bay of Bengal and west of the Nicobar Islands. They were designed to advance participating nations' military-to-military coordination and capacity to plan and execute tactical operations in a multinational environment. "Events planned during the at-sea portions included liaison officer professional exchanges and embarks, communications exercises, surface action group operations, helicopter cross-deck evolutions, underway replenishments, gunnery exercises, visit, board, search and seizure, maritime strike, air defence exercises, encounter exercises, shore-based surface strikes and anti-submarine warfare," according to the US Naval spokesman.

Rajput-class destroyer INS Ranvijay.

Fleet replenishment tanker INS Shakti (A57), along with Rajput-class destroyer INS Ranvir (D54) and Kora-class corvette INS Kulish (P63).

Exercise Shoorveer

'Brave Warriors' in the Desert



Trio of C-130J Super Hercules aircraft of No.77 Squadron in low level tactical formation over the Rajasthan desert during 'Exercise Shoorveer'.

Exercise 'Shoorveer' took place in the deserts of Rajasthan from 1May2012, witnessed by General VK Singh, then Chief of Army Staff who was received at the 'battle ground' on third day of the exercise by Lieutenant General Gyan Bhushan, COC-in-C, South Western Command, plus other senior Army and Air Force officers.

GOC I Strike Corps, Lieutenant General Ashok Singh, briefed the Army Chief on details of 'Shoorveer' which predominantly involved mechanised battle maneouvres in which MBTs, ICVs, Long Range Artillery, Air Defence Weapon Systems, Electronic Warfare Systems and Surveillance Equipment were operated

ZSU-23-4 Schilka self propelled air defence system

in synergy with the Indian Air Force. The IAF deployed fighter aircraft types including Sukhoi Su-30s, Jaguars, MiG-27s along with Mi-25 attack and Mi-17 assault helicopters plus UAVs. IAF transport aircraft which took part in the exercise were IL-76s, An-32s and the recently inducted C-130Js.

Exercise 'Shoorveer' was based on a series of transformational initiatives spanning organisational structures and absorption of new generation technologies, particularly in the fields of

T-90 main battle tank being maneuvered to firing position

precision munition, advance surveillance systems, space and network centricity and implemented on ground to finetune war fighting concepts.

The Exercise was based on an integrated theatre battle concept under South Western Army Command with I Strike Corps in the offensive, supported by 10 Corps and other elements of the South Western Command. According to a spokesman "The Army and IAF tested new battle fighting concepts and doctrines during the exercise with real time images of the battle zone provided to a centralised command and control centre from fighters, unmanned aerial vehicles and attack helicopters, waging war in network centric environment and massed tank drills backed by long range artillery guns. More than 300 combat vehicles including T-90s and T-72s, 155mm howitzers, multi barrel rockets and about 60,000 troops took part in this major exercise in the Rajasthan desert".

Gunner's eye-view of target under attack by Mi-35 gunship helicopter

Rafael

Tejas Times

Within six weeks of the first flight of the seventh limited series production Tejas LCA (LSP-7), the first LCA Naval variant (NP-1) made its maiden flight at HAL Airport, Bangalore.

The Tejas LSP-7 (KH-2017) took off on its maiden flight from HAL airport at 16:27 hrs on 9 March 2012, the flight lasting 28 minutes with Gp Capt KK Venugopal at the controls in the cockpit and Wg Cdr Kabadwal of the National Flight Test Centre (NFTC) as Test Director in the telemetry. During the test flight, performance of the aircraft systems including Multi-mode Radar (MMR), Helmet Mounted Display System (HMDS), Auto-pilot and Instrument Landing System (ILS) "was satisfactory, providing a moment of pride for all the stakeholders which include ADA, HAL, IAF, CEMILAC, DGAQA, ADE and NAL among others".

LSP-7 airborne

This test flight is significant for the programme, as the LSP-7 build is close to the initial operational clearance (IOC) standard. Accordingly, Tejas LSP-7, along with LSP-8 will shortly be offered to the Indian Air Force for user evaluation trials (UET). The flight was also significant considering the fact that for the first time, Production Test Schedule was used for the first flight of a LSP aircraft in this programme. Also for the first time, maiden flight of a prototype was not accompanied by the customary 'chase' aircraft, which is an indicator to the level of confidence in the Tejas Light Combat Aircraft.

LSP-7 streams brake parachute on landing.

NP-1 taxing out

The first LCA Navy prototype (NP-1) with tail number KHN-T 3001 made its long awaited maiden flight on 27 April 2012, from HAL Airport Bangalore. Piloted by Commodore TA Maolankar, Chief Test Pilot at the NFTC with Wg Cdr M Prabhu in the second seat, NP-1 took off at 12.10 hrs for the flight which lasted 20 minutes within the designated flight envelope and carried out the planned test "successfully". NP-1 had had its roll out nearly a year earlier, in July 2010 and the delays in first flight are also attributed to concerns by the Centre for Military Airworthiness and Certification (CEMILAC) on structural issues.

The LCA Navy flew with its landing gear extended 'which is standard practice' and gave observers a good look to examine this undercarriage which is different from the land-based LCA. However, there was no tail hook which is a major design requirement for carrier based aircraft. As per carrier aircraft design experts, the landing

NP-1 airborne

NP-1 climbs out

gear is a critical path baseline design item for carrier aircraft and significant upgrading to the vertical load capability for nose and main gear is required which should be about twice as capable as the land version to absorb the increased vertical loads.

Launch and recovery are the other key baseline areas for the naval variant. For arrested landings into the wires the position of the hook, plus the level of damping to prevent hook bounce are the critical design issues. That and the fuselage attachment point take huge longitudinal stress loads.

According to the development plans, there will be two Naval LCA prototypes, the two-seat trainer (NP-1) followed by a single seat fighter (NP-2) as technology demonstrators to carry out carrier suitability certification and weapons integration. HAL is the major partner to ADA for the Design & Development of the Light Combat Aircraft and in the Naval variant, the responsibilities of HAL include design of general systems including fuel system, environmental control system, hydraulics, electrical, communication system, landing gear, arrestor hook, LEVCON (Leading Edge Vortex Control Surface) to reduce the forward speed of the aircraft during carrier landing, telescopic landing gear with high sink rate, arrester hook for deck recovery and fuel dump system for emergency deck recovery.

The LCA Navy is specifically designed for take off from a 14 degree ramp on the aircraft carrier's deck and use the arrester hook system to facilitate landing within the deck length of 90 meters. HAL is also responsible for manufacturing of prototypes, system integration and installation, ground testing and the Integrated Fight Control System Test facility.

Commodore TA Maolankar after test flight, seen with PS Subramanyam, Director LCA programme at ADA.

The second technology demonstrator (TD-2) of HAL's Light Combat Helicopter in test flight at Bangalore.

HAL Flies On

Although the official HAL Press Release giving financial highlights for 2011-12 declares this as 'an impressive financial performance', in fact the PSU's sales turnover at Rs 14,001 crore, registering a growth of 6.74% over the previous year is less than half that of the 14.5% posted in the previous financial year.

Profit before tax, however has increased by 12.6% to Rs 3200 crores, up from the previous Rs 2840 crores. An interim dividend of Rs 747.70 crores has been paid for the year 2011-12, which is 620% of the paid-up capital. The Company for the 11th year running has met all the targets set in "Excellent" category in respect of the MOU concluded with the Government of India, for the year 2011-12.

As for "major achievements" during the year, HAL highlights that :

- All flight trials for the turret gun and rocket have been completed for the ALH-WSI, which marks a significant milestone towards certification.
- On the Tejas Light Combat Aircraft, LSP-7 has made its maiden flight and this will be offered to IAF for user evaluation trials.
- First flight of Light Combat Helicopter (TD-2) was carried out. TD-2 has weight reduced parts, optimised transmission system and incorporates several improvements based on flight evaluation of TD-1.
- Detailed design and analysis of structural parts of the Light Utility Helicopter (LUH) have been completed.

Amongst the aircraft produced and delivered to the customers (essentially Indian Air Force, but also the Army and Coast Guard) were some 26 Su-30MKIs, 15 Hawk AJTs, 24 Dhruv ALHs, 6 Dornier 228s plus miscellaneous helicopter types.

In fact HAL have an enormous reservoir of orders, having received Rs 83,754 crore worth in the previous financial year which HAL's annual report described as "healthy". "The order book position for new aircraft and helicopters is healthy with orders for Sukhoi Su-30MKI, Hawk Mk.132, Dornier 228, Tejas LCA, HJT-36 Intermediate Jet Trainer, Dhruv Advance Light Helicopter (ALH) and Chetak, worth Rs 68,265 crore".

HAL also booked export orders worth Rs 352 crore during 2010-11, which includes orders for supply of avionics for Su-30MKI to Rosoboronexport, Russia,

HAL-built Dornier 228 for the Indian Coast Guard at Chakeri (Kanpur)

RUAG

Dhruv ALHs of the Indian Army. The armed version (Rudra) is under final development.

supply of spares, services and technical assistance to Malaysia towards maintenance of helicopters and aircraft. What is not revealed is the value of Dornier 228 assemblies (including the wing) supplied to RUAG Aerospace of Germany, with each shipset costing Rs 6 crore and some 8 aircraft sets exported thus far.

An expenditure of Rs 986.96 crore was incurred on various Research and Development projects as compared to Rs 832.12 crore in the previous year. This must be augmented greatly as there are major R&D expenditures ahead, with the Multi-Role Transport Aircraft (MRTA), Fifth Generation Fighter Aircraft (FGFA), Light Combat Helicopter (LCH), Light Utility Helicopter (LUH), Hindustan Turbo Trainer (HTT-40) programmes on the anvil.

At the same time, the Government of India is close to a final decision on disinvestment in HAL, after receiving the recommendations of an expert group constituted by the Government for suggesting measures for strengthening and restructuring of HAL.

According to Defence Minister AK Antony in his statement to Parliament on 7 May, "the disinvestment is expected to reduce the government burden for the 10-year Rs.20,000 crore modernisation plans for the Bangalore-headquartered HAL, which is slated to take up new programmes with foreign collaboration in the future …."

Defence Minister AK Antony at the HAL stand at DefExpo 2012, also seen RK Tyagi, Chairman and P Soundara Rajan, MD Helicopter Complex.

First 'Raw Material Phase' Sukhoi Su-30MKI built by HAL Nasik Division

Avi Oil

"Fly Higher, Faster and Further"

A400M banks shaply

The Airbus TMB'12

Vayu was invited by Airbus Military and Airbus Commercial for interactive sessions where updates from Airbus Divisions and products was presented. Usually the two divisions hold separate tours in the year; this year both combined their Trade Media Briefing (Airbus Military TMB'12) and Airbus Innovation Days'12 (Airbus Commercial) back-to-back. Starting 20 May we were with Airbus Military and from 23 May onwards, with the commercial division.

Since much was shared and discussed, in this issue we shall cover Airbus' military activities (TMB'12) while Innovation Days will be detailed in the forthcoming Issue IV (July/August 2012).

First stop was at the Airbus Getafe plant where we given a market overview, commercial update, product update and competitive marketing positioning at Airbus Military. A coffee break later, we were given an engineering and technology update as well as the latest on the A330MRTT programme. Later in the day there were detailed presentations on the A400M and training for entry into service by the aircraft. Since most of the test A400M aircraft were in Toulouse (France) at that time, we then headed for France briefed on.

At the Airbus Delivery Centre in Toulouse we were briefed on the A400M and its EIS (Entry Into Service) and an A400M programme update. A presentation on the flight test update later, we went into out of the test aircraft. Technicians and pilots were available to clear our doubts and questions- a very impressive aircraft indeed !

Alongside, during various points of the two days, we were given briefings on Airbus' Light and Medium Division responsible for the CN-235, C-295 and C-212.

The Military Family

Airbus Military is the only military and civic/humanitarian transport aircraft manufacturer to develop, produce, sell and support a comprehensive family of airlifters ranging from 3 to 45 tonnes of payload. Airbus Military's product range includes the three to nine tonnes payload Light & Medium Family, comprising the C212, the CN235 and the C295 workhorses, the all new 37-tonne A400M "designed for the needs of the 21st century", as well as the A330 MRTT "the benchmark in Multi Role Tanker Transport aircraft", and further military derivatives based on Airbus commercial aircraft. Altogether, Airbus Military has sold more than 1,000 aircraft to some 130 military, civilian and governmental customers. More than 800 of these aircraft have been delivered.

Airbus Military A400M receives initial type certificate from EASA

Airbus Military has received the initial type certification for the A400M, marking a key milestone towards first delivery around end of the year. This first approval, known as a Restricted Type Certificate (RTC), was presented by European Aviation Safety Agency (EASA) Executive Director Patrick Goudou at an internal ceremony in Toulouse, France.

The RTC is a critical step towards the award of full civil type certification which is expected in mid-2012 following the completion of 300 hours of function and reliability (F&R) flight tests, and towards military Initial Operating Clearance later in the year.

As part of the flight-test activity the A400M has recently flown to countries in Latin America and South East Asia, and in the upcoming period will travel to the "home" nations that ordered the aircraft and the Middle East in the frame of the F&R tests.

The fleet of five A400M development aircraft continues to make "good progress" in the intense flight-test campaign in order to "ensure delivery of a reliable aircraft to our customer" and has now completed more than 3,100 hours in the air, despite continued engine challenges.

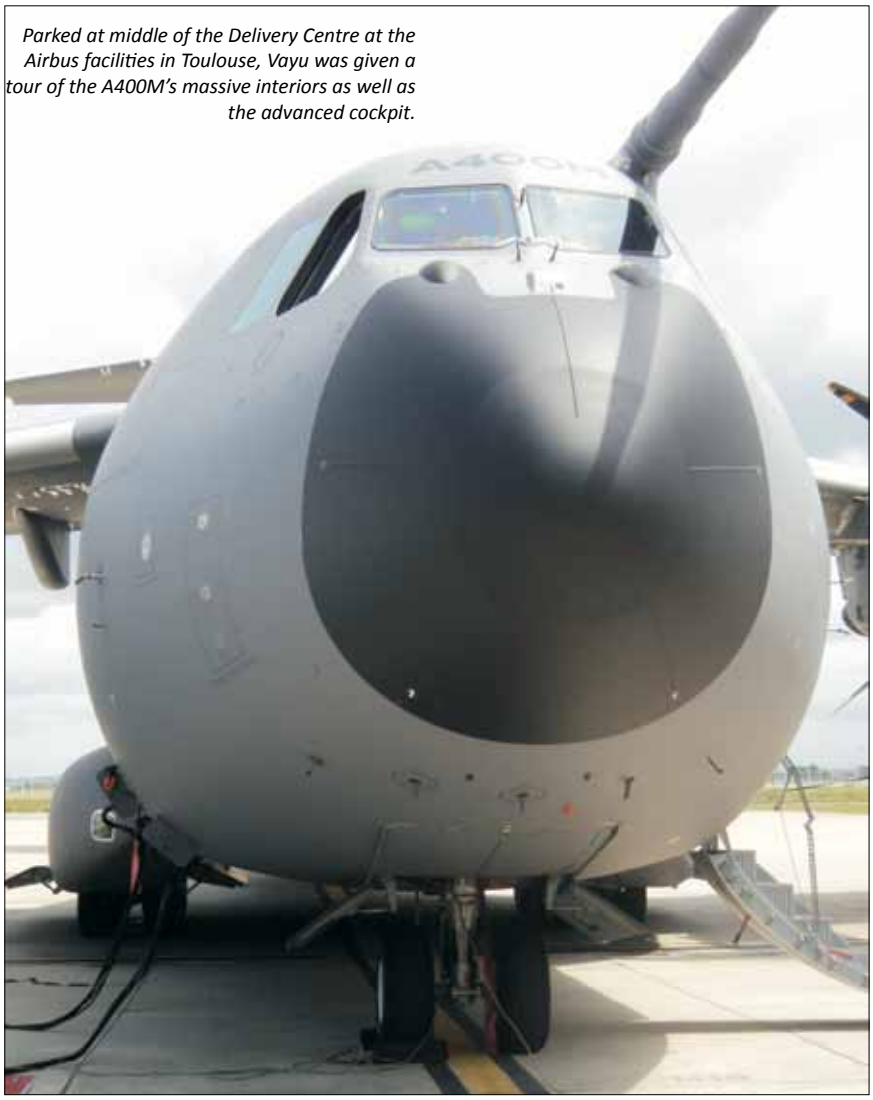
Headquartered in Madrid (Spain), the company's facilities are essentially based in Spain. Its main sites are Getafe, close to Madrid, where civil Airbus A330 airframes are converted into Multi Role Tanker Transport (MRTT) aircraft, and Seville, where the San Pablo factory, south of the airport, hosts the A400M as well as the complete production and final assembly of the C212, CN235 and C295.

Airbus Military was formally created in April 2009, following the integration of the former Military Transport Aircraft Division (MTAD) and Airbus Military *Sociedad Limitada* (AMSL) into Airbus. This integration allows for a single and streamlined organisation. Airbus Military has its own P&L accounting, and employs more than 5,000 people.

The A400M is the all new military airlifter designed to satisfy not only the Armed Forces' needs in the 21st Century, but also those of humanitarian aid and other civil missions to the benefit of society. It is able to fly higher, faster and further while retaining high manoeuvrability, low speed and short, soft and rough airfield capabilities. With its cargo hold specifically designed to carry today's outsize equipment, it can bring this material much faster and directly to where it is most needed, be it for military or humanitarian missions. Conceived to require very little maintenance, the A400M "is extremely reliable and available."

Being able to combine both tactical and strategic/logistic missions, and also act as a tanker, it can perform the job of three different types of aircraft as one. Doing more with less, the A400M means less investment from the operator. The A400M features technical innovations in all areas, from the airframe structure and materials to its aerodynamic design, its all new turboprop engines its fly-by-wire controls and related advanced flight-deck.

In order to reduce weight, there has been extensive but careful use of composite materials throughout the structure. Thirty per cent of the A400M's structure is made of composites, which is more than on the A380. Following the principle of applying the best material for every part, depending on the expected loads and potential damage by foreign objects on the ground, composites are



Parked at middle of the Delivery Centre at the Airbus facilities in Toulouse, Vayu was given a tour of the A400M's massive interiors as well as the advanced cockpit.

used in those parts where it makes most sense from an operational and maintenance point of view. Parts of the structure which are made of composites include most of the wing, with, for the first time in history, the main spars being made of that material. Nearly the entire tail (the horizontal and vertical stabilizers and the control surfaces), the rear cargo door, the sponsons (undercarriage bays) and the propeller blades (with Kevlar shell) are made of composite. The wing's 19m / 748in skin panels are the largest ever produced. The extensive use of composite material enables the A400M to be much lighter, enhancing its performance both in terms of range and payload.

Once on the ground, the A400M is designed for very rapid and autonomous cargo unloading or loading without any specialised ground support equipment. Fitted with a sophisticated cargo handling system comprising an on-board 32-tonne-capable powered winch and an (optional) five tonne / 11,000 lb-capable crane to load directly from ground level, the cargo hold is optimised for single loadmaster operation from a computerised workstation, where the loadmaster can pre-plan loading from a loads database.

Furthermore, the A400M's landing gear can "kneel" down in order to reduce the angle of the ramp to 6.7 degrees, thereby facilitating the off- and on-loading of large vehicles or oversize equipment such as helicopters or heavy cranes.

One of the key elements to ensure versatility of the A400M was the selection for the aircraft of an all-new, specifically designed three-shaft turboprop engine with eight bladed propellers. The 11,000 shp / 8,200kW TP400 developed by Europrop International (EPI), a consortium comprising Rolls Royce, Snecma, MTU and ITP, is the most powerful turboprop ever built. It allows for the wide range of speeds and flight levels required, while reducing fuel burn and weight. Powered by four of these engines, the A400M can cruise at altitudes as high as 37,000 ft and at speeds between Mach 0.68 and 0.72. This will permit the aircraft to fly above turbulent weather conditions and to be integrated into the commercial aircraft airspace. At the other end of the speed/range envelope, the A400M will be capable of flying at 110 kt / 200km/hr to refuel helicopters, or to para drop equipment and supplies.

Another key feature of the A400M is its computerised "fly-by-wire" flight controls already widely used on other civil transport aircraft, starting with the A320. Replacing

Airbus Military A400M in Malaysia

The Airbus Military A400M new generation airlifter recently arrived in Malaysia at the Royal Malaysian Air Force (RMAF) Subang Airbase as part of its Asia tour, where a welcome ceremony took place in the presence of the Chief of the Royal Malaysian Air Force. The visit, the first time that the A400M was in Asia, gave the Malaysian Government and Air Force a chance to see the A400M at first hand. The Malaysian Government has ordered four of the new aircraft which has as its launch customer nations Belgium, France, Germany, Luxembourg, Spain, Turkey and the UK.

A400M makes first refuelling contacts with A330 MRTT

The Airbus Military A400M new generation airlifter has successfully performed simulated refuelling contacts with an Airbus Military A330 MRTT Multi Role Tanker Transport making some 30 contacts with the hose and drogue of the A330 MRTT's Fuselage Refuelling Unit (FRU). No fuel was passed in these tests which consisted of "dry contacts". The A330 MRTT that took part in the tests is one of the aircraft to be delivered to the Royal Air Force, where it is known as Voyager, as part of the Future Strategic Transport Aircraft (FSTA) programme. The FRU is typically used to refuel large aircraft such as the A400M and the tests demonstrated the stability of both aircraft when flying in close formation when refuelling.

Europrop delivers engines for 1st production A400M

EPI Europrop International (EPI) has started delivery of the first production series TP400-D6 engines which will power the French Air Force's first A400M military transport aircraft into service in early 2013. The engines were assembled in Munich from modules produced by the four EPI partner companies - ITP, MTU, Rolls-Royce and Snecma - prior to testing in Berlin and dispatch to the Airbus A400M final assembly line in Seville, Spain.

Commenting on the event, Simon Henley, President of Europrop International, said: "The delivery of our first production TP400 marks a significant milestone in the engine programme. We'll now see a rapid ramp up our production rates as we begin a new chapter of the EPI story. "Meanwhile, the engine continues to perform well in the flight test programme. We have now accumulated over 10,000 flying hours as we build towards the entry into service of an aircraft and engine that will bring a significant improvement in operational capability to customers."

The TP400 engine was certified by EASA in May 2011. Since the first engine run in 2005 the TP400 has completed over 20,000 running hours, both in flight and on the ground.

the conventional cables and pulleys by electrical wires linked to four independent flight control computers which send signals to actuators, not only reduces weight, but also maintenance time. This also gives a much greater precision to the commands. Furthermore, fly-by-wire controls permit the implementation of "flight envelope protection" which, by preventing the aircraft from stalling, allows the pilot to achieve optimum performance in an extreme and critical escape manoeuvre by simply pulling the stick full back. The fly-by-wire system then manages the whole aircraft configuration accordingly, without the pilot having to intervene further.

The A400M also features two foldable Head-up-Displays (HUD) which provide the pilots with all primary flight information together with Flight Director guidance during critical mission phases, such as landing at unequipped airfields, in-flight refuelling or low-level flight. The optional Enhanced Vision System (EVS) based on Forward Looking Infra Red (FLIR) technology generates a sensor based image of the environment in front of the aircraft in low visibility conditions. The EVS image is displayed on the HUD to provide the pilots with additional visual cues.

Airbus Military A400M in rough field tests

The Airbus Military A400M has completed its first set of unpaved runway tests at Cottbus-Drewitz airfield in Germany. Grizzly 2 performed a series of ground runs on the grass surface including maximum-braked rejected take-offs. Analysis of the data and examination of the runway are now underway and the aircraft will return in due course for further trials.

International media and Airbus' public relation personnel from around the world in front of the A400M especially flown to the Airbus Delivery Centre in Toulouse.

The A330 MRTT

The A330 MRTT is the only new-generation Multi Role Tanker Transport aircraft flying, and fully certified, today. Having demonstrated its capability during an extensive Flight Test campaign and following a first delivery in early June 2011, it made its first flight in RAAF service in September 2011. In April 2012 it entered service with the UK Royal Air Force as the *Voyager*. The A330 MRTT uniquely offers simultaneous military strategic air transport and air-to-air refuelling capabilities, the only aircraft able to perform simultaneously three different types of missions: Aerial Refuelling (Tanker role), passenger and/or freight transport, and/or medical evacuation (MEDEVAC) – making it "exceptionally productive". Additionally, its fuel capacity is sufficient to supply the required quantities without the need for any additional tanks, nor major structural modifications and it is able to carry more passengers and more freight than any competing type.

The A330 MRTT is based on the medium–to long-range, twin-aisle, twin engine commercial aircraft of the Airbus family, the A330. More than 1,100 of these have been sold to some 90 customers and over 800 are operated all around the globe, ensuring easy support and many years of commercial life ahead.

Derived from the successful A330-200 series which has a wing large enough to hold all the fuel needed to make it the "highest performing tanker," the A330 MRTT is able to carry up to 111 tonnes/245,000 lb of fuel in its wings alone. Without the need for any additional fuel tanks, it retains its full and simultaneous passenger and cargo carrying capability. The A330-200 has a range of up to 8,000 nm/ 14,800 km, with a maximum speed of Mach 0.86.

Uniquely, the A330 MRTT can refuel any kind of receiver. To refuel receptacle-equipped aircraft such as the F-16 Fighting Falcon, F-35A Lightning II, or even the A330 MRTT itself when fitted with an Universal Aerial Refuelling Receptacle Slipway Installation (UARRSI), it is provided with the Airbus Military Aerial Refuelling Boom System (ARBS), the only certified new generation boom, which also allows the fastest fuel transfer and hence greatly reduces the refuelling operation time. Refuelling can be performed at any altitude up to 35,000 ft while cruising at speeds between 180 kt and 325 kt. To refuel probe-equipped receivers such as on the Eurofighter, Tornado, or Sukhoi Su-30, the A330 MRTT is fitted with two Cobham 905E under-wing hose and drogue pods. Large probe-equipped aircraft such as the A400M or C295

Airbus Military A330 MRTT in RAF service

The Airbus Military A330 Multi Role Tanker Transport made its maiden flight in service with the Royal Air Force on 8 April. Known as the Voyager in RAF service, the aircraft took off from RAF Brize Norton for a training sortie around the United Kingdom to allow the AirTanker crew to familiarise themselves with the aircraft and achieve the first part of the Voyager crew training schedule. The Voyager aircraft was delivered by Airbus Military to AirTanker, the company

formed to operate and support the Voyager for the UK Ministry of Defence under the Future Strategic Transport Aircraft programme, Airbus Military has to deliver 14 converted aircraft to AirTanker, of which two have already been converted from the basic A330-200 in Getafe and another two are in conversion at Cobham facilities in the UK. The Voyager has both military and civil certification and the service will operate aircraft on both the military and civilian registers.

At the Getafe factory: MRTT conversion in progress

can be refuelled via the Cobham 805E Fuselage Refuelling Unit (FRU).

The AAR (Air-to-Air Refuelling) systems are controlled from an advanced Fuel Operator Console in the cockpit which features an Enhanced Video monitoring System to perform day and night refuelling. To fly further or stay longer on station, the A330 MRTT can also be fitted with an Universal Aerial Refuelling Receptacle Slipway Installation (UARRSI) which allows refuelling from another tanker's boom.

The A330 MRTT can also be used for towline missions, whereby it can be on station at about 1,000 nm (1,850km) from its base for some four hours 30 minutes, with the capability to provide 50 tonnes lb of fuel for receivers. Or it can provide 60 tonnes of fuel while remaining on station for five hours at 500 nm (930 km) from base. It enables, for example, four Eurofighters to fly 3,600 nm (6,700 km) by refuelling them en-route, or, when carrying 20 tonnes of payload, to deploy four fighters a distance of 2,800 nm (5,200km).

With its true widebody fuselage, the A330 MRTT is ideal for carrying a wide range of military or humanitarian payloads on strategic missions. Furnished with an attractively modern design, the cabin is conceived to ensure optimum seating configurations in every class, maximising both capacity and comfort. These features enable a complete range of configurations, from pure troop transport to the complex customisation required for VIP guests. It can accommodate a large variety of layouts, from 253 seats in a three-class configuration, through 270 passengers in two classes, or some 300 in a single class layout.

The A330 MRTT is also designed to carry a cargo payload of up to 45 tonnes. Thanks to its optimised fuselage cross section, the cargo can conveniently be carried under-floor in any of the standard containers and pallets, ranging from the LD1 to LD3 and LD6, as well as the standard 463-L NATO military pallets, which can be loaded onto the aircraft through a proven semi-automatic cargo loading system. Some of the cargo can also be carried as non-palletised "bulk".

The main deck cargo compartment can also be used for cargo, as required, when the aircraft is specified as a freighter. In this instance the main deck is fitted with a large upper deck cargo door and cargo loading devices in the main deck floor. This allows the A330 MRTT to carry up to 26 463-L NATO military pallets. Furthermore, the aircraft can also be configured as a combi, to carry freight in the forward part of the main deck and passengers in the aft part.

The A330 MRTT is also a strategic medical evacuation (medevac) aircraft with a widebody cabin capable of carrying, from prepared airfields, up to 130 stretchers over intercontinental distances in comfort. The A330 MRTT is offered with a customised suite of military avionics and a mission system integrated with civil avionics. A comprehensive survivability package including a Defensive Aid System (DAS), fuel tank inerting system and an armoured cockpit are available.

RAAF carries 220 passengers in A330 MRTT

An Airbus Military A330 MRTT multi role tanker transport of the Royal Australian Air Force, designated the KC-30A, has flown the highest number of passengers ever carried by the service in a single flight. The aircraft of No.33 Squadron RAAF carried 220 passengers from the Australian Defence Force Academy as well as its 14 crew, on a two-hour flight from Defence Establishment Fairbairn. The sortie was part of the squadron's induction into service of the KC-30A which is capable of carrying 270 passengers in the configuration selected by the RAAF.

A prototype of the C295AEW under development seen making its first flight. Equipped with IAI Elta sensors, the platform should be ready in 3-4 years

The Airbus Military light and medium transport aircraft range

As recorded earlier, Airbus Military is the only supplier of transport aircraft to produce a comprehensive range of airlifters offering payloads from 3 to 45 tonnes. For maritime and coastal patrol, the three members of the light and military family provide a "flexible solution for all budgets" and numerous tasks that has made them the "aircraft of choice for armed forces and security agencies across the world". They are quickly convertible from one transport configuration to another, making them very useful to the many operators faced with a diverse range of civic tasks. In less than an hour the aircraft can be switched from carrying personnel to a medevac role, or to a cargo layout including aerial delivery equipment if required.

EADS North America delivers final CN235 MPA for Mexico

EADS North America has delivered the fourth and final Airbus Military CN235-300 Maritime Patrol Aircraft (MPA) to be supplied to the Mexican Navy under a U.S. Coast Guard managed foreign military sales agreement. The Coast Guard employs the CN235-300 in the HC-144A Ocean Sentry configuration for a range of missions, including search and rescue, disaster relief and drug interdiction. In March, a Coast Guard HC-144 crew used the aircraft's sensor capabilities to locate and help interdict a semi-submersible "drug sub" in the Western Caribbean Sea.

The MPA configuration of the CN235 incorporates the latest technology developed for surveillance over the sea. The combination of a Forward Looking Infrared (FLIR) system and search radar allows the aircraft to locate and track ships to conduct thorough patrols of a coastline. The Automatic Identification System (AIS) and the Fully Integrated Tactical System (FITS) help make this aircraft "the ideal tool to carry out military surveillance missions for the Mexican Navy." The FITS was developed by Airbus Military and ensures that the extensive data gathered by the aircraft's onboard sensors can be easily used by the crew to execute their mission.

In the transport role all these aircraft feature a rear ramp to allow for easy loading and unloading, especially in ill-equipped operating locations and a cargo compartment that is completely unobstructed and adaptable to operators needs. They have hardened cabin floors to cope with concentrated loads and STOL performance with robust landing gear designed to handle soft (CBR2) and unpaved terrain.

For maritime patrol, anti-submarine warfare and surveillance missions the aircraft have low-level flying characteristics with up to 3g manoeuvrability and, for the CN235 and C295 in particular, a cruise speed optimised for persistent surveillance and wide area coverage.

The Airbus Military C295 is a new generation, robust and versatile tactical airlifter able to carry up to nine tonnes of payload or up to 71 personnel, at a maximum cruise speed of 260 kt /480 km/h. Fitted with a retractable landing gear and a pressurised cabin, it can cruise at altitudes up to 25,000 ft, while retaining remarkable short take-off and landing (STOL) performance from unprepared short, soft and rough airstrips, as well as low level flight characteristics. Powered by two Pratt & Whitney Canada PW127G turboprop engines, the C295 provides "good manoeuvrability, hot and high performance, low fuel consumption and consequently a very long endurance of up to 11 hours in the air."

First delivered in 2001, the C295 is a developed version of the CN235 with many component upgrades, and offers greater capacity and range. The civil and military certification of the C295 ensures compliance with international airworthiness regulations and safety standards, including stringent FAR 25 requirements.

Kazakhstan orders C295s

Airbus military has signed a contract with the Kazakhstan Ministry of Defence owned state company Kazpetsexport to supply two C295s. The deal encompasses the related support package for spare parts and ground support equipment. According to the company, a Memorandum of Understanding (MoU) has been signed for a further six C295s, for which separate firm contracts will be signed over the next few years. The first two will be delivered by April 2013 and a delivery schedule for the remaining six will be defined over the following years. As per the terms of the MoU, Airbus Military will also provide technical expertise until such time as the Kazakhstan Air force is able to provide full support for the aircraft without external assistance.

U.S. Coast Guard order additional Airbus Military CN 235s

The U.S. Coast Guard has exercised a $78.5 million contract option to purchase the service's 16th and 17th HC-144A Ocean Sentry Maritime Patrol Aircraft. The HC-144A is based on the Airbus Military CN235 tactical airlifter, more than 250 of which are currently in operation by 27 countries. The option is part of a contract awarded in August 2010 for three aircraft, plus options for up to six additional aircraft.

Under this contract, Airbus Military, via prime contractor EADS North America, has already delivered two HC-144As, the 12th and 13th for the service – both on budget and ahead of schedule. The 14th aircraft is due for delivery by July. The Coast Guard exercised the first option on the contract for the 15th HC-144A in August 2011, with delivery expected in 2013. The 16th and 17th aircraft will be delivered in 2014. The remaining options left on the contract, for up to three additional aircraft, can be exercised sometime in the next two years. The U.S. Coast Guard plans acquisition of some 36 HC-144As.

Being 12.7 m / 41 ft 8 in long, the C295 has the longest unobstructed cabin in its class, accommodating up to 71 seats, offering a much higher personnel carrying capability than its peers in this segment. For the same reason, it can carry much more palletised cargo (up to five standard HCU-6E pallets) with direct off-loading through its rear ramp door.

The CN235 is the "lowest cost solution to meet the needs and requirements of governments and air forces, as well as non-governmental organisations in the light and medium airlift field". Able to carry up to six tonnes of payload, or up to 51 personnel, the CN235 has gained vast experience in daily airlift missions, in the deployment and logistic support of peacekeeping forces and in disaster relief operations.

The CN235 cruises at altitudes up to 25,000ft, and speeds up to 245kt (454 km/h) while retaining low level flight characteristics, as well as short take-off and landing (STOL) thanks to its robust landing gear. Powered by two General Electric GE CT7-9CE, 1,750 shp turboprop engines, the CN235 provides great manoeuvrability, fast engine response, very good hot and high performance, low fuel consumption and consequently a very long endurance of up to 11 hours.

The CN235's reliability and dependability have also been well demonstrated. In service with some 40 operators worldwide, the aircraft has accumulated over one million flight hours. And with more than 270 sold, the CN235 is the best selling airlifter in the light/medium segment.

The C212 is the smallest member of the family with a 2.8 tonne maximum payload. The type has lengthy operating experience in desert, jungle and Antarctic conditions where it was designed to operate for extended periods without requiring ground support equipment. Its STOL performance coupled to sturdy landing-gear with low-pressure tyres make it uniquely capable of handling the roughest of landing strips.

In the transport role it can carry two standard pallets; bulky loads such as light vehicles, aircraft engines or rotor blades; or up to 24 paratroops plus jumpmaster.

Oman order eight C295 aircraft

The Royal Air Force of Oman (RAFO) recently signed a contract with Airbus Military for the acquisition of eight C295 aircraft, five of them configured as tactical transports and three as maritime patrol aircraft (MPA). They will be delivered from next year. As well as upgrading the tactical transport capability of the RAFO in hot and dusty conditions, the aircraft will enhance Oman's ability to patrol its territorial waters and to conduct missions against piracy,

An example of the C-295 seen here in Columbian Air Force colours

illegal immigration and smuggling. Oman becomes the first country of the Gulf Cooperation Council to order the C295, and is the fourth customer to order the C295 in the MENA region and the first in the area to order the C295 for maritime patrol operations. Two Airbus Military CN235 aircraft are already operated by the Royal Oman Police.

With this, a total of 108 C295s have now been ordered, with 85 currently in operation with 13 countries.

Final Korean Coast Guard CN-235 delivered

The fourth and final Indonesian-built CN-235 MPA maritime patrol aircraft for the Korean Coast Guard has been delivered. The contract had been signed in December 2008 and the first two were delivered to Korea in early May 2011. The third aircraft then followed on 27 December 2011. Korea still has outstanding options for eight CN-235s, covering aircraft for both the Coast Guard and the Republic of Korea Air Force (ROKAF). The split between CG and ROKAF examples has not been announced. Negotiations to convert these into firm orders will commence in 2013. Currently, the ROKAF has six standard transport CN-235s in service, together with two VIP variants.

Civility in Begumpet

India Aviation 2012

The Third International Exhibition and Conference on Civil Aviation, *India Aviation 2012*, was held in Hyderabad from 14 to 18 March at Begumpet airport. The aviation show was jointly organised by the Ministry of Civil Aviation, Government of India and the Federation of Indian Chambers of Commerce and Industry (FICCI) and was formally inaugurated on 14 March by the Minister for Civil Aviation, Ajit Singh. The Chief Minister of Andhra Pradesh, Kiran Kumar Reddy was the Chief Guest. Dr. Nasim Zaidi, Secretary Ministry of Civil Aviation, RV Kanoria, President, FICCI and their teams were behind the excellent show put up this around. Once more, *Vayu* was supporting media with its stand in Hall C.

Spread over more than 20,000 sq. mtrs. of exhibition area, some 250 exhibitors showcased products and services on the civil aviation industry. The event provided very good networking opportunities. A total of 18 hospitality chalets were taken by various companies from India and overseas to have meetings with their prospective customers in typical Air Show atmosphere. *India Aviation 2012* received great response with participation from 18 countries and attended by more than 8,000 business visitors.

At the static park 25 aircraft were on display and this year, UK was the 'Partner Country', France the 'Focus Country' and USA the 'Guest Country'. Andhra Pradesh was the host state for India Aviation 2012. India Aviation 2012 was supported by Air India, Pawan Hans Helicopters Ltd., Directorate General of Civil Aviation, Business Aircraft Operators Association.

Some of the highlights of the show included the Boeing 787-8 series Dreamliner (showcased for the first time at India), participation from UAC/ Sukhoi with their Sukhoi Superjet 100 airliner, Embraer's new business jets Phenom 300 and 100 and Irkut with their MC-21 cabin mockup. Leading business and commercial aircraft manufacturers including Airbus, Boeing, Bombardier, Dassault, Gulfstream, Hawker Beechcraft and Piaggio Aero had major presence. Helicopter companies like AgustaWestland, Bell Helicopter, Eurocopter and Sikorsky were conspicious.

In full support were engine manufacturers GE, CFM, Safran, Pratt & Whitney, Rolls-Royce and IAE at the event.

According to Kapil Kaul who leads CAPA (Centre for Asia Pacific Aviation), India will become the world's third-largest aviation market by 2020 but he examined whether the country has the right investment, infrastructure and regulatory system to enable this growth. "Technology and innovative practices will play a key role in meeting the challenge of growth but here we find that IT is not always considered a tool of strategic importance".

Aviation in India has changed hugely since 2000 when just one carrier flew overseas. Today there are seven; annual passenger traffic has increased from 42 million to 150 million; and the 'VT' registered airliner fleet has grown from 119 aircraft to 437. The low cost sector has grown massively and now represents 70 percent of the market. CAPA predicts that by 2020, 452 million passengers will fly each year and there will be 1,030 aircraft in service. This will make India the world's third-largest aviation market.

Indian aviation has seen financial turbulence in recent years, but continued investment is vital if the industry is to meet the challenges of growth. Total investment in the Indian air transport industry since 2000 is estimated at US$27 billion and is expected to reach US$120 billion by 2020, of which US$80 billion will be spent on new aircraft. To meet the demands of air transport in 2020, up to US$2 billion will have to be spent on air traffic control and more than US$1.5 billion on upgrading security.

Dr. Nasim Zaidi, Secretary Ministry of Civil Aviation stated, "The huge growth in air traffic presents a number of challenges. To address these, investment in infrastructure and skills will be needed. Perhaps even more importantly, technological innovation will be required to bring efficiency and speed to the sector". Kapil Kaul further observed that "Technology today has the potential to become far more pervasive and to transform the operations of airlines, airports, service providers and border control. The aviation industry can leverage technology not only to deliver functionality and cost efficiencies, but to drive enhanced passenger experiences, new commercial revenue streams and improved security".

According to Airbus' latest market forecast, Indian carriers will require 1,043 new passenger (1,020) and freighter (23) aircraft valued at US$145 billion between now and 2030 to satisfy surging annual demand. India's requirement for new aircraft makes it the world's fourth-largest in both number of aircraft and value. Indian annual passenger traffic growth rates of 7.2 per cent are well above the regional Asia Pacific average growth rate of 5.9 per cent and the world average of 4.8 per cent. Of the requirement for 1,020 new passenger aircraft, some 860 will be for growth and 160 would be to replace the eldest aircraft in the existing fleet of 327 airliners. In real terms, this means that India's passenger fleet will more than triple to some 1,180 aircraft. The new passenger aircraft will include 646 single aisles like the A320 and A320neo Family, 308 twin aisles like the A350XWB and A330, and 66 very large aircraft such as the A380.

Minister for Civil Aviation Ajit Singh at inauguration of the show.

Growing urbanisation and population concentrations combined with a growing middle class and dynamic economic growth are the real drivers of demand and this trend is expected to continue. Despite near term challenges, the Indian economy is forecast to continue expanding, helping India's growth in domestic air travel to reach even higher growth rates of nearly 10 per cent annually, making it one of the fastest growing aviation markets in the world.


House full ! Attendees at the opening ceremony of India Aviation 2012.


Director NAL Shyam Chetty and Dr. Nasim Zaidi, Secretary of Civil Aviation at the CEO's conference.

"By 2030, India's economy is forecast to be fourth-largest in the world creating exceptional potential for growth in the aviation sector. Through our Indian industrial partnerships we are proud to boast that every A320 today is partly made in India," said Dr. Kiran Rao, Airbus Executive Vice-President, Sales and Marketing, and President of Airbus India. "Our engineering and industrial footprint in India supports over 2,000 highly skilled Indian jobs throughout our supply chain, and this figure is growing."

Airbus' partnership with India dates back almost 40 years. Today, virtually half of all A320 forward doors and all flap track

Boeing's 787 Dreamliner before delivery.

Air India Chairman Rohit Nandan and EK. Bharat Bhushan, the DGCA

beams are produced in India. Established in 2006, the Airbus Engineering Centre India (AECI) at Bangalore employs over 270 highly skilled local engineers working in high end analysis and design on all Airbus products. The centre is expected to grow to 450 over the next three years. Airbus recently established a second pilot training centre at Noida (this one in cooperation with CAE and Interglobe) to complement the existing facility at Bangalore. Combined, they will have the capacity to train up to 5,000 pilots and maintenance engineers per year. Airbus' market share of new aircraft orders in India is over 70 percent.

An Airbus ACJ318, the corporate jet version of the A318 airliner, was highlight of the company's presence at the Hyderabad show, marking the first time that any of the company's bizjets were exhibited in India. The Airbus ACJ318 on display is operated by Abu Dhabi-based Al Jaber Aviation, which offers it for VVIP charters. "Corporate jets such as the Airbus ACJ318 are primarily business tools that save time and enhance productivity, but are also an extension of the home and office facilities of company executives and world leaders, who want to take into the air what they have on the ground," commented Airbus CEO Customers, John Leahy. "With the widest and tallest cabin of any bizjet, existing or planned, Airbus corporate jets are best placed to deliver this work and lifestyle benefit," he added. Airbus' ACJ318 is similar in size externally to traditional large bizjets, but has a cabin that is about twice as wide, delivering a new league in comfort, space, and freedom of movement.

Irkut Corporation presents the MC-21 programme in India

Irkut Corporation took part for the first time at *India Aviation* the highlight being presentation of the MC-21 programme for South Asian airlines, as well as government and private aviation-related organisations. The presentations were made by Vice President, Marketing/ Sales of Civil Aircraft, Mr. Kirill Budaev. Representatives of airlines and the government aviation services of India were provided with detailed information on the MC-21 programme, features and advantages of the prospective MC-21-300 and MC-21-200 aircraft.

Kirill Budaev of UAC in front of the MC-21 mockup. UAC is keen to push its upcoming airliner in growing markets, particularly in the Asia-Pacific region.

The full-size mock-up of the passenger cabin and the cockpit of the MC-21 was of particular interest. Pilots of Air India said that the cabin and the interior were definitely "far superior to many airliners available" but added that they would wait to see the actual performance of the aircraft.

The MC-21 programme envisages the creation of short/mid range airliner family with wide range of operational capabilities focused on Russian and international markets. "MC-21's technical performance will exceed the currently available aircraft. Implementation of modern technologies will provide 12-15% operational costs reduction, the increase of comfort level as well as high level of flight safety", stated Irkut officials.

Irkut Corporation has signed contracts and agreements with Russian and foreign companies for delivery of 235 MC-21-300 and MC-21-200 aircraft configured for 181 and 150 passengers respectively in the single class layout.

It features a lounge-like main cabin that welcomes passengers in several different zones, as well as another room that is an office by day and a bedroom with ensuite bathroom at night.

The Boeing 787 Dreamliner made its debut at Hyderabad as part of Boeing's commercial products showcased at *India Aviation*. "The 787 Dreamliner is a game changer and we are proud to bring it to India Aviation 2012, which is a perfect place to showcase the world's most advanced commercial airplane," boasted Dinesh Keskar, Senior Vice-President, Sales Asia-Pacific and India for Boeing Commercial Airplanes. The Dreamliner was on static display from 14 to 16 March, 2012. Decked out in Air India livery, the 787 Dreamliner featured the distinctive 'red and white' colours depicting a flying swan with the 'Konark Chakra.' The airliner has an Air India-designed interior with warm colours, a luxurious business-class cabin, overhead crew rest compartments and an economy-class section.

Dassault Falcon presented its Falcon fleet of large cabin, long range business jets at this third *India Aviation* event. Dassault is the Indian market leader for large cabin, long range aircraft and continues to consolidate its position as the benefits of business aviation become recognised by an increasing number of Indian companies and private owners. Private investment in the country's aviation infrastructure and growing support by the Indian authorities are making this dynamic market even more attractive. About 20 Falcons are currently operating from airports in Delhi, Mumbai, Bangalore, Chennai, Pune and Hyderabad. Several additional aircraft are on order for delivery to Indian customers over the next two years. Almost half of the new aircraft orders are for Dassault's flagship Falcon 7X, the first business jet certified with a fully-digital flight control system.

Dr. Kiran Rao, Airbus Executive Vice-President, Sales and Marketing, and President of Airbus India.

Vayu's photographer look this picture during a demo flight in the Superjet 100: looking at Hyderabad suburbs.

Airbus ACJ318, the corporate jet version of the A318 airliner

Leading French companies at India Aviation 2012

Ubifrance and the French Trade Commission, in collaboration with GIFAS (French Aerospace Industries Association) and the DGAC (French Civil Aviation Authority), organised an Official French Pavilion at India Aviation. France being the 'Focus Country' for the exhibition, was represented by 13 leading French companies. "France ranks second in the world aerospace market in terms of exports and imports. Sustained commitment to research and development (R&D) keeps France at the forefront of aircraft and aviation technology development and application. The French aerospace industry remain's among the largest and fastest growing in the world." Participating companies at Begumpet included Adhetec, Aviatec, Air France Industries-KLM Engineering Maintenance, AeroEuro Engineering India Pvt. Ltd, Pegase, Serta ASD, UUDS, Altran, Bureau Veritas Aeronautics and Space, ATEM, Present Overseas, APSYS, and ELTA France.

CFM's LEAP engine at their stand in Begumpet.

"We remain encouraged by the potential for long-term growth in business companies in India," said John Rosanvallon, President and CEO of Dassault Falcon. "Business jets are now seen in the region as a powerful tool to enable quick and convenient access to customers within the country and worldwide. The dramatic growth of the economy and the experience of travelling on commercial airlines have all contributed to the expansion of the market over the last few years. With their exceptional performance and fuel efficiency, I have no doubt that the Falcon fleet is positioned for long-term success in the region and that we will maintain a high level of market share," concluded Rosanvallon.

To support the growing Falcon fleet and move the company closer to clients, Dassault has opened spares distribution centres in Chennai and Mumbai, complementing regional facilities in Dubai and Singapore, and positioned a technical field team in Mumbai. Last year it reinforced the Delhi office and plans for a further expansion are in the works. Mumbai-based Air Works India recently became an authorised service centre for the Falcon 900EX while other service centres are on the anvil.

Unlike at Aero India shows there were excellent facilities at India Aviation 2012: a functional business centre, plush lounge, a decent exhibitor restaurant, tasteful florist counters, numerous snack counters with a wide variety of food, easily available drinking water (!!), information desks, clean and well placed toilets, travel and transport desks, business information centre, non-crowded and uncluttered media centre, etc. Shabash, FICCI !

Hawker Beechcraft Corporation (HBC) continue to lead the market for aircraft delivered to India over the last decade. Industry data shows that more than 60 percent of all business aircraft from turboprops to super-midsize business jets delivered into India in the past decade have been Hawker Beechcraft products. "In the segments in which we compete, Hawker Beechcraft is proud of its market share leadership in India," said Dan Keady,

Sukhoi's Superjet 100 performed daily demonstration flights

Vice-President, Asia, Australia and India. "For years, the family of HBC business turboprops and jets has been in-country and proving they are an excellent fit for this region. We've also expanded our customer service and support capabilities in the region to reflect increased activity. We see that activity continuing to grow as India is one of the fastest growing economies in the world."

The HBC fleet in India includes aircraft from across its product line, with the most popular models being the Hawker 125 series, King Air B200/250 and King Air C90.

"Hawker Beechcraft owns 86 percent market share among business turboprops in India," Keady continued. "Their reliability, durability and versatility make them especially well-suited for operations in both the highly developed urban locations of the country and in areas with undeveloped air strips." HBC showcased three of its products: the Hawker 4000, Hawker 900XP and King Air C90GTX.

Embraer Executive Jets also participated with a version of their Legacy 650 executive jet making its Indian debut. It featured refinements to its interior, a state-of-the-art cabin management system and offering increased efficiency and safety, significantly raising the bar for jets in its class. On static display were the Phenom 100 and Phenom 300 executive jets, introduced in 2009 and 2010 respectively. More than 300 of the entry-level and light aircraft have since been delivered. The Phenom 100 also recently achieved more than 100,000 flight hours. "India is key to our growth strategy in Asia Pacific," said Jose Eduardo Costas, Vice-President, Marketing and Sales, Asia Pacific, Embraer Executive Jets. "With a growing, active business jet fleet, of which more than 60 percent is less than 10 years old, India is a prime market for the development of the business jet industry and we expect it to be the largest market in this region, outside of China. A third of the active Embraer executive jet fleet in service in the Asia Pacific region is based in India."

Delivery ceremony of the first Bell 429 to an Indian customer; the signing took place at the show in the Bell Helicopter stand.

Embraer has also invested in developing a customer service network across the Asia Pacific. In India, Embraer has appointed Airworks and Indamer Pvt. Ltd. as Embraer Authorised Service Centres (EASC) to provide maintenance services for the Phenom 100, Legacy 600/650 as well as Lineage 1000 jets.

Eurocopter India delivered a strong performance during the first year of operation as a full-fledged Eurocopter subsidiary, leading the market with 65 percent of new aircraft deliveries in 2011. It has set its sights on meeting new milestones in the evolution of India's civil and parapublic helicopter market, and is expanding its support and services network in major cities to provide proximity services to customers across India.

Eurocopter's internationalisation strategy to establish subsidiaries in key markets to be closer to its customers is showing good results in India.

"Eurocopter has the honour of being the first helicopter manufacturer to commit to this market with a full-fledged subsidiary, and we have moved steadily ahead after its creation," said Xavier Hay, the CEO of Eurocopter India. "It may be a young subsidiary, but we have already achieved much, thanks to the experience and industrial relations that Eurocopter has built up over the last 50 years in India. We look forward to another half-century of success with our Indian partners," he added. Based on the 2011 record of the Directorate General of Civil Aviation, Eurocopter India delivered nine brand new turbine helicopters out of a total of 14 registered last year, representing a 65% market share. Out of the nine Eurocopter aircraft delivered, five were twin-engine helicopters, with the remaining four being the single-engine AS350 B3.

Other highlights of the year have included the delivery of Pawan Hans Helicopters' 10th and final AS365 N3 Dauphin in a deal that was signed in March 2010. This makes Pawan Hans the biggest Dauphin operator in the world, with a fleet of 35 helicopters and a record of over 375,000 flight hours logged.

Pandora's Box at

The Ural Vagon Zavod outdoor display with the modernised T-90S was a major crowd-puller.

Organised by the Defence Exhibitions Organisation of the MoD and FICCI, the Defexpo India 2012, seventh in the series of biennial Land, Naval and Internal Security Systems Exhibition, was held at Pragati Maidan in the heart of New Delhi from 29 March to 1 April 2012.

As per Wikipedia, in classical Greek mythology, Pandora was the first woman on Earth. Zeus ordered Hephaestus, the God of craftsmanship, to create her and so he did, using water and Earth.

Pandora was given a beautiful container which she was not to open under any circumstance. Impelled by her curiosity, Pandora opened it, and all evil contained therein escaped and spread over the earth. All contents had escaped, except for one thing that lay at the bottom, which was the angel of Hope named Astrea.

So what has all this to do with the 7th Land, Naval & Internal Security Systems Exhibition, organised by the Ministry of Defence in collaboration with FICCI in New Delhi in late March 2012? There were analogies aplenty if the imagination of visitors to Pragati Maidan those days would be allowed to soar !

Some 560 exhibitors, from A (Aarjay International) to Z (Zomidea Design) presented their wares and skills to the multiple thousand visitors, many of them in uniform (olive green, white, blue and khaki), others in safari

* All you wanted to see at DefExpo 2012 – but could not be there !

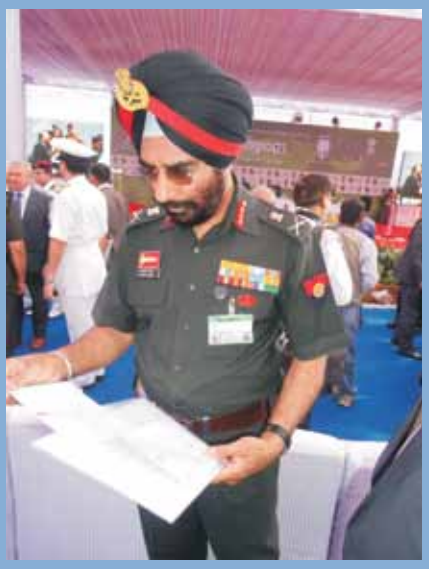
Pragati Maidan *

suits or mostly casually outfitted, who entered Pragati Maidan suitably tagged and security checked. From main battle tanks and supersonic cruise missiles to camouflage netting and night vision devices, all these and very much more were contained in this metaphorical Pandora's box.

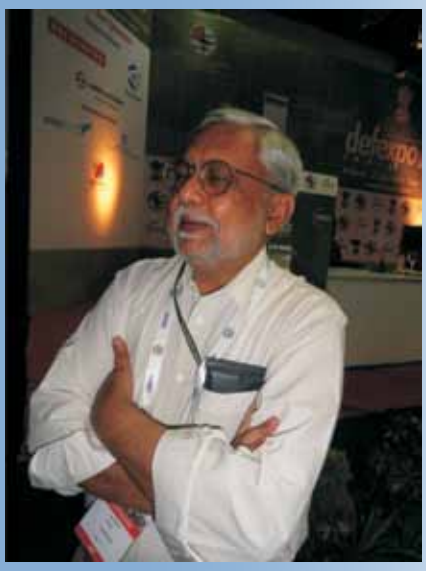
The exhibition was inaugurated by Defence Minister AK Antony who lit the traditional lamp. The Indian Navy band played the National Anthem to lend solemnity to the event which was attended by large number of foreign guests, senior officers of the Army, Navy and the Air Force, Ministry of Defence and CEOs of the Indian and foreign companies participating in the exhibition.

PSOs of the Army, Navy, Air Force and Integrated Defence Staff at the inaugural.

Defence Minister AK Antony lights the traditional lamp at Pragati Maidan.



Lt Gen Dalbir Singh Sidhu, DGMF, at the inauguration.



Mr Vivek Rae, Director General Acquisitions at MoD.

The home country

In his inaugural address Defence Minister AK Antony said that at the politico-security level, "India has always been recognised as a responsible power and stabilising factor in this region in the face of various security challenges originating from different sources around us. India has traditionally been a peace-loving nation. However, we have to be ready to meet any challenge to our territorial integrity and sovereignty. Our armed forces need to have access to the latest defence technologies, with the state-of-the-art platforms, equipment and systems to meet any threat. The Government's efforts are directed towards modernisation of the Armed Forces."

The Minister of Defence observed that India's defence expenditure in the recent past has been around 2% of the GDP which is consistent with the country's security needs but, "with projected growth of the Indian economy expected at a trajectory of 8-10% for the next two decades, expenditure on defence is bound to increase." The country has achieved a high level of indigenisation in defence and

Dr Shivthanu Pillai, head of BrahMos.

"this is our thrust area. Our quest for self-reliance in defence underlines the growing importance of private sector participation on the one hand and revitalising the public sector on the other. Hence the emphasis is on public-private sector partnership in the defence industry. Enabling policy framework has been put in place to develop indigenous capabilities through harnessing the potential and unitising resources available, both in the public and the private sector. The country's defence industry is now open to 100% Indian private sector participation, while foreign direct investment is permissible upto 26%."

Referring to the Defence Offsets policy, the Minister said that its scope has now been expanded to include Civil Aviation, Internal Security and Training within the ambit of eligible products and services for discharge of offset obligations. As with the Defence Procurement Procedure, the Defence Offsets policy is being periodically reviewed and "further changes are expected in due course."

The Indian defence industry is open to enter into mutually beneficial agreements with "friendly countries" in the field of critical and state of the art futuristic defence technologies. At the same time, DefExpo 2012 would provide ample opportunities to Indian and foreign exhibitors to display their latest technologies and products and tap the market and business potential for mutual benefit. In conclusion, the Defence Minister announced that the 8th DefExpo India will be held during 6-9 February 2014 at New Delhi. But this time, the four-day DefExpo 2012 (29 March to 1 April) had over 560 exhibitors, 15 country pavilions, 32 participating countries, and hosted 58 official delegations, in the exhibition area of which measured 51000 square meters.

Minister of State for Defence Dr MM Pallam Raju later stated that the government would encourage Joint Ventures and promote participation of Small and Medium Enterprises (SME) in the defence industry sector. The Government, he added, was striving for self-reliance even while it remained committed to equip the armed forces with the latest equipment and weaponry.

DRDO displayed the Prahar tactical ballistic missile (TBM) in 3x2 configuration mounted on a Tata transporter.

VK Saraswat, Scientific Advisor to the Defence Minister and Director General of DRDO, speaking at a press conference.

Turbulence within–and without

Defence Minister AK Antony addressed a Press Conference attended by a large number of print and electronic media. In fact, it was more of a question-and-answer session where the Minister answered queries in his characteristic manner and did not dodge even tricky ones concerning the COAS and recent revelations which was upper most in the news. "Strict action would be taken against the person found guilty of leaking the letter written by the COAS to the Prime Minister of India - we shall go to root of the matter and take stringent action", the Minister emphasised.

He also confirmed that six companies, four of them foreign and two Indian, had been "blacklisted" on account of complaints of malpractices, for a period of 10 years, but accepted that this directly affected working of the ordnance factory at Nalanda. After its earlier partners — both foreign firms — were banned by the Defence Ministry, Ordnance Factory Board (OFB) Nalanda has now begun to indigenously develop critical components needed for artillery shells, including for the Bofors howitzers.

On the ongoing CNC pertaining to the MMRCA, the Minister was candid in stating in that even while the process was on, investigations have begun in parallel on complaints received on the process of the establishing of 'L-1'.

Mr Antony shared some statistics in that while the earlier ratio between defence equipment produced in the country and that imported was 30:70, this has now been reduced to 40:60 and indigenisation efforts continue apace.

In reply to persistent queries regarding the perceived divide between the COAS and the Ministry of Defence, Mr Antony asserted that the Chiefs of Staff of the three Services "enjoyed his full confidence". The Defence Minister cautioned that the media should act "in a manner to protect the prestige of the defence forces and make sure they do not demoralise our jawans and officers serving in difficult frontiers of the country".

Absolutely ! *Now read on* !

DRDO and PSUs

The largest participation at DefExpo 2012 was of the Defence Research & Development Organisation (DRDO) which took 1779 square metres of indoor area and another 1143 square metres outdoors. In fact DRDO's missiles, AFVs and radars were dominant outside the Central Hall (significantly chosen for the official inauguration by Mr AK Antony just after his opening address at the Harshavardhan Theatre). Exactly opposite and across the road in Hall 10 were showcased DRDO's current and futuristic programmes, with 49 establishments taking part. These ranged from UAVs of the Aeronautical Development Establishment (ADE) to the Centre for Artificial Intelligence & Robotics (CAIR) whose mission is to design, develop and productionise high quality Secure Communication, Command and Control, and Intelligent Systems, through synergic interactions with academic institutions and industry.

At the Central Hall were the large pavilions of Hindustan Aeronautics Limited, organised once more by the Transport Aircraft Division at Kanpur with large scale models of the HAL-built Dornier 228, Sukhoi Su-30MKI, HJT-36 IJT, HTT-40 basic turboprop trainer and the Indo-Russian multi-role transport aircraft (MRTA). Models of the Dhruv ALH adorned the pavilion which was cynosure of numerous foreign delegations that visited the HAL pavilion.

The Central Hall also had the large pavilion of Bharat Electronics Limited (BEL), highlighting its Network Centric Warfare (NCW) systems developed indigenously for the Indian armed forces. This included Combat Management System, which automates tactical data from the ship's sensors to provide decision support to the ship's command; Coastal Surveillance System, an all-weather 24x7 surveillance system developed to safeguard the nation's coastline by networking various sensors such as radars, day-and-night electro-optical equipment; Automatic Identification System and meteorological equipment; and Advanced Composite Communication System, an IP-based New-Generation voice, data and video integrated system as also key elements developed for use in various C4I systems.

On 30 March, BEL signed an MoU with Defence Electronics Applications Laboratory (DEAL), Dehra Dun in the presence of Dr V K Saraswat, SA to RM where Anil Kumar, CMD BEL and H N Ramakrishna, Director (Marketing) BEL were present. The MoU was signed by I V Sarma, Director (R&D) BEL and R C Agarwal, Director, DEAL.

The MoU is for development of Indian Automatic Identification System (IAIS) for coastal security, one of the Satellite Data Terminals which will be jointly developed by DEAL and BEL. IAIS will be used for Satellite-based data communication in secure mode. Meanwhile, N Suresh, General Manager BEL-Panchkula, said that the Panchkula Unit of BEL would manufacture the Satellite DataTerminals for INSAT3C and future satellites like GSAT6, GSAT7 and HUB baseband services.

The Electronics Corporation of India Limited (ECIL), Bharat Dynamics Limited (BDL) and BrahMos Aerospace were all in the Central Hall, close to where *Vayu Aerospace & Defence Review* had its location as well (LH.20). It was therefore appropriate that continuous interaction took place between editors of the *Vayu* and senior personalities of the various public sector undertakings (including being invited to the birthday cake cutting ceremony of Naresh Babu, Managing Director HAL's Bangalore Complex).

Dr Shivathanu Pillai, head of BrahMos Aerospace was eveready to review future programmes of this world leading supersonic cruise missile. Earlier, during the Naval Exercise TROPEX-2012 off Vishakhapatnam, the climax was dramatic launch of the Brahmos supersonic long range anti shipping missile, from a recently upgraded *Ranvir*-class destroyer. Soon thereafter, the Indian Army successfully test fired the 290-km range BrahMos supersonic cruise missile at the Pokharan range on 4 March to mark operationalisation of its second Regiment equipped with the BrahMos weapon system.

The Indian Army has thus far placed orders for BrahMos to equip three Regiments of this supersonic cruise missile and with this test firing, two of them have been operationalised. The third Regiment is reportedly to be deployed in Arunachal Pradesh, in north-eastern India. Each BrahMos Regiment comprises 65 missiles, five mobile autonomous launchers on Tatra vehicles and two mobile command posts, among other supporting infrastructure.

The private sector and JVs

As far as the private sector was concerned the largest space was taken by the Tata Group in Hall 12, where were showcased the LPTA 5252 12x12 Prahaar Missile System, the 8x8 Pinaka Container, the 8x8 and 6x6 carrier and the 'crown jewel', the Mine Protected Vehicle (MPV). Tata Motors has been supplying vehicles to the Indian armed forces since 1958 and are participating in the Future Infantry Combat Vehicle (FICV) programme.

Apart from Tata Motors, Larsen & Toubro (L&T), Mahindra Defence and OFP are in the competition for the massive order (2,000 FICVs). The Larsen & Toubro

At the HAL stand are seen the Company's Directors (from L-R) Mr Naresh Babu, MD Bangalore Complex, Mr P Soundara Rajan, MD Helicopter Complex, Mr PV Deshmukh, MD Nasik, Mr T Suvarna Raju, Director (Design and Development) and Mr VM Chamola, Director (HR).

Air Marshal Anil Chopra, the AOP at Vayu's stand in the Central Hall.

At inauguration of the Israeli pavilion in Hall 10 were (L-R) General Udi Shani, Director General of Israel Ministry of Defence, Mr Itzhak Nissan, President of IAI and Colonel Yossi Rafaelov, Israeli Defence Attache in India.

A Nexter CAESAR self-propelled 155mm howitzer.

(L&T) stand was dominated by the South Korean K-9 Thunder 155mm/52-cal howitzer from the Samsung Techwin Company with whom L&T are cooperating for the Indian Army's tracked self propelled artillery programme.

In addition, L&T and Nexter Systems of France (NS) have signed consortium agreements to collaborate for key artillery programmes of the Indian Army, which include the 155mm/52 Cal Towed Gun System (TGS) and Mounted Gun System (MGS) programme, with Nexter Systems as lead partner and a 130mm/39 Cal M-46 up-gunning programme, with L&T as lead partner.

The partnership between L&T and Nexter is based on delivering "the best solution and value to the Indian Army". According to the agreements signed between L&T and Nexter, the latter will transfer the production of sub-assemblies of Trajan (TGS) and Caesar (MGS) and the final integration of both systems to L&T in India. The engineering customisation of the systems to fulfill specific Indian requirements will be accomplished together by L&T and Nexter.

Bharat Forge, who exhibited in Hall 18, are amongst the world's largest specialist companies in forging and have got into the fray for meeting the Indian Army's long standing requirement for 155mm howitzers. Taking an unorthodox approach, they have imported from Austrian gun manufacturer Maschinenfabrik Liezen (MFL) a service version of its 155mm/45-calibre, autonomous gun system. Interestingly, they have also bought, knocked down and transported to India an entire operational artillery gun factory from the Swiss Group RUAG, intending to absorb foreign technology, in an effort to cut down extended development processes.

The Pipavav Defence and Offshore Engineering Company had their own 'mini' Hall, virtually leaning on Hall 12A. Promoted by the SKIL Group, Pipavav was the first private sector company to produce 'strategic defence vessels', beginning with five OPVs. Their impressive brochure includes the Centauro AIFV 'Freccia', Midivisana Mobile Ground control stations for UAVs and the Hitfist 30mm overhead weapon system. Much more significant is the Pipavav relationship with the Saab Group for their Saab 2000 MPA and Saab 2000 Airtracer aircraft and RBS15 Mk.III surface to surface missile. Announced at DefExpo was formation of the Combat System Engineering Group (CSEG) between Saab and Pipavav which will undertake modeling and simulation and prepare systems integration requirement for Naval ships. According to Gunilla Fransson, head of Saab's Business Area Security and Defence Solutions, "this joint venture will bring a technology value to India's growing defense programmes".

IAI Harop hunter-killer UCAV which is designed to loiter over the battlefield and self destruct onto a target.

Another JV announced at DefExpo was between SELEX Galileo and the Data Patterns Group. Fabrizio Giulianini, CEO of SELEX Galileo reiterated that "this Joint Venture will establish a centre of excellence for key technologies in the defence electronics sector. It is a truly value adding JV on both sides and will create an effective partnership that will foster and sustain the long term prospects of both companies".

Mahindra & Mahindra and Israel's Rafael advance defence systems will form a joint venture in India to develop and produce anti-torpedo defence systems, electronic warfare systems and remotely operated weapon systems for FICVs. According to Major General Ilan Biran, Chairman, Rafael said "As part of our global strategy, we form alliances to develop military applications based on our proprietary technologies and in Mahindra we see a lot of synergy and opportunities for growth in new markets and especially in India which is a strategic market for us".

International participation

In sheer size the largest international participation was that from Israel, followed by Russia and then France. The largest indoor and outdoor area was taken by SIBAT of Israel (1293 square metres) which considerably dwarfed that of the next biggest country participation, that of Russia.

The Israeli pavilion was inaugurated by Itshak Nissan, President and CEO, Israel Aerospace Industries for which *Vayu* was specially invited. Mr Nissan said in Hebrew (translated for *Vayu*) that "as an industry, our purpose here today is to enhance our sales, and indeed together with the Israel Ministry of Defence, we are presenting a strong case for Israeli defense exports. The Israeli Pavilion is the largest at Defexpo, displaying the best offerings of the Israeli defence industries."

"But India is much more than a customer for us. India is a strategic partner to the Israeli nation and to the Israeli defence industries. Together we have reached many great achievements, assimilating in India some of our most advanced large scale systems.

Israel Aerospace Industries (IAI) are currently discussing several major new programmes with the Indian armed forces, Ministry of Defence and the industries. I hope that the other Israeli industries are doing just as well !"

"We will continue to work closely with India, helping to beet this nation's great needs. The extent of these needs is reflected in India's large defence procurement budget. The impressive presentation of the Israeli industries and Ministry of Defense here, at the Defexpo are proof of the mutual respect and cooperation between Israel and India and of the important role that our industries play in this relationship".

Vayu was informed that IAI's subsidiary ELTA systems Ltd., had signed a slew of new orders for supply of 3D fire control radars, SATCON network system, AD-STAR radar systems and its tactical short range air defence radar, in contracts totaling $ 106 million. ELTA was awarded a $39 million contract for supplying "a foreign customer" high-performance 3D fire control radars for its ground-based surface-to-air defence weapon systems.

The AD-STAR, designated ELM-2288, is a leading 3D S-Band radar system designed to support air defence, early warning and traffic control missions in complex clutter environment. ELM-2288 provides high accuracy and highly reliable 3D data of detected targets, initiating automatic target tracking.

Israel Aerospace Industries (IAI) presented the advanced virtual training solution at Defexpo India 2012. "The changing combat environment and growing need for multi-service warfare require adjusting training concepts and systems to support joint and coalition training in various operational scenarios. To meet these training challenges IAI has introduced the Multi-Service Integrated Network-based Exercise and Training System (MI-NET) which provides effective, multi-level' and joint training to combine live, virtual and constructive capabilities. MI-NET is tailored to customers' requirements and integrates existing and future training assets".

As periodically reported by *Vayu* over the last two decades IAI has developed and supplied advanced training systems and solutions for air, sea and ground forces to various customers around the world. Among IAI's well-known and widely-used training systems are the EHUD AACMI (Autonomous Air Combat Manoeuvering Instrumentation) - the leading instrumented solution for real-time live air combat training, NCMI (Naval Combat Maneuvering Instrumentation) - a network-embedded on-board training system, and HTS (Helicopter Training Solution).

Mockup of HAL's Light Combat Helicopter along side an Armed Dhruv model.

From Russia with …

The Russian pavilion was in Hall 12A under which banner were displayed the products and plans of nearly 50 joint stock companies, design bureauex which included those involved with aero engines, shipyards and armoured fighting vehicles. The 'Jewel in Russia's crown was prototype of the new T-90S main battle tank, in its first foreign debut, as announced by Rosoboronexport delegation head Viktor Komardin. "The Indian Army already operates the T-90, so its modernised variant - which, by the way is an absolutely new machine - will be of great potential interest to the Indians," he said.

" And this....is the INS Vikramaditya."

A new tank turret is the main upgraded tank component. The turret is fitted with a new automated fire control system, a more precise 125-mm gun, a remotely controlled 7.62-mm machine gun, and a new explosive reactive armour providing an enhanced level of counteraction to all existing antitank guided missiles, as well as additional protection from high-precision weapons, mines and field charges. Thanks to commander's stabilised panoramic sight, gunner's multichannel sight, and all-round surveillance system the automated fire control system provides effective day and night target detection, identification and engagement at halts and on the move. The tank controllability is greatly improved due to installation of an automatic gearbox and a steering wheel sweep drive. The upgraded T-90S tank is powered by a 1,130-hp diesel engine. It is also fitted with an auxiliary diesel-generator unit which powers the tank at station, thus both saving tank fuel consumption and considerably decreasing its infrared signature. Tank designers have also managed to retain the traditional advantage of Russian tanks: small weight and dimensions. "For the time being the upgraded T-90S is the best tank in the international arms market, judged by the combination of its characteristics."

Also in the Russian exhibition were models of the Tigr armoured car, Kornet-EM antitank missile system, BMPT fire support combat vehicle,

A model of the Sikorsky S-70B Seahawk being offered to the Indian Navy in the medium airlift role.

Inaugurating the Saab stand in Hall 14 are (L-R) Ambassador Lars-Olof Lindgren, Major General Christer Lidstrom, Advisor to Defence Minister and Head of Indo-Swedish MoU and Major General Gunnar Karlson, Head of Defence Production and (shortly) Military Intelligence.

Rear Admiral AK Chawla, Assistant Chief of Naval Staff (Policy & Plans) at the Boeing stand.

BMP-3M infantry combat vehicle, BTR-80A armoured personnel carrier, Smerch multiple launch rocket system, Nona-SVK self-propelled artillery gun, Khrizantema-S self-propelled antitank system, Vena self-propelled artillery system, a family of BREM type armoured recovery vehicles, a wide variety of close combat weapons and ammunition.

Amongst Naval systems were the Amur-1650 and Project 636 diesel-electrical submarines, Gepard 3.9 and Project 22356 frigates, Tigr and Project 11356 patrol ships, Tornado small missile ship (gunship), Mirage, Mangust, Sobol patrol boats, various sets of shipborne armaments, maritime control and surveillance systems.

Aircraft types displayed (again in model form) were the Mi-28NE attack combat helicopter, Ka-226T multi-purpose helicopter, Ka-31 radar picket helicopter, Mi-17 medium-assault helicopters, Il-76MD military transport aircraft, Il-78ML tanker aircraft. The Chemyshev Enterprise of Moscow displayed full scale aero engines which power several Indian Air Force and Navy fighters including the RD-33MK for the MiG-29K/KUB.

As far as air defence systems were concerned, the Buk-M2E, Pechora-2M, Tor-M2E and Antey-2500 air defence missile systems, Pantsir-S1 air defence gun/missile system, Igla-S man-portable air defence missile system and a large variety of radars were evident.

Tommy Hutin of Saab with model of Saab 340.

Saab celebrates 75 years

Celebrating 75 years of their involvement in defence and security matters, Saab's excellent form was vividly displayed at their stand in Hall 14 at Defexpo 2012. "Saab is committed to long-term cooperation and teaming up with Indian companies to develop leading technology". The Saab pavilion was officially inaugurated by Swedish Ambassador Lars-Olof Lindgren, along side Major General Christer Lidstrom, Advisor to Defence Minister and Head of Indo-Swedish MoU and Major General Gunnar Karlson, Head of Defence Production and (shortly) Military Intelligence.

Vice Admiral (Retd) JS Bedi, former FOC-in-C Western Naval Command with Mr Anatoly Pokryshkin, of Chemyshev Moscow with the RD 33MK engine which powers the Indian Navy's MiG-29K/KUBs.

According to Jan Widerstrom, Chairman, Saab India Technologies Pvt. Ltd., "India is one of our most important markets. The main theme for Saab for this Defexpo is *Teaming Up With India in Defence and Security*. We really, truly believe that partnership is the way forward to work in India and to be able to fully support the market."

Saab has extensive experience in supporting air forces with solutions designed to meet such needs and "offers India proven solutions across the spectrum of air superiority, operational dominance, peace time operations, air policing missions, border patrol, surveillance and battlefield integration based on 75 years of trial and error".

Saab Aeronautics are involved with advanced airborne systems, related subsystems, Unmanned Aerial Systems (UAS), aero-structures and services to defence customers and commercial aerospace industries worldwide. Saab's range of airborne solutions comprises the world's most advanced multi-role fighter, the Gripen as also the Saab 340 and Saab 2000 transport aircraft, as well as unmanned systems.

Speaking to *Vayu* at the Defexpo, the Saab spokesman said that the company "understands the challenges involved in designing and building aircraft and what it takes to keep them flying. Saab's offer includes a range of advanced platforms capable of fulfilling different roles, either independently or integrated into a wider defence network".

Saab develops avionics products to give "affordable and future proof solutions". This combined with aircraft development gives unique avionics and integration knowledge in bringing flexible and scalable solutions with open modular technology for the benefit of the aircraft manufacturer. "Saab's solutions enable the addition of functionality required to realise new dimensions of avionics whenever operational requirements expand or needs change".

From the US of A

The products and services of twenty top US defense firms were showcased at the US International Pavilion in Hall 14. This was organised by International event management firm Kallman Worldwide for the first time in India. The pavilion occupied some 800 square metres and included the big ones : Boeing, Northrop Grumman, Raytheon Company, Rockwell Collins, General Dynamics, Honeywell, L-3 Communications Systems (and others). Sikorsky Aircraft and Textron Systems were keenly represented as well.

Sikorsky Aircraft are currently awaiting licence from the government to manufacture components and assemble helicopters for the Indian defence services which will be undertaken by Tata Sikorsky Aerostructures, the joint venture with Tata Advanced Systems Ltd. Sikorsky is a shortlisted by the MoD to supply 16 multi-role helicopters to the Indian Navy.

Tata Sikorsky Aerostructures, in which Tatas hold a majority 74% stake and Sikorsky the rest, makes about 4,000 parts of Sikorsky's S-92 helicopter cabins, and a licence by the Indian government would allow the company to manufacture the complete helicopter. "The partnership with Tatas will be extended to manufacturing and assembling Sikorsky helicopters besides making Sikorsky S-92 helicopter cabins. We have applied to the government and are expecting a licence shortly," Steve Estill, Sikorsky's vice-president, strategic partnerships, stated while Air Vice Marshal AJS Walia, Sikorsky's executive vice-president, India and South Asia, said that although there was yet just a single order for the S-92 helicopter in India, the facility near Hyderabad was playing a major role in Sikorsky's global supply chain.

Boeing showcased a comprehensive portfolio of products and services at Defexpo India 2012 including models of their C-17 Globemaster III, P-81, AH-64D Apache, CH-47F Chinook, V-22 Osprey, ScanEagle and 737 Airborne Early Warning & Control aircraft.

"India is a significant market for Boeing and we are committed to working closely with the Indian Defence Ministry, armed forces and indigenous industry to meet India's defence and security needs," said Dennis Swanson, Vice President, International Business Development, Boeing Defence, Space & Security in India. "In 2012, we will continue to strengthen our relationships in India through delivering on our promises on our existing P-81 and C-17 contracts; expanding our partnerships with the Indian aerospace industry; and demonstrating how the CH-47 and AH–64 are the right choices to meet India's heavy-lift and attack helicopter requirements."

Northrop Grumman exhibited a large scale model of its E-2D Advanced Hawkeye airborne early warning and control systems for maritime reconnaissance and unmanned aircraft systems, the company said.

"Our core competencies and proven capability in airborne early warning and control and unmanned systems for aerial surveillance are well matched to meet the region's growing defence and security," said William J Schaefer, Northrop Grumman Aerospace Systems sector vice president of business development.

Samsung Techwin, as part of their JV with L&T, displayed the K-9 Thunder self propelled 155mm howitzer

IAI Elta's maritime patrol aircraft based on the Bombardier Q400 platform.

At the Northrop Grumman Corporation stand in Hall 14 are (R-L) William J. Schaefer, Sector Vice President Business Development, Greg Miller, Pam Frazier, Tom Trudell and Commodore Gyanu Sharma.

"We look forward to highlighting how our products and capabilities can help India achieve its defence modernisation objectives and the requirements for a coordinated national defence structure."

The E-2D Advanced Hawkeye couples newly designed electronically scanned radar with a matching suite of sensors, avionics, processors, software and displays to provide the most technologically advanced command and control capability available worldwide. The AN/APY-9 radar with a two-generation leap in capability is the backbone of this aircraft and provides greater flexibility and significantly improved detection and tracking over all terrains. To date, Northrop Grumman has delivered seven E-2D Advanced Hawkeye aircraft to the U.S. Navy. The programme is undergoing its Initial Operational Test and Evaluation in 2012 and is on track for Initial Operational Capability with the U.S. Navy fleet in 2015.

The Raytheon Company's innovative technologies were showcased at Defexpo 2012 which covered military modernisation, Air and Missile Defence and Homeland Security applications across all domains. According to Raytheon India Head, William Blair, the company has developed a vehicle-launched version of the Javelin anti-tank guided missile and is in discussion with local major Tata for developing it for Indian Army.

He also informed *Vayu* that Raytheon has been vigorously following the paramilitary forces and have given general presentations to most of them, in support of the growing priority for homeland security in India. Raytheon has also forayed successfully into setting up air traffic management systems for the Airports Authority of India and airfields security for all airports.

"Border security and coastal management is one of Raytheon's expertise and we plan to be involved in India's need in this area. We are currently in discussion with India's Navy about providing Athena, a configurable C4I system that provides situational awareness to authorities in coastal areas and ports. Athena employs open architecture and is scalable, fusing available sensor and surveillance systems and data that provide a clear operational picture," Raytheon has stressed.

Meanwhile, Raytheon has delivered the first APY-10 radar to Boeing for integration in the Indian Navy's first P-8I maritime reconnaissance aircraft, the Fish Hawk, a wing-kit currently being developed by Raytheon for the U.S. Navy's high altitude anti-submarine weapon concept. "Fish Hawk would give India's new P-8 Poseidon fleet the capability to deploy torpedoes from an extended launch envelope. Fish Hawk combines a GPS controlled wing kit with the Mk.54 lightweight torpedo and is designed specifically for the P-8. Once launched, the system glides the torpedo to a water entry at a precise location to seek out, engage and destroy a submarine threat," he said.

On Raytheon's Javelin third generation anti-tank guided missile, Indian Defence Minister AK Antony had informed Parliament on 16 August that the Government will be issuing the procedural Letter of Request (LoR) to the US Government for this missile under its Foreign Military Sales (FMS) Programme along with Transfer of Technology (ToT).

Raytheon Asia President Admiral Walter Doran earlier told *Vayu* that the US Government had already cleared this sophisticated missile for sale to India, the missile having been demonstrated in the field during the Indo-US exercise *Yudh Abhyas* in October 2009. Javelin is actually a joint development product of Lockheed Martin and Raytheon. With a range of 2.5 km, Javelin is optimised for close combat assault and in the anti-tank role.

BAE Systems presence

As Dean McCumiskey, Managing Director & CEO-India, BAE Systems told *Vayu*, "DefExpo is an extremely important platform for us in the continuing development of our business and the last two years have marked very good progress. Partnering with the industry in achieving self-reliance in the design, development, and production of equipment, systems and platforms is the cornerstone of our business in India and we take pride in the milestones our joint ventures with Mahindra & Mahindra and Hindustan Aeronautics Limited have marked in their journeys since the last DefExpo. As we build our footprint, we are committed to creating key intellectual property indigenously working closely with partners and customers to deliver best of breed solutions."

BAE Land Systems M777 155mm lightweight towed howitzer is being offered to meet the Indian Army's requirement for additional field guns.

Finmeccanica had a large presence at the show, with a number of products on display at their stand.

Most dominant in Hall 8 was the M777 155mm howitzer which remains the subject of ongoing discussions between the Indian and US Governments in relation to a possible sale to the Indian Army.

'Mobility' was a dominant theme at BAE Systems' displays at Defexpo 2012, which marked the debut of its family of CV90 LightTanks and BVs10 'go-anywhere' All-Terrain Vehicle family in India along with the ultra-light M777 howitzer. The BAE Systems' pavilion at Defexpo spanned products and solutions in Air and Defence Information, Maritime, Intelligence and Security, and Electronics Systems.

The many hues of Finmeccanica

Finmeccanica through its companies AgustaWestland, Alenia Aermacchi, DRS Tactical Systems, Inc. (a division of DRS Technologies), Selex Galileo, Oto Melara and WASS, exhibited a vast range of products, platforms and technological solutions in the field of helicopters, aeronautics, radar systems, naval and land armaments and underwater systems at their stand in Hall 18. For Finmeccanica, "India is a market of great strategic importance, where it can establish long-term partnerships involving the mutual exchange of technology and expertise. The establishment of the Group's offices in India clearly represents the company's increasing interest in the country and a step forward in the Group's relations with local partners".

In 2010, the company was awarded the tender to supply 12 AW101 helicopters to the Indian Air Force for State VIP transportation. As for present and future needs, "AgustaWestland is able to meet the requirements for both land and sea missions, proposing models such as the AW119, AW109 LUH, AW139, NH9O and AW101". In March 2012 Indian Rotorcraft Limited, a joint venture between AgustaWestland and Tata Sons, began construction on a new helicopter production facility in Hyderabad which will be completed in mid-2013, marking a new development in the Indian aerospace industry. At Defexpo 2012, AgustaWestland exhibited its range of modern military helicopters including the AW101, the AW119Ke, the AW109LUH, the AWl39 Coast Guard, the naval version of the NH90.

Alenia Aermacchi are currently following the requirements of the Indian Air Force for a tactical transport aircraft and the Indian Coast Guard for maritime patrol aircraft. The C-27J, tactical transport aircraft manufactured by Alenia Aermacdhi, with its special characteristics, "represents an excellent solution for the Indian Air Force's requirements".

SELEX Galileo has expanded its footprint in India and exhibited its Electronic Warfare (EW) products such as the Aircraft Gateway Processor (AGP) which is now part of the standard fit on the Apache AH-64, the next-generation ELINT system SAGE to meet the needs of India's Rustom-2 MALE UAS and the SEER Radar Warning Receiver for the IAF's Hawk AJT, among many other products.

The French at Pragati Maidan

Thales demonstrated its capabilities in the area of Global Air Defence Solutions, Force Protection, Missile Systems and Rocket Systems, showcasing the Shikra 60 (the tactical C2 to ensure a complete airspace surveillance of up to a range of 80 km and heterogeneous weapon systems coordination), ADES (the ultimate all-in-one mobile short range air defence system), Gun System (the latest generation air defence gun to defeat emerging low-cost targets), SAMP/T (the European, in- service, medium range air & missile defence solution), LMM (the new family of lightweight multi-role missiles) and Laser Guided Rocket in 70mm calibre.

As *Vayu* was briefed, "Thales develops a comprehensive range ofoptronic equipment aimed at evaluating critical situations at a tactical and strategic level. "Thales is the European leader in night vision systems, whose equipment are used by tactical units, special forces and aircraft and helicopter pilots". At the Thales stand, were exhibited: Catherine XP, a Compact high-performance thermal imager, Sophie XF, a multifunction hand-held thermal imager with continuous optical zoom, Helie, Helicopter Light Intensified equipment and Damocles, a 3rd Generation multi- function Targeting pod.

Speaking with Sagem's representative at Defexpo 2012, *Vayu* was informed that the British Ministry of Defence has awarded Sagem (Safran Group) a major contract for JIM LR (Long Range) multifunction infrared binoculars for its

'Long Range Thermal Imager Programme' worth a total of Euro 5 million Developed and produced by Sagem, JIM LR incorporates in a single portable optronics package a number of advanced features, including day/night (infrared) vision, rangefinding, laser pointer, North seeker, GPS and data transmission. Used for intelligence, surveillance, target acquisition and reconnaissance missions, JIM LR binoculars will significantly expand the capabilities of British infantry units. "The decisive factors in DE&S's selection were the JIM LR proven operability in severe combat environments, detection and identification performance, and a complete multimedia service designed to support a real-time intelligence cycle".

Eurocopter expectations in India

As India proceeds upon its massive modernisation programme for the armed forces, one of the most important requirements is for 'Reconnaissance and Surveillance' for which the Government intends to procure 197 helicopters for this demanding and critical requirement. 'The competition is strong with the world's leading helicopter manufacturers in the fray. One of the helicopters that is acknowledged as the frontrunner is Eurocopter's AS550 C3 Fennec.

Speaking to *Vayu* at Defexpo 2012, Rainer Farid, Eurocopter's Vice President Sales, Asia Pacific, said "extensive global experience tells us that Reconnaissance and Observation helicopters need to be capable of fulfilling various roles: personnel transport, escort and armed missions, casualty evacuation and observation. The three key expectations fron a successful helicopter in this segment, therefore, are maneouverability, versatility and agility. "This is what makes Eurocopter's AS550

Thales was keen to stress its involvement with the Rafale, now that the MMRCA winner has been announced.

Fennec one of the most successful helicopters in the world for this kind of requirement."

"The Fennec is clearly a versatile helicopter, certified by internationally accredited military certification agency (French DGA Under MOD). Eurocopter has a manufacturing capacity of producing more than 300 Fennec / Ecureuil helicopters a year or one helicopter each day Eurocopter is today best geared to deliver the 197 units required by the Indian Armed Forces at the earliest".

Mr. Farid stressed that "the Fennec is our most advanced helicopter and it is a proven military helicopter including complete weapon systems, fully compliant with the quality requirements of the Indian Army and the Air Force. We have completed field trials and the Fennec has demonstrated excellent results, fully compliant with the expectations of the Armed Forces."

Meanwhile Eurocopter has offered the Indian Coast Guard its twin-engine EC725 helicopter to fulfil the maritime patrol and search & rescue (SAR) tasks. Officials from Eurocopter believe that "with its all-weather capability, range, heavy-lift capacity and complete systems package, the EC725 delivers the combat search and rescue (CSAR) performance just as required by India and also has full in-country product support from Eurocopter's Indian subsidiary".

The DefExpo 2012 Land, Naval and Internal Security Systems Exhibition came to its conclusion on the evening of 1st April 2012 but the myriad of weapon systems that were concentrated in that finite space of Pragati Maidan for 96 hours would well have shaped the future for India's Defence and paramilitary forces in a manner hardly visualised by the mythical Pandora and her box.

AgustaWestland AW101 model at the Finmeccanica stand.

Eurofighter Typhoon model on display in front of a poster of IAF Su-30MKI in formation with RAF Typhoon.

VAYU interviewed many country heads of international companies in India. This section is devoted to them !

Bernard Buisson, Managing Director, DCNS India

VAYU : What is the current status of construction of submarines at the MDL? When is the first submarine likely to roll out of MDL?

To date, MDL is done with the hulls of the first five submarines; the sixth one is to be completed later this year. We are working on the outfitting where equipment is being integrated inside the hulls section. The first Scorpene submarine is to be launched at end of 2013 and commissioned in 2015.The last Scorpene is expected to be commissioned in 2018.

VAYU : What have been the reasons for delays?

The Scorpene programme by its very nature is a huge, complex and challenging programme, both for the competences and the industrial means involved. All past teething problems have been resolved since 2010; we went through investments and learning stages that we wish to make the most of. MDL and DCNS developed industrial capabilities around the Scorpenes and have the capacity to bring technological innovations to India. Today, we are constantly improving our performance.

VAYU: Can you brief us on cooperation with the Indian industry with regards to their P75 programme specifically the areas in which DCNS is transferring technology to India/MDL under P75?

For P75, most of the technology will be transferred to MDL through the construction of the submarines. To do so, the DCNS's Advising and Overseeing Team (AOT) is based within the shipyard to support MDL in the manufacturing process. In parallel, DCNS India is managing the indigenisation programme to manufacture P75 equipment and sub-systems through Indian companies. DCNS India is providing support and assistance for the partners to meet the rigorous qualifications needed for the submarines. Indeed, P75 benefits from an unprecedented and unmatched level of ToT. No other submarine project in any other country has benefited from a greater depth and scale of ToT right from the first submarine onward.

VAYU : As of now, what is the part of indigenous Indian content in the Scorpene submarines?

The Indian content is a very important aspect. First, the fabrication of the hull is under MDL's control. I think it is for the first time ever that a submarine has been built in the country of the customer, starting with the first submarine. Usually, even with a ToT

Chilean Navy Scorpenes

agreement, the first submarine is built in the premises of the OEM. The MPM (Mazagon Purchased Materials) equipment will be progressively indigenised, beginning with the first submarine. Most of the equipment that can be built in India, will be built in India. Considering equipment bought from abroad, some sub-systems are still to be built in India.

VAYU : How do you deal with such indigenisation in India?

We manage the indigenisation programme for P75 from Mumbai through DCNS India. DCNS India is providing its Indian partners with know-how and technical assistance to manufacture equipment which will be installed onboard the Scorpenes. Together with MDL, DCNS India is qualifying the suitable companies which are meeting the rigorous specifications needed for the submarines. This first contract was signed with the company Flash Forge in June 2011 with the first deliveries earlier this year.

Mistral-Class LHD Dixmude and FREMM Aquitaine

Recently, DCNS India signed a contract with SEC Industries for the manufacture of further P75 items (hull hatches, cofferdam doors, knuckle hoses, ballast vent valves, high pressure air cylinders, weapon handling and storage system, etc). Further partnerships and milestones for P75 shall be announced shortly.

Mr. Khalil Rahman,

Country Head India, Atlas Elektronik

VAYU : Tell us about the Atlas Electronik product line and its relevance to India.

KR: Atlas Electronik is a 100-year-old marine electronics company and probably the world's leading sonar house. We are jointly owned by EADS and Thyssen Krupp who are one of the largest conglomerates in Germany.

We have three major product lines, viz. the submarine division, which makes sonar systems, combat systems and towed arrays to increase the listening range of submarines; the weapons division, which is Europe's leading torpedo supplier and the only provider that has all aspects of electric torpedo technology and can provide technology to India from the homing head to the fibre optic cable; and the surface division, which has a large range of solutions in the areas of anti-submarine warfare and mine counter measures (MCM) amongst others.

In addition we have a number of smaller divisions including a hydrographic division and Hagenuk, which specialise in communication systems. Given India's ambitious naval modernisation programme each of our divisions has a lot of potential for business in India.

VAYU : Atlas Electronik is a joint company of EADS and Thyssen Krupp. How does that influence your activities in India?

KR: Atlas Elektronic is an independent company but of course we benefit all over the world from our relationship with our parents. We work closely with our colleagues at Cassidian and Thyssen Krupp marine systems where projects require it. In the Indian context we also are observing carefully the industrial partnerships that our parents are working on and trying to learn from their experiences. Given our specialisation in the marine area it is obvious that we need our own strategy in this regard. For example we are unlikely to have to work with HAL, but BEL is clearly relevant to Atlas Electronik.

VAYU : What were the key highlights for Atlas Electronik at Defexpo India 2012?

KR: Atlas Electronik was excited to be present at Defexpo 2012 and exhibited products from our three major divisions. We showcased our experience in towed sonar arrays with the active towed array sonar. Atlas Electronik with its know-how in towed arrays is able to offer twin, triplet and thin-line arrays. Our naval weapons division showcased the DM2A4 heavy weight torpedo with the complete range of technologies from the homing head to the battery to the propulsion system to the fibre optic cable. Our Naval Weapons Division provides torpedos to many countries across a range of platforms. The technology behind the propulsion system for the French F21 torpedo as well as the MU 90 Light Weight Torpedo are from Atlas Electronik. Other highlights included MCM including the concept of a containerised MCM solution.

Peter Forrest, Selex Galileo's VP Marketing and Sales for Electronic Warfare

VAYU : Selex Galileo exports its technology all around the world. How important a market is India for Selex Galileo?

India is an absolutely critical market for Selex Galileo which is why we had such a large presence here at Defexpo! The Indian customer has some extremely sophisticated requirements that need very high levels of technology to satisfy – so we are the ideal candidate to help meet those needs.

VAYU : What kind of background does Selex Galileo have in India?

Selex Galileo has been in India for many years now. Thanks to legacy Sea King and Sea Harrier sub-systems we have established repair facilities in-country and have trained Indian personnel in the design of key systems. The CARES facility, which we support at the Naval Aircraft Yard at Kochi, is seen as a benchmark repair facility within the Indian Navy and we've successfully operated the Mirach 100/5 target drone at the Indian MoD's Integrated Test Range (ITR) for several years.

Our subsidiary company in India (Selex Galileo India Private Limited) allows us to maintain the relationships and understanding we've built up over the years and work effectively with our customers in India.

VAYU : Have you encountered any challenges in accessing the Indian market?

At Selex Galileo we understand that we can only win business in India if Indian industry is fully involved in the production and development of our products. We also feel that we could benefit from the technology available in India to jointly develop systems for third-country markets. That is why we are actively exploring opportunities for joint ventures with Indian companies and looking at sharing some of our technologies with partners in the country. Ultimately, these joint ventures will allow India to develop its independent and sovereign defence electronics capability that will be leveraged across a wide range of platforms, product and systems – both in the military and civil sectors – that India is, and will be developing in the future. This will also benefit the Indian Armed Forces and government agencies as we and our Indian partners will be able to support these high-level technologies in-country.

VAYU : Does this mean you are confident about meeting India's offset requirements?

What differentiates Selex Galileo is that while many companies are seeing India's offset requirements as a challenge to meet, we are seeing them as an opportunity to embrace. By combining the capabilities of Indian industry with our experience in the operational integration of electronic warfare systems, we believe we can create some very successful collaborations.

VAYU : What do you consider as the most important trend in electronic warfare?

The most important trend in electronic warfare right now is the growing awareness of the dangers posed by radar guided threats. The main requirement over the last few years has of course been protecting aircraft from cheap, man-portable infrared-guided missiles fired by enemy forces on the ground, called MANPADS.

VAYU : How are you responding to this shift in the market?

Well, while a lot of defence companies have been developing only the technology to counter the MANPADS threat (and we have a world leading IRCM capability), we at Selex Galileo have been investing for a number of years now in developing new technologies to help counter the more advanced radar-guided threat, so we are ahead of the game in both matters.

To give you an example, we are developing some really advanced phased array jammers which can allow aircraft to deal with multiple threats at different locations and frequencies.

VAYU : What else do you foresee in the future of electronic warfare?

At Selex Galileo we are also looking at two other electronic warfare trends: reduced cost and total integration. With regard to reduced cost, this is being driven by the increasing importance of small platforms such as UAVs which, while unmanned, nevertheless still benefit from being protected by electronic warfare equipment. While our SEER digital Radar Warning Receiver (RWR) and SAGE digital Electronic Support Measures (ESM) system are suitable for manned aircraft such as fighter jets, the technologies are also aimed at bringing these capabilities to lower-cost platforms such as UAVs.

VAYU: What is the view of the nations involved (in MBDA) with regard to transfer of the latest, and sensitive, technologies to India?

MBDA has clearly stated for some time that our idea of partnership with India is more than just a standard buyer seller relationship. When we talk about partnership we are talking about a meaningful partnership of equals. For this to work, technology transfer will have to be a core element of the relationship. In the long term I see the Indian defence industry working closely, perhaps in multi-national teams with MBDA, on future products not only for the Indian customer but for the European and a global customer base as well.

VAYU: You have been cooperating with BDL for over 30 years through licensing agreements. Can you elaborate on your association with BDL?

We are very proud of our longstanding relationship with BDL of India which revolves around production of the Milan anti-armour weapon. Our stated strategy in India is to link and to work with local industry and to advance technology transfer wherever feasible. So should Mistral MANPADS be selected, we are exceptionally well positioned to get local production capability of the Mistral missile up and running as soon as required. This could of course be a single Mistral production line in India for both the Dhruv's air–to-air Mistral ATAM system which is currently being integrated and for the surface to air requirement. As for the PARS 3 LR, we are already working closely with an Indian company on the design of a specific PARS launcher for the Dhruv. Should we get the go ahead, another Indian partner will be lined up to carry out launcher production.

VAYU: Many European firms are looking for joint development of future system with Indian firms. Does MBDA have any plan in this regard? What are the strong points of Indian defence industry? In which area of missile technology do you think India private firms have capability or expertise?

There are a couple of projects that we definitely would like to advance as joint developments with India. I can say we are in advanced discussions and have

Loïc Piedevache, Country Head, MBDA India

identified potential partners but at this stage, and in fairness to these potential partners, I do not want to go into any more detail.

With regard to the strong points of the Indian defence industry, I think most important is the Indian government's vision for the sector. The government's very commitment to advancing an indigenous industry base and acquiring the necessary technologies is crucial in itself. The process is being helped by the government's pragmatism in realising that tangible results can only be achieved by bringing together global players as well as India's large, medium and small private and public enterprises.

VAYU: How do you view MBDA's potential in the Indian market?

Partnership is the key word that represents our strategy and our long-term plan for India. India has a lot to offer in terms of indigenous skills, in engineering, in electronics as well as software development, so I see a very good fit between MBDA and certain sectors of Indian industry. As I mentioned earlier, for me the future will see combined teams, either here in India or in Europe or both, working to meet the needs of our respective domestic customers as well as the global export market.

I should point out here that we are currently celebrating MBDA's tenth birthday. This represents not just ten years in the life of a company but ten years of international integration. It hasn't been an easy task integrating the skills and cultures of four different countries (France, Italy, Germany and the UK), but we have got there. This is proof of MBDA's ability and its determination to make partnerships work, to prove the point that the sum of the parts is greater than the sum of the total. Just as we have achieved this in Europe, we will be able to do the same in India; that is the goal. If we are able to move along this road in India, then I see enormous potential for both MBDA and for India.

Mr. Kanji Ishimaru, Managing Director, ShinMaywa Industries India Pvt Ltd

VAYU : Please give us an overview of the company and its products.

ShinMaywa Industries began its business operations as the Kawanishi Machinery Company when the Kawanishi Type 1 amphibian aircraft was manufactured. It has since manufactured more than 3000 aircraft. After World War Two, the company utilised its expertise in the aerospace segment to make special purpose trucks and industrial machinery. Later, the company was renamed ShinMaywa Industries Ltd. By the mid 1960s, ShinMaywa once again began to design and manufacture seaplanes The Company has supplied 47 seaplanes to the Japanese Maritime Self Defence Force (JMSDF). Its latest product is the US-2 which is operated by the JMSDF. We have offered the same US-2 to the Indian Navy.

Since then we have expanded our product portfolio to include many products including passenger boarding bridges, environmental systems, pumps, direct drive motors and automated car parking systems. With sales in more than a 100 countries and overseas plants in five countries we achieved sales of about US $1.3 billion last year. Our company philosophy is "to contribute to the improvement of societies and our company prioritises the values of safety, quality, delivery schedule and cost in all its operations".

VAYU : The year 2012 marks the 60th anniversary of the establishment of diplomatic ties with India and it is interesting to see Japanese participation at Defexpo. Please comment.

India and Japan have a historical relationship which we truly value. India was the only country that signed a separate peace treaty with Japan and waived off all war claims. In fact this is the first time ever that ShinMaywa or a Japanese company participated in a Defexpo. We are really overwhelmed with the response that we have received and it is clear to us that the Indian people have a lot of interest in Japan and in the US-2. We see the US-2 as a platform to elevate relationships between our two countries.

VAYU : How do you see the US-2 furthering the mission requirements of the Indian Navy?

We believe that this aircraft is really the best and second to none in its category. It's huge capabilities can play a major part in enhancing India's role in the region using cutting edge Japanese technology for the good of society. It can carry out a variety of missions ranging from SAR, Disaster Relief, Surveillance and also a avriety of Logistic Support missions to distance islands and even ships. The US-2 has many applications.

VAYU : How do you see ShinMaywa growing as a business venture in India? Will you be focusing only on the US-2 or other innovative products also for the Indian market?

ShinMaywa began its India operations almost 20 years ago. We already are a supplier of Passenger Boarding Bridges and Wire Terminating machines to Indian customers. We have now responded to the Indian Navy's RFI for amphibian aircraft. We also have regular enquiries for our other engineering products and environment systems. Therefore, we are here in India for the long term and we will grow our business operations in a calibrated and systematic manner which will best contribute to the needs of the Indian Navy as well as other customers in India.

VAYU : In what way is the US-2 different from other amphibian aircraft?

The STOL Technology based on BLC (Boundary Layer Control) which allows ultra-low speed operations and introduction of Spray Suppressor technology which enables operation in rough seas with waves of three meter high which no other aircraft has achieved. Its radar system combines both weather and surface surveillance. For India, the US-2 uses the same class of engines that the C-130J uses. I also see the US-2 as a very good vehicle to implement the vision of our two countries to build a solid partnership between India and Japan. The US-2 is the best way to begin this partnership since this aircraft benefits a larger world community and would rightly fit into India's growing responsibilities.

VAYU : What are the advantages of the US-2?

With US-2, which is the only aircraft that can land on rough water, India can cover the Indian Ocean throughout the year. The STOL capability of US-2 enables IN execute the search and rescue operation and also the landing on and taking off from some lakes and rivers that have enough depth for the operation. The operation area of the aircraft will be drastically extended.

VAYU : What are your business expansion plans for the Indian market? Where do you see ShinMaywa industries in India 10 years down the line?

Ten years is not such a long time. Our primary interest is in introducing the US-2 over Indian skies. Our other products are also of unmatched quality and use very powerful modern aand innovative technologies. We expect that the Indian market will accept our products for their high quality and high technology. Our intention is to be in India for the long term and we will expand our operations in a calibrated manner.

Self Ad

In Contrast:

CAG and MoD on "defence preparedness"

The Defence Ministry's Annual Report 2011-12, which focuses on "defence preparedness" is actually in contrast to the earlier remarks made by the Comptroller and Auditor General (CAG) and the Army Chief, General VK Singh's observations in his 12 March letter to the Prime Minister Manmohan Singh, which was mysteriously 'leaked' to the media. Asking the Prime Minister to "pass suitable directions to enhance the Army's preparedness", General Singh had written in his letter that the state of the major fighting arms was "indeed alarming" and indirectly blamed the long-winded arms procurement process and the bureaucracy for this state of affairs.

The MoD's Annual Report 2011-12 states that a contract for armoured recovery vehicles has been concluded and schemes

Israeli-made combat rifles on display at Defexpo 2012.

The DRDO-developed Arjun MBT, seen at Defexpo 2012.

to acquire digital control harness and state-of the-art fire control systems for T-72 tanks are underway. "Induction of T-90 and Arjun main battle tanks are also proceeding apace and a number of procurement schemes are at an advanced stage. In the case of armoured regiments, this includes establishment of repair facilities for T-90 tanks, procurement of AMK 339 shells and 3UBK 20 Invar missiles, the latter fired from the T-90's barrel."

Subsequent information has it that 25,000 Invar missiles and 66,000 APFSDS (armour-piercing fin stabilised discarding sabot) rounds for the Russian-origin T-90S MBTs as well as 10,000 Konkura-M anti-tank guided missiles (ATGMs), at an overall cost of around Rs 6,000 crore, are at the final stages. There are two big contracts in the pipeline for the 3UBK-Invar missiles which anti-tank weapons have a 5 km strike range. The first is for 10,000 missiles for Rs 1,386 crore from Russia for which a "draft" note by the Cabinet Committee on Security has already been prepared and circulated. The balance 15,000 missiles will be ordered from Defence PSU Bharat Dynamics Ltd.,

at a cost of over Rs 2,000 crore, which the Contract Negotiations Committee "is progressing."

Contrary to CAG observations that Indian artillery has gun systems "whose technology goes back to World War II and those developed during the seventies", the Annual Report states that the focus has been on improving surveillance and firepower capabilities. Acquisition plans for battlefield surveillance systems and mobile telescopic masts for long-range reconnaissance and observation system were concluded last year. Also, the procurement of Heron UAVs and weapon-locating radars is "at an advanced stage" according to the Report. The procurement of the multiple-rocket launcher Pinanka is proceeding "at a brisk pace" and plans for selecting the 155 mm self-propelled gun (wheeled) and 155 mm ultra-light howitzers are "progressing well".

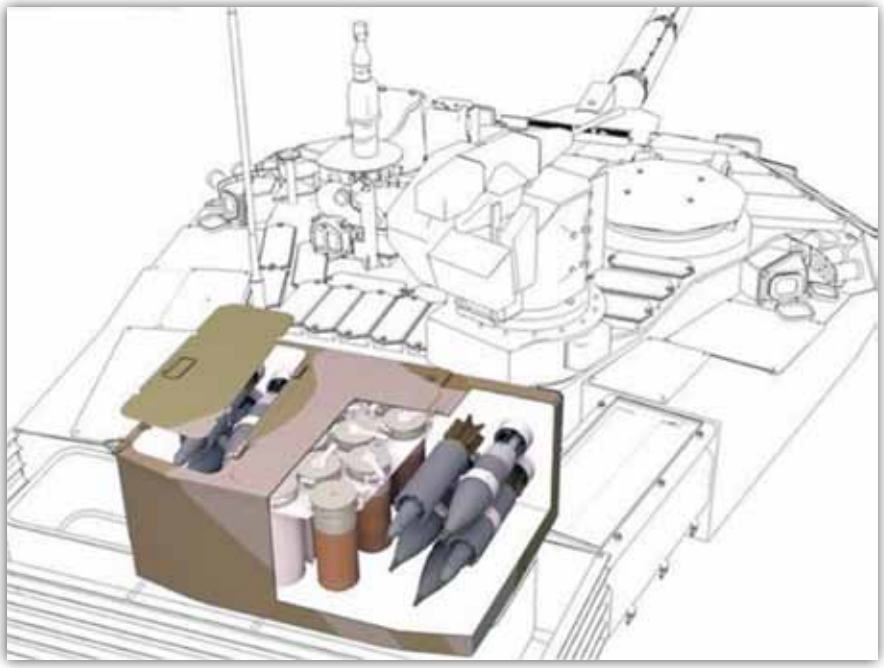
Submachine guns and assault rifles for the Special Forces are undergoing trials according to the Ministry of Defence, which is contrary to the Army Chief's complaint that the Special Forces are "woefully short of essential weapons".

The modernised Russian T-90S, with a 125 mm gun as main armament, embodies further refinements and is on offer to the Indian Army.

As for air defence, the contract for acquisition of Akash surface to air missiles has been concluded even as the Schilka 23 mm gun system and L70/40 light air defence guns are to be upgraded. The Army chief, in his letter to the Prime Minister, had said that 97 per cent of the air defence system of the Army "was obsolete". Distressingly, the CAG observes that the Aerostat radars procured for Rs 676 crore are "out of action".

The observations made by the COAS and the CAG however did create a manner of national alarm on India's security preparedness and the Parliamentary Standing Committee on Defence has urgently sought detailed briefings on arms procurement and defence preparedness from the three Services chiefs and the Defence Secretary, Shashi Kant Sharma. Perhaps the most positive outcome of this vexed issue is that a new set of guidelines for procurement of arms and ammunition "could be expected soon".

Karanjit Singh of 'Homeland Warriors' trying out a SIG Sauer TAC2 sniper rifle at Defexpo 2012.



Hidden from view: T-90MS storage box for ammunition.

Check list on the Year that was

Indian Defence Milestones during 2011

New Weapon Systems

- Successful test launch of the 3,500 km range Agni IV Ballistic Missile on 15 November.
- Sixth successful test launch of Agni AI Ballistic Missile from Wheeler Island on 1 December.
- Successful launch of Dhanush and Prithvi Missiles by the Strategic Forces Command from Interim Test Range, Chandipur, Orissa and a warship off Orissa Coast on 11 March.
- Successful launch of new Surface to 'Prahaar' by DRDO on 21 July.
- Successful flight testing of Agni (A-II) on 30 September from Integrated Test Range, Chandipur, Orissa Coast.
- Successful flight testing of Surface to Surface Strategic Missile Prithvi (P-II) on 26 September from ITR, Chandipur.
- Successful flight test of the 700- km range Shourya Missile from Launch Complex III of Integrated Test Range (ITR), on 24 September.
- Successful launch of Prithvi (P-II) missile on 9 June.
- 5th successful flight of UAV 'Rustom I' near Hosur, Karnataka on 11 November.
- Successful engine ground run of LCA Tejas (Navy) at Bangalore on 27 September.
- Kaveri engine being developed by the DRDO for the Light Combat Aircraft successfully completed the first phase Flying Test Bed trials mounted on a modified IL-76 aircraft in Russia during April.
- Defence Minister AK Antony inaugurated the DRDO's state-of-the-art composite propellant processing facility ACEM (Advanced Centre for Energetic Materials) at Nasik in Maharashtra on 29 June.
- Indian Naval crew began training in Russia in April aboard the new aircraft carrier Admiral *Gorshkov* (INS *Vikramaditya*).

Acquisitions and Capacity Building

- Admiral Nirmal Verma commissioned INS *Satpura*, second in the *Shivalik*-class of stealth frigates, on 20 August.
- Commissioning of Fleet Tanker INS *Deepak* at Mumbai by Defence Minister AK Antony in January.
- Induction ceremony of C-130J -30 Super Hercules at Air Force Station, Hindan on 5 February.
- Second indigenous (ASW) corvette 'Kadmatt' at the Garden Reach Ship Builders & Engineers (GRSE) in Kolkata on 25 October.
- Commissioning of Indian Coast Guard Station at Mundra in Gujarat on 19 May.
- Foundation stone laying ceremony of Indian Coast Guard Academy at Azhikkal in Kannur district of Kerala on 28 May.
- Foundation stone laid for the National Institute for Research and Development (NIRDESH) in Defence Shipbuilding at Kozhikode, Kerala on 4 January.
- The new Officers Training Academy (OTA) at Gaya, Bihar inaugurated on 18 July.
- Commissioning of a Fast Attack Craft, INS *Kabra*, at Naval Base Kochi by Vice Admiral KN Sushil on 8 June.
- Commissioning of Indian Coast Guard Ship (ICGS) C-152 at Okha, Gujarat on 18 June and (ICGS) C-153 at Porbandar, Gujarat on 22 October.
- Commissioning of two Indian Coast Guard Ships C-150 and C-151 on 28 March.


Agni IV Missile


INS Satpura


Endo-Atmospheric Interceptor

- Commissioning of hi-tech 3G connectivity services in the Air Force in March.
- Re-induction of upgraded An-32 tactical transport aircraft in June, after total technical life extension (TTLE), overhaul and re-equipment at Ukraine.
- Inauguration of an integrated microwave tube development unit in Bangalore on 9 April.
- DRDO dedicated Integrated Thermally Regulated Shelters for use of the Indian Army in Leh (Ladakh) on 16 June.
- Indian Army introduced superior habitat for its personnel at high altitudes in April.
- Licensing agreement on 25 April to acquire the technology of Explosive Detection Kit developed by the High Energy Material Research Lab (HEMRL), Pune.
- An intensive anti-piracy operation launched by Indian Navy during the week ending 18 March.
- Indian Navy warships apprehended an Iranian boat 400 nautical miles off Lakshadweep, rescuing 12 Iranian and 4 Pakistani crew and detaining 16 pirates in a operation on 26 March.
- On 11 March Indian Navy warships assisted a damaged Egyptian-registered ship take to the sea again that was released by pirates off Somalia

Exercises / International Cooperation

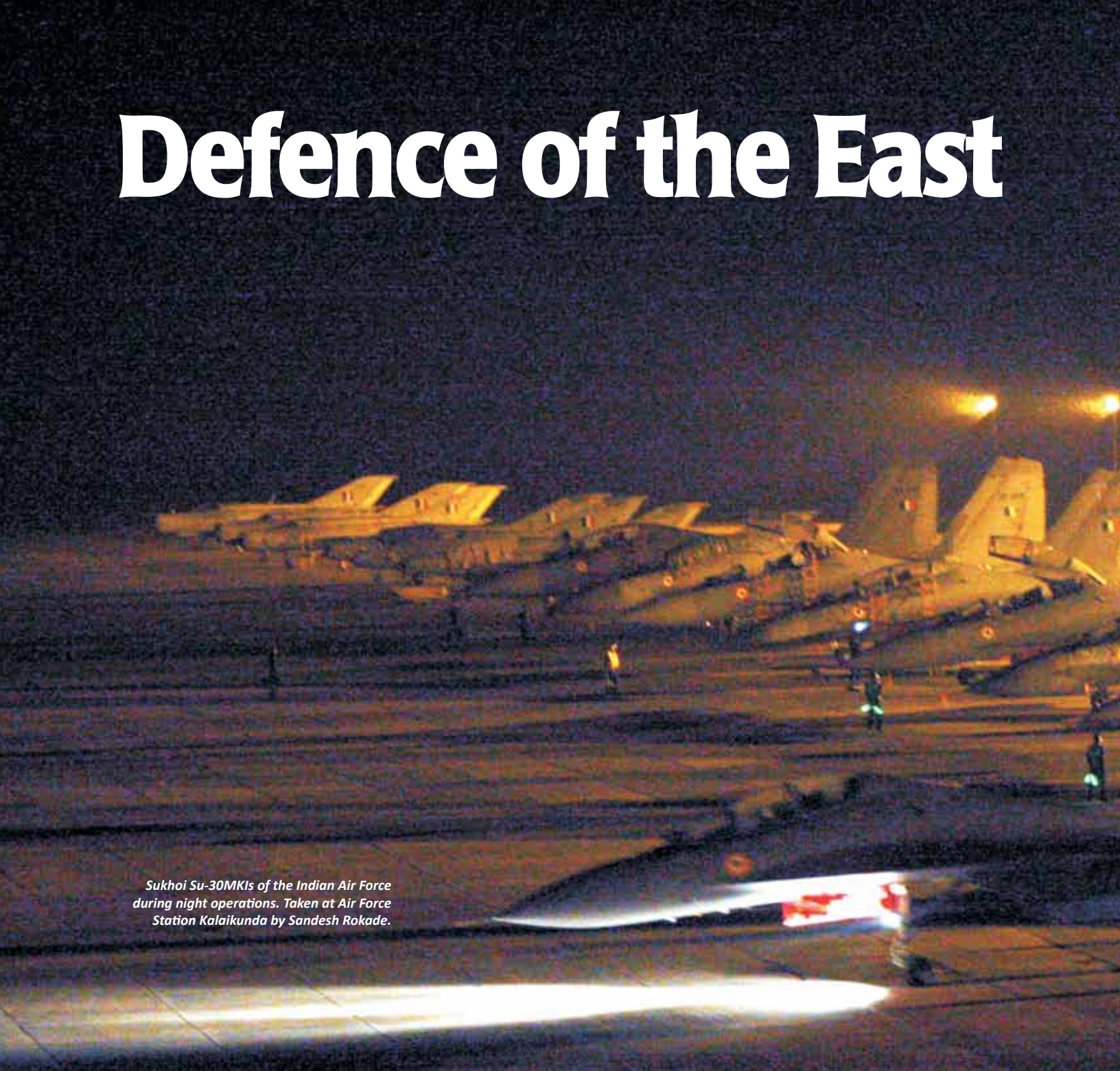
- The Army conducted a major exercise with the Indian Air Force in the Thar desert in November-December. The army's Southern Command and IAF's South Western Air Command participated in the month long exercise 'Sudarshan Shakti', during which Network Centric Warfare and other assets such as satellites, UAVs and HUMINT (Human Intelligence) were integrated and validated.
- Joint Army-Air Force Exercise 'Vijayee Bhava' in Northern Rajasthan in May.
- 8-day long Joint Indo-US Salvage Exercises (Salvex) of naval divers off Port Blair began on 5 January.
- Joint Indo-French naval exercise 'Varuna -10', commenced on 7 January in Arabian Sea off Goa, with participation of aircraft carriers, destroyers/frigates, tankers and submarines from both sides.
- The Indo-French Army joint Exercise 'Shakti' at Chaubatia, near Ranikhet in Uttarakhand conducted between 10-21 October.
- Turkish Naval warships visited Mumbai for joint exercises with the Indian Navy in the middle of July.
- The Indo-Oman Air Exercise 'Eastern Bridge-II' at Jamnagar, Gujarat in mid-October.
- *Simbix 2011*, the annual India-Singapore bilateral Naval exercise, conducted in March.
- Indo-Singapore Armed Forces conducted joint training in March.
- *Vajra* Corps conducted its annual exercise *Pine Prahar* in May, in which over 200 tanks, ICVs and 12,000 men participated.
- Flagging-in ceremony of the joint Indo-Nepal Army Women Officers Eco-Himalayan Trek in Nepal was held in Delhi on 8 October.

Dhanush, naval variant of the Prithvi missile, in successful launch from an I.N. warship.

Nag missile fired

Tejas Light Combat Aircraft : development test flights continue.

Defence of the East



Sukhoi Su-30MKIs of the Indian Air Force during night operations. Taken at Air Force Station Kalaikunda by Sandesh Rokade.

The IAF's Eastern Air Command conducted a combined-service exercise codenamed 'Pralay' (destruction), commencing on 29 February (leap year day) and concluding on 3 March. The Exercise took place in the north-eastern states of Assam, Arunachal Pradesh, Sikkim and Mizoram and involved joint operations with the Indian Army's Eastern Command. (See news item in Vayu II/2012)

The Eastern Army Command, headquartered at Fort William in Kolkata is headed by Lt.Gen. Bikram Singh (appointed as next COAS), while Eastern Air Command has its headquarters in upper Shillong and is headed by Air Marshal S. Varthaman. Eastern Air Command assets and air bases are distributed not only along the Brahmaputra Valley but also in south-west Bengal where the major air base of Kalaikunda is situated. In northern Bengal and the Dooars are airbases at Bagdogra (Siliguri) and Hashimara while further east, in Assam, are those at Tezpur, Gauhati, Jorhat and Chabua, most of these having their antecedents in the Second World War, which literally saw hundreds of airstrips being built for use by the Allied air forces, particularly the USAAF.

Exercise 'Pralay'

As Air Marshal M. Matheswaran, then senior air staff officer of Eastern Air Command said, "We focused on the Brahmaputra Valley, Arunachal Pradesh, Sikkim and Mizoram to exercise our entire capabilities in all roles in conjunction with the army to disrupt enemy intrusion and take the battle to the adversary."

Exercise Pralay was significant because it included participation by out-of-command forces in co-operation with EAC units. In addition to testing combat potential of the Air Force in various roles such as air defence, strike operations, counter-air operations and electronic warfare, the exercise emphasised ground support operations with the Army, including offensive support, night-and-day special operations and logistics.

The IAF deployed assets from other commands to the east and northeast for the exercise, with over 70 aircraft involved: Phalcon airborne warning and control system (AWACS), Il-78MKI in-flight refueling aircraft, Su-30MKIs, MiG-29s, MiG-27s, Jaguars, MiG-21 Bisons, Mi-17s, An-32s, C-130Js and Mirage 2000s, along with Army UAVs.

The full power of the AL-31FP turbofans in reheat is seen in this dramatic picture by Sandesh Rokade.

Exercise *Pralay* also marked the first time the IAF's Phalcon AWACS was tested in this arena against a variety of targets in a simulated combat environment and on such a large scale. The AWACS "plugged the gaps" in the ground-based air defence systems by providing an over-the-horizon capability to the involved forces. Communication systems were validated in the difficult hilly terrain of the north east, as were Intelligence, Surveillance and Reconnaissance (ISR) platforms. Air Marshal Matheswaran said the AFNET (the air force's own optic-fibre cable grid) was used for voice, data and visual communication.

MiG-21U of the Operational Conversion Unit at Kalaikunda. Photo by Sandesh Rokade.

Along with Air Force operations in the air, ground-based situations were also exercised, notably mass casualty evacuation scenarios by modified An-32 aircraft in the air–ambulance role. The An-32 aircraft were refuelled and loaded with 'casualties' shortly after landing, to practice minimising the time that aircraft spend on the ground during actual casevac operations. Procedures for dealing with various other emergency situations, such as unexploded enemy ordnance, air raids, shifting ground-based equipment and so on were also practiced. Time cycles were checked out in terms of Battle Damage Assessment (BDA) using all available resources as an integral part of the missions flown.

Emphasis was placed on Special Forces operations, including those by night in co-operation with troops holding ground. Simulated bombing missions under dense air defence conditions were undertaken by day and night, as were a variety of network-centric electronic warfare and information warfare missions. The exercise concluded with a simulated long-range strike bombing mission deep into enemy territory.

Angad Singh
(with inputs from EAC)

MiG-21U returns from sortie, taxiing past a lineup of Su-30MKIs. Photo by Sandesh Rokade.

MiG-27ML being marshalled by ground crew.

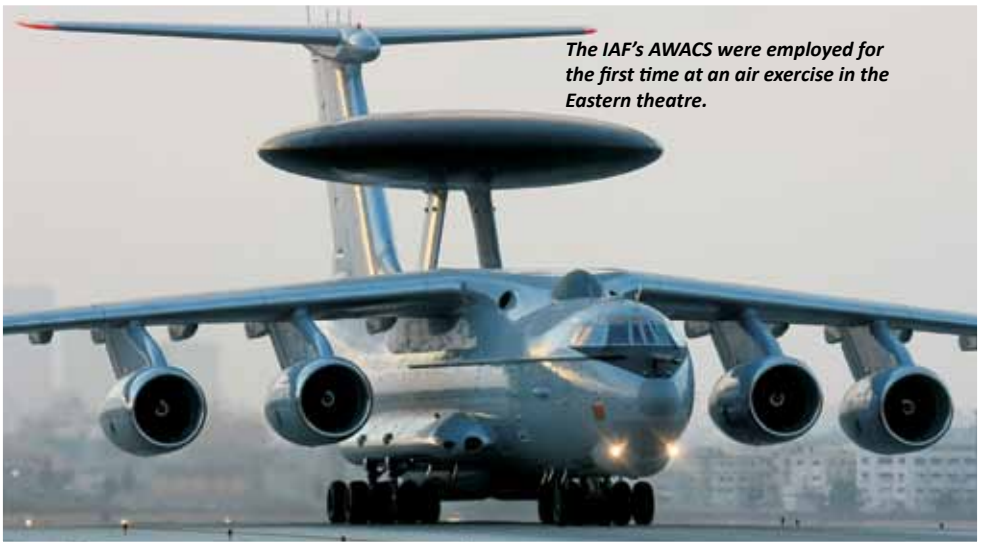
The long range of the IAF's Su-30MKIs is made still longer with in-flight refuelling by Il-78MKIs.

Jaguars from Central Air Command took part in the exercise.

Mi-8 at Guwahati.

Antonov An-32s at an advanced landing ground (ALG) in the Arunachal Pradesh area.

Ilyushin Il-78MKI mid-air refuelling pair of Mirage 2000s.



The IAF's AWACS were employed for the first time at an air exercise in the Eastern theatre.

The Flying Dragon bares

Chinese Air Exercises in the Qinghai-Tibet Plateau

PLAAF frontline fighters at a Tibetan air base. These could be Shenyang J-11s or perhaps Su-27SKs.

Within weeks of Exercise 'Pralay' which was held south of the Tibetan Plateau by the Indian Air Force, the Chinese People's Liberation Army Air Force (PLAAF) conducted a ground-attack training exercise over the Qinghai-Tibet plateau, not far from the Line of Actual Control (LAC) along the Sino-Indian border. While PLA military activity in the Tibet Autonomous Region (TAR) is not unusual, this exercise was the first of its kind, with Chinese J-10 fighters being operated from several air bases including those at altitudes of 3,500m and temperatures of -20ºC. The J-10s reportedly conducted precision ground attack strike missions with live ordnance, including conventional 'dumb' bombs as well as indigenous laser-guided bombs.

Its underwing armament clearly seen, PLAAF Su-27SK being prepared for sortie.

its fangs

and Su-30MKKs at several air bases in the Tibetan region, including Gongar near (Lhasa) while photographs of J-10s operating from Shigatse, closer to the Sino-Indian border have been released.

It is understood that there are nine major air bases in the TAR and some of these are dual-use, with civilian flights sharing space with military operations. The other major air bases are at Pangta, Linchi, Hoping, Gar Gunsa and Rikaze. The neighbouring Chengdu military region has considerably more air bases, situated at lower altitudes which are logically tasked for operations against India.

The PLAAF has also tested its larger J-11 air superiority fighters in the TAR in the recent past (33rd Air Division from Chengdu), along with various air defence exercises. Only five months earlier, in October 2011, the PLA conducted another major exercise on the plateau, this time involving aircraft, tanks and artillery including T-96G MBTs, T-07 122mm self-propelled guns, HY6 portable SAMs and T-85 SP howitzers.

In an interesting revelation, the Chinese conducted wargames with several scenarios including one where the 'Blue Army' (read: Indian) moves into Tibet to establish forward defences before advancing further into the depths of the region. The 'Red Army' (read: Chinese) is mobilised to conduct land-based operations with aerial support to wipe out the strongholds and eventually defeat the 'Blue Army' completely.

According to the PLAAF spokesman "The fighters scrambled and attacked the targets with conventional bombs and laser-guided bombs. Sorties were made both during the day and at night."

Earlier, on 31 January 2012, J-10s had reportedly made their first flights in the Qinghai-Tibet Plateau with a typical air combat patrol payload, namely two medium-range air-to-air missiles, two short-range missiles plus three external fuel tanks.

Observers see this as a strong signal to India which has demonstratedly taken steps to counter China's massive build up of its military infrastructure along the 4,000km LAC, upgrading its air bases in North Bengal and Assam where frontline squadrons of Su-30MKIs are now based. China in turn has located its Su-27SKs

Pair of PLAAF Su-27SKs take off from an air base in Tibet.

PLAAF Su-27SKs in formation over the high mountains of Southern Tibet.

J-10As at Shigatse air base, photographed in mid-2011.

J-10A airborne.

A pair of J-10s launch from Shigatse air base in Tibet.

J-10A dropping laser-guided bombs.

PLAAF J-10As lined up alongside a KJ-2000 AWACS at an undisclosed location.

Last winter also marked the first time that Chinese fighters (J-10As) were deployed at Lhasa throughout the winter, instead of being withdrawn because of the thin air and difficult operating conditions. The J-10s (reportedly of the 44th Air Division) were photographed launching indigenous 500kg LGBs to keep the aircraft out of reach of Indian air defences.

Angad Singh

[All photos sourced from Internet]

Enter The Dragon

An underside view of the LM Gulfstream III demonstrator (LM photo).

Vayu's U.K. Editor Richard Gardner reports on Lockheed Martin's

At first glance Lockheed Martin's flying laboratory carried aboard a highly modified Gulfstream aircraft looks like just another sleek business jet, apart from its overall grey paint scheme. But seen close up it clearly has non-standard airframe bulges housing advanced sensors and extra aerials which betray its true military capability. This is no ordinary Gulfstream, but a demonstration platform, specially configured to provide a range of airborne Intelligence, Surveillance and Reconnaissance options, known collectively as the *Dragon* configurations, that can be tailored to meet specific defence requirements. Earlier in 2011, it visited Australia for the Avalon Air Show, where Charles Gulledge, Strategic Business Development Vice President at Lockheed Martin, outlined to the author the different ways in which the Dragon concept, including ground control configurations, could be customised for what is becoming an essential asset in today's network-enabled search for enhanced situational awareness and connectivity.

The Dragon series comprises six different configurations that are aimed at a number of different requirements. These include military airborne ISR and communications, homeland defence, disaster relief and humanitarian assistance missions. In all these roles, the configurations use proven systems, sensors and other special equipment and are fully integrated according to the specific customer needs. Ground tests started more than three years ago and subsequent air testing and certification has resulted in a product line that builds on extensive ISR experience. Lockheed Martin has produced many special ISR platform aircraft and associated ground control facilities for US Forces and export customers and so the development risk that would usually accompany such a new airborne ISR platform has been minimised and the total procurement cost kept affordable.

The airborne Gulfstream G3 mission flying laboratory aircraft has shown that the integrated mission systems are very well suited for use in the business jet airframe.

Family

bid for the growing airborne ISR market

The fuel efficient engines and extensive fuel capacity of the latest business jets give them very long endurance, with quiet operations, which enhances the crews' cabin environment, spacious working conditions, low fuel consumption, high speed and the ability to use medium size runways. The Dragon configurations can be for single or multi-purpose integrated air and ground intelligence use.

Lockheed Martin has chosen to promote this solution by highlighting its suitability for integrating into existing customer ground and air system architectures. Cost-effective life-cycle management is made easier by using modern software and hardware designs and the company uses extensive simulation modelling to work closely with customers to give a quantitive-based analysis of the appropriate mission and aircraft needs that support the chosen system. The 'plug and play' systems architecture allows rapid introduction of new operational capabilities, with wide and narrow band communications suites together with dedicated ground processing systems with multi-level security.

The Dragon options currently includes six different types. *Dragon Scout* is a large business jet platform with a full range of ISR systems, aimed at customers with enduring requirements and the need to cover large geographical areas of interest. The nominated airborne platform used does not have to be a member of the Gulfstream family, such as the G550, although this has formed the basis for the demonstrator programme. The multi-mission suite in this configuration allows for up to 8 operators and the operational role can include Signals, Electronic and Communications Intelligence. Satellite communications gives immediate access and onboard data-links give real-time ISR connectivity. Having on-board operators can help avoid data overload for ground control staff as a certain amount of filtering and interpretation can be carried out in the aircraft.

Dragon Shield is a roll-on/roll-off flexible sensor suite for customers who need a platform that can perform multiple missions (such as airlift as well as ISR roles). The palletised mission systems can be fitted and operational in a day, offering full SIGINT/ISR capability. The Finnish Air Force has introduced such a system which is carried in an EADS CASA C-295

The L3 electro-optical sensors turret is fitted beneath the rear fuselage, protected from tail strikes.(Richard Gardner photo)

The Dragon platform aircraft demonstrator takes off showing its large canoe shaped SAR radar housing below the fuselage. (LM photo)

transport aircraft. Under the $100 million contract Lockheed Martin has provided an open and modular system architecture that allows for future upgrades and simple and rapid reconfiguration to support changing mission needs. The company is also supplying the ground stations and communications terminals. The programme support team includes Rockwell Collins, DRS Technologies, Applied Signal Technology, Adam Works and L3 Communications. The team is working with Finnish industry to maximise local industrial participation and to ensure national autonomy to maintain the payloads well as enhancing host country technical capabilities. The *Dragon Shield* system can also be fitted to a C-130 Hercules, or similar size transport with rear loading ramp access to the main cabin. It enables a big increase in network centric capability in joint operations.

Dragon Star is a medium size platform (can be a small business jet or turboprop design) with a flexible suite of sensor systems. Suitable platforms include the Hawker 800 and King Air 300ER. The very long range of some of these platforms can be exploited by providing on station endurance of six or more hours in the air, or in the case of *Dragon Scout* up to 8-10 hours.

The interior can be configured for up to 8 operator stations, depending on the role required (LM photo)

Dragon Stare consists of a flexible sensor and communications suite integrated into a smaller jet or turboprop platform, or contained within a special pod, with an optional ground system. *Dragon Den* is the name given to the ISR ground processing stations that can range in size from a single desktop workstation in a transit case, to a shelter with the associated communications suite. Both these options are well suited to transportability and can be moved easily and set up where needed.

Net Dragon is the contractor owned or contractor operated ISR service provider option that can be used with all the other configurations and is aimed at customers who may not want to incur the total acquisition cost of a complete system.

The Dragon ISR flying laboratory programme from LM has involved extensive flight tests and demonstrations to disseminate real-time intelligence data, including screening video, imagery and communications feeds to ground stations. During the flight experiments, the aircraft relayed streaming video as well as previously collected communications and electronic intelligence to a ground station at the company's SWIFT laboratory facility at Farnborough, UK. Almost immediately, staff members on the ground were able to view and analyze data and update mission plans and tasks. The multi-INT data sent to the SWIFT facility was then linked with the Distributed Common Ground System (DCGS) Integration Backbone (DIB) at another LM facility in Colorado, USA.

The DCGS is the US Department of Defence organisation that collects and processes vast amounts of intelligence and imagery from manned and unmanned reconnaissance sources. This Transatlantic exercise demonstrated the flying laboratory's ability to transfer intelligence between coalition forces and reinforced the fact that the Dragon initiative can considerably reduce the development challenge that customers might otherwise face in attempting to counter capability shortfalls by configuring ISR platforms to meet specific requirements. The biggest benefit probably comes from the fact that a simulation framework can be combined with real-world assets to work out exactly what is needed and what works best.

ISR is certainly one aspect of air power that may be unseen, but is very much at the heart of what operational planners need to know in order to make the most use of what air and surface assets they have at their disposal. The term "situational awareness" may sound old-hat, but it is nevertheless a good description of what this aspect of modern warfare is really all about!

The Lockheed Martin Dragon Airborne Multi-Intelligence laboratory is built around this Gulfstream III business jet. (LM photo)

US deploys F-22 Raptors in UAE

In early May, the United States deployed its fifth generation F-22 Raptors to the United Arab Emirates amid deepening tensions between Iran and its pro-US neighbours. The US officials would not say how many F-22s would be sent to the Al-Dhafra air base in the United Arab Emirates. "The United States Air Force has deployed F-22s to Southwest Asia. Such deployments strengthen military-to-military relationships, promote sovereign and regional security, improve combined tactical air operations, and enhance interoperability of forces, equipment and procedures," according to the US spokeperson. However, Pentagon spokesman Captain John Kirby said that the move "was a very normal deployment" in keeping with an adjustment of US forces in the region following the withdrawal of American troops from Iraq.

Territorial disputes between Iran and the United Arab Emirates over three islands in the Gulf have flared again, with Washington voicing support for Abu Dhabi's stance. The argument over the Gulf islands comes against the backdrop of tensions surrounding Iran's nuclear programme, with the US, European and Israeli governments fearing that Iran is pursuing a clandestine nuclear weapons project. Iran's atomic ambitions and growing missile arsenal have raised concerns in Gulf Arab states, which have negotiated arms deals with Washington to build up missile defences as a counter to Iran.

'Shi Lang' completes sixth sea trials

China's first aircraft carrier *Shi Lang* has recently completed its sixth sea trials and has returned to harbour in Dalian in Northeast China's Liaoning province. The 9-day-long trial came just a week after the previous one.

The aircraft carrier is the original Soviet Navy *Varyag*, bought from Ukraine in 1998 ostensibly for "scientific research and training purposes". As the Chinese Navy's *Shi Lang*, the aircraft carrier made its maiden sea trial in August 2011.

Saab to upgrade Thai aircraft carrier

Saab has received an order from the Royal Thai Navy for upgrading of the command and control system on the aircraft carrier HTMS *Chakri Naruebet*. The contract involves upgrading the aircraft carrier with the latest generation of command and control system, 9LV Mk4. Saab will also supply data-link equipment to the carrier, which will allow communication between the ship and the Royal Thai Air Force's Gripen fighters and the airborne radar system Erieye, mounted on the Saab 340 AEW.

Saab is the main contractor to the Royal Thai Navy, and as well as supply of its own systems, its tasks will include procurement of third-party systems and responsibility for integration of all existing and new systems. The contract mainly concerns the Security and Defence Solutions business area as the supplier of the command and control system. The Electronic Defence Systems business area will supply the Sea Giraffe AMB surveillance radar system as well as data-link equipment for communication with Gripen and the Erieye airborne early warning systems.

Refurbished P-3Cs for Pakistan Navy

On 21 February 2012, the second batch of two refurbished P-3C Orions were inducted into the Pakistan Navy at a formal ceremony held at Mehran Naval Aviation Base near Karachi (where ten months earlier in a terrorist attack on 22 May 2011, two P-3C Orions were destroyed). The former US Navy aircraft, which were upgraded with new avionics/sensors, are part of the US assistance being provided to the Pakistan Navy under a Foreign Military Funding programme.

In batches of two, the Pakistan Navy is receiving a total of six P-3Cs from the US, the first of which was inducted in 2010, and these are being employed for extended surveillance. The Northern Arabian Sea is regarded as an important trade and energy corridor for the global economy and has intense maritime activity, which warrants "continuous guard" as per the US spokesmen.

JGSDF orders EC225

One EC225LP will be supplied by Eurocopter's Japanese subsidiary to the Japanese Ministry of Defence, and will be operated by the Japanese Ground Self-Defence Force (JGSDF) as a replacement for a similar EC225 that was submerged at Sendai Airport during the earthquake and tsunami that hit Japan on 11 March 2011.

On 8 March 2012, the Japanese Ministry of Defence signed a contract with Eurocopter to acquire the attrition replacement EC225. Since the major earthquake and tsunami in 2011, various public sectors in Japan are recognising the benefits of helicopters in times of large-scale disasters and are boosting their rotary-wing aircraft fleet.

RAAF Chinooks in Afghan Operations

Providing medium-lift transport capability to Australian and International Security Assistance Force (ISAF) units, Australian Army CH-47D Chinooks have returned to duty in southern Afganistan. The helicopters are operated by Rotary Wing Group 7 (RWG 7) personnel who recently began deployment to Afganistan in support of 'Operation Slipper', the Australian contribution to ISAF.

Major General Stuart Smith, Commander of Australia's joint task force 633 in the Middle East, said the helicopters were a major addition to ISAF rotary wing capability in southern Afganistan. "The troops of Rotary Wing Group 7 (RWG 7) are experienced and their CH-47s are historically important helicopters for supporting coalition forces moving thousands of passengers and hundreds of thousands of tonnes of freight during their annual rotation." Embedded with the US Army's 25th Combat Aviation Brigade known as Task Force Wings, RWG 7 will provide medium-lift helicopter support to USAF missions throughout Daykundi, Kandahar, Uruzgan and Zabul provinces.

Russia orders 30 Su-30SMs

The President of Irkut Corporation Alexey Fedorov, and Russia's Defence Minister Anatoly Serdyukov, have signed a contract for 30 two-seat Sukhoi Su-30SM multi-role fighters. Irkut announced the deal on 22 March and said that all 30 aircraft will be delivered to the Russian Air Force by 2015. The contract value was not disclosed. The Su-30SM is a derivative of the thrust vectoring Su-30MKI variant being supplied to the Indian Air Force. Last year Irkut had revealed that it was negotiating with the Russian Defence Ministry for sale of up to 40 Su-30SMs, of which 28 would be firm orders, with options held on the remaining 12. These were to be split between 28 for the Air Force and 12 for the Navy, replacing Sukhoi Su-24s in the strike attack role.

Russian Navy orders MiG-29Ks

Following the Indian Navy's selection and order of MiG-29Ks, the Russian Defence Ministry and RAC MiG have signed a contract for the production of 20 MiG-29K and four two-seat MiG 29KUB carrier-based fighters for the Russian Navy. Deliveries are to take place between 2013 and 2015.

The new aircraft are to be flown from the Russian Navy's sole aircraft carrier, the Northern Fleet's *Admiral Kuznetsov*, whose home port is at Murmansk. Currently the carrier is equipped with the Sukhoi Su-33 naval fighter. Though it was originally designed for the Russian Navy in the late 1980s as a navalised derivative of the MiG-29M, the Russian Navy then opted for the Su-33. The Indian Navy has ordered 45 MiG-29Ks, with the first examples formally inducted into service on 19 February 2010.

US Navy: F/A-XX required

The US Navy has announced its intention to replace the current frontline Boeing F/A-18E/F Super Hornets and EA-18G Growlers with a new carrier-based air supremacy fighter in the 2030s, termed as the F/A-XX. The USN wants the F/A-XX to have capabilities including organic air-to-air refuelling, tactical reconnaissance, surveillance, target acquisition and airborne electronic attack. A request for information calls for unmanned, optionally manned and manned aircraft concepts derived from legacy aircraft or new 'clean-sheet' designs for a target initial operational date of 2030. According to Rear Admiral Donald Gaddis, Naval Air Systems Command's programme executive officer for tactical aviation, "there is no formal programme as yet".

By the 2030s, the USN's earliest Super Hornets will be reaching the end of their 9,000 flight-hour life spans. Their successor will be defined by the USN's own projected needs as well as what the industry believes is possible. Rear Admiral Gaddis is of the view that these requirements will call for "far greater kinematic performance and increased range".

Israeli M-346s with simulated radar

Elbit Systems will supply its virtual mission training system (VMTS) equipment to give the Israeli air force's future fleet of Alenia Aermacchi M-346 trainers a simulated airborne radar capability. The VMTS system simulates a tactical radar's air-to-air and air-to-ground modes by using data links installed on participating aircraft. It is also networked to an instructor's ground station. By using the equipment, student pilots are able to train in advanced areas such as the simulated use of weapons and electronic warfare systems.

The TOR Systems joint venture between Elbit and Israel Aerospace Industries will involve Israel air force's 30 M-346s from 2014. The company will acquire the selected aircraft and associated equipment and sell flight hours to the service under a multi-year arrangement.

EADS unveils Armed Aerial Scout combat helicopter

EADS North America has unveiled its Armed Aerial Scout 72X+ (AAS-72X+) during the annual Army Aviation Association of America convention in Nashville. The AAS-72X+, an armed derivative of the Army's UH-72A Lakota Light Utility Helicopter, will be manufactured by the company's American Eurocopter business unit in Columbus, Mississippi. The AAS-72X+ helicopter builds on the three Armed Aerial Scout Technical Demonstrator Aircraft (TDA) already developed, tested and flown, using the company's own research and development investment. The AAS-72X or AAS-72X+ could be built and delivered at a cost competitive with the upgrades planned for the Vietnam-era OH-58 Kiowa Warrior and fielded to Army units as early as 2016. This variant is based on the commercial EC-145T2 rotorcraft, which incorporates the

more powerful Turbomeca Arriel 2E engines with dual channel FADEC, a Fenestron tail rotor for improved anti-torque, an upgraded transmission, the Helionix glass cockpit and avionics suite, and a 4-axis autopilot system.

Doubly historic day for Saab

2 April 2012 was a doubly historic day for the Swedish company Saab: while Saab celebrated its 75th birthday, Gripen fighters from four countries participated in the exercise *Lion Effort* in Sweden.

Saab was founded on 2 April 1937 based on a decision by the Swedish Parliament that Sweden should have its own indigenous ability to produce its own fighter aircraft. Since then, Saab has been a key player in building an innovation-strong Swedish industry.

Lion Effort 2012, hosted in Ronne by Sweden, was the biggest Gripen exercise so far. Some 30 Gripen fighters from the Swedish, Hungarian, Czech and South African Air Forces participated in the exercise. The Royal Thai Air Force participated with a number of observers.

Today, Saab has its own operations in 32 countries, on all continents with nearly 14,000 employees around the world. "The key to its success has been the ability to foresee change and make quick adjustments as well as big investments in research and development".

Thales delivers RBE2 AESA radar to Dassault

In February 2012, Thales delivered the first series-produced RBE2 radar with active electronically scanned array (AESA) to the Dassault Aviation facility in Mérignac, France. The radar will be installed on Rafale C137, the first Rafale with this new capability, which is scheduled for delivery to the French defence procurement agency (DGA) this summer. A comprehensive three-month flight test programme conducted with the first production RBE2 AESA radar at the Istres air base demonstrated the qualities of the radar and confirmed the expected levels of performance prior to delivery to Dassault Aviation.

Saab Sensis selected for wide area multilateration surveillance

Lotte has selected Saab Sensis Corporation, a subsidiary of defence and security company Saab, to deploy a Wide Area Multilateration (WAM) system for surveillance of flights operating in close proximity of the Lotte World Tower being constructed near Seoul Air Base in Korea. Saab Sensis will provide WAM surveillance to Republic of Korea Air Force (ROKAF) air traffic controllers with the first operational deployment of conflict detection and alerting capabilities for a WAM surveillance system.

Saab Sensis multilateration uses multiple low-maintenance, non-rotating sensors to triangulate aircraft location based on transponder signals, providing air traffic controllers with precise aircraft position and identification information regardless of weather conditions. With a higher update rate and greater positional accuracy than traditional radar, Saab Sensis multilateration delivers effective surveillance for increased safety, capacity and efficiency of airspace and surface operations.

4,500 F-16 aircraft delivered

Lockheed Martin has commemorated the 4,500th F-16 Fighting Falcon delivery recently with a ceremony for employees, customers, former executives and elected officials,

including U.S. Rep. Kay Granger and Fort Worth Mayor Betsy Price. The F-16 is recognised as one of the world's most successful modern-day fighters. Since the F-16's first production orders in 1975, it has been produced in partnership with five countries and has been selected as the front-line fighter for 26 nations. The 4,500th F-16 is an advanced Block 52 aircraft destined for Morocco (see above).

Apache Block III performance

The US Army's AH-64 Apache Block III next-generation attack helicopter has completed its Initial Operational Test and Evaluation (IOT&E) at Fort Irwin, California, and should be ready to deploy sometime next year. Although formal results of the Block III Apache's IOT&E are still in the process of being determined, preliminary observations and early indications suggest the high-tech aircraft is "performing well". Thus far, the Army has already taken delivery of 10 of the Boeing-built AH 64 Apache Block III aircraft, a helicopter engineered to bring the Apache fleet improved, next-generation range, performance, maneuverability and electronics. Total planned procurement for the Apache Block III is 690 aircraft.

First F-35 for The Netherlands

The first F-35 Lightning II for The Netherlands rolled out of the F-35 production facility on 1 April, the latest step in the production process leading to its eventual assignment to Eglin Air Force Base (AFB), Florida, later this summer. The Netherlands will use the conventional takeoff and landing (CTOL) jet, known as AN-1, for training and operational tests for pilots and maintenance engineers. AN-1 will undergo functional fuel system checks before being transported to the flight line for ground and flight tests in the coming weeks.

AW139 delivered to Egyptian Air Force

AgustaWestland North America has delivered the first AW139 helicopter to the Egyptian Air Force via its contract with US Army Aviation and Missile Command (AMCOM) Contracting Center for Foreign Military Sales. Produced in the United States at the company's Philadelphia, Pa. facility, AgustaWestland has configured the AW139s for the Egyptian Air Force's search and rescue missions.

Operational firing of Aster 30 missile

The French Navy's *Horizon*-class air defence frigate *Forbin* successfully engaged a supersonic target simulating an anti-ship missile flying at very low altitude. The target was launched from the DGA's (*Direction Générale de l'Armement*) missile test centre based on the Ile du Levant in the south of France (Var region) and intercepted in flight by the Forbin's Aster 30 system. Another French Navy *Horizon* frigate, the *Chevalier Paul*, tracked the target and the missiles fired. This test, carried out in conjunction with the DGA, confirmed the Navy's ability to assure the protection of armed forces at sea (carrier and amphibious battle groups) against the most severe of anti-ship missile threats. "In addition, the test marks a first for Europe with the two frigates being prepared for and then successfully carrying out a complex operational scenario, confronting a supersonic threat flying at sea-skimming altitude".

The *Forbin* and *Chevalier Paul* frigates, equipped with the PAAMS system (deploying Aster 30 and Aster 15 missiles) were active notably during the *Agapanthe* deployment in the Indian Ocean between October 2010 and February 2011 and then during *Operation Harmattan* (see *Vayu Issue III/2011*). Deployed off the Libyan coast, they provided protection for naval groups linked to the aircraft carrier *Charles de Gaulle* as well as for the LHDs *Tonnerre* and *Mistral*. They also carried out coastal fire support operations and coordinated air activity for the coalition operating off the coast of Libya, a mission known as "Red Crown".

Rolls-Royce power for USN littoral combat ships

Rolls-Royce will supply power and propulsion systems for the two latest vessels in the US Navy's Littoral Combat Ship (LCS) programme. Designed to operate in combat zones close to the shore (littoral waters), each LCS will be equipped with two Rolls-Royce MT30 gas turbines powering four large Mk1 water jets. This will enable the vessels to reach speeds in excess of 40 knots. This latest order is for ships named *Little Rock* and *Sioux City*, and follows previous orders for the *Milwaukee* and the *Detroit*, which are both under construction. Rolls-Royce already powers two Lockheed Martin Littoral Combat Ships, the USS *Freedom*, which was deployed two years early and the USS *Fort Worth*, which is due to complete trials later in 2012.

Six EC725s for Indonesian Air Force

On 12 March 2012, the contract was signed between Eurocopter and PT Dirgantara Indonesia/Indonesian Aerospace for the supply of six EC725s. To be received in 2014, Indonesian Aerospace will customise and deliver these combat search and rescue configured helicopters to the Indonesian Air Force. The aircraft, for delivery from Eurocopter starting in 2014, will be shipped to Indonesian Aerospace's facility in Bandung, West Java, where they will be reassembled and customised before delivery.

Lockheed Martin delivers final F-22 Raptor

Lockheed Martin has delivered the 195th and last F-22 Raptor to the US Air Force in a ceremony at the Lockheed Martin Aeronautics site on 2 May 2012. "There is no longer any nation that wishes us ill or any adversary who wishes us harm that has any doubt that their actions will have consequences – that they will be held to account and that our response will be undeterred," said Robert J. Stevens, Lockheed Martin's chairman and CEO. "The very existence of this airplane – your airplane – has altered the strategic landscape forever."

This final Raptor joins the US Air Force fleet of 187 operational F-22s with other F-22s in the Air Force's 3rd Wing at Joint Base Elmendorf-Richardson, Alaska. In all, Lockheed Martin delivered 195 F-22s to the US Air Force beginning in 1997, with eight Raptors used as test aircraft. 5The F-22s are assigned to seven US bases. Flight testing takes place at Edwards AFB, Calif., operational tactics development continues at Nellis AFB, pilot conversion training takes place at Tyndall AFB, Fla. Operational F-22 aircraft are assigned to Joint Base Langley-Eustis, Va.; Joint Base Elmendorf-Richardson, Alaska; Holloman AFB, N. M.; and Joint Base Pearl Harbor-Hickam, Hawaii.

Logistics Support for Iraqi Bell 407s

Bell Helicopter has been awarded a contract by US Army Contracting Command Redstone Alabama for logistics support for 30 Bell 407 helicopters in service with the Iraqi Army. The award valued at $15 million allows Bell Helicopter to provide logistics support of 24 Bell 407 aircraft purchased by the Government of Iraq through the Foreign Military Sales (FMS) programme and six Bell 407 aircraft purchased by the US Army and supplied to the Iraqi Ministry of Defence at Al Taji Air Base in Iraq. The Iraqi 407 programme is an initiative to design, develop, integrate and qualify a unique customer directed aircraft configuration under the Foreign Military Sales (FMS) programme utilising the total package approach.

Japan National Police Agency for GrandNew helicopters

AgustaWestland has been awarded a contract by the Japan National Police Agency (JNPA) to supply two GrandNew law enforcement light twin helicopters as part of an on-going programme to modernise the police helicopter fleet. The two aircraft will be operated in Saga and Tottori prefectures and is the first sale of GrandNew helicopters to the Japan National Police Agency. The selection of the GrandNew helicopter brings the number of AgustaWestland light twin helicopters operating in the Japanese law enforcement market to 25 and continues AgustaWestland's growing share of the Japanese light twin engine market.

CAE records C$950 million military orders

CAE ended fiscal year 2012 with more than C$950 million of military orders, including a record order intake coming from the United States. Included in this total are more than C$400 million of orders won in its recent fourth quarter. The company was awarded military contracts from more than 15 countries during the year. Some of the key orders this fiscal year included six P-8A operational flight trainers for Boeing and the United States Navy, four C-130J weapon systems trainers for Lockheed Martin and the United States Air Force, significant upgrade and services contracts for the German Air Force's Tornado and Eurofighter training systems, several CAE 3000 Series AW139 helicopter simulators, and the world's first AW189 full-flight simulator for Rotorsim.

Firing tests of Viper Strike

Incorporated's GBU-44/E Viper Strike munition scored multiple direct hits from a US Marine Corps KC-130J Harvest HAWK aircraft during developmental testing at Naval Air Warfare Center's China Lake, California Weapons Station. Viper Strike is a glide munition capable of precision attack from extended stand-off ranges using GPS-aided navigation and a semi-active laser seeker. "Its small size, precision and high agility provides a very low collateral damage weapon that is effective against stationary and moving targets". Using the new pressurised derringer door launcher on Harvest Hawk, Viper Strike successfully launched and scored multiple direct hits on tactical targets.

Raytheon delivers USN's first dual-frequency sonar

Raytheon has completed delivery of electronics for the AN/SQQ-90 tactical sonar suite, the complex sonar for the first ship of the US Navy's DDG 1000-class multimission destroyer. The AN/SQQ-90 tactical sonar suite, the first dual-frequency hull-mounted sonar of the Navy's surface fleet, is a "major advancement in undersea warfare capability and will provide broad warfighting coverage to DDG 1000". Raytheon delivered the sonar electronics completely assembled and integrated into an Electronic Modular Enclosure (EME), an innovation to 21st century shipbuilding designed into the *Zumwalt*-class destroyer programme for affordability. The EME delivers benefits not only in upfront integration and testing before delivery to the shipyard for ship installation, but also minimises the footprint occupied onboard the ship (size and weight) and maximises efficiencies in both power and cooling.

NGC Silent Watch DAS demonstrated

Northrop Grumman engineers have successfully demonstrated capability of the company's Silent Watch Electro-Optical Infrared (EO/IR) Distributed Aperture System (DAS) to enable a surface vessel to sense and track threats. The Silent Watch EO/DAS was originally designed and developed by Northrop Grumman to provide 360-degree situational awareness for F-35 pilots. The innovative threat warning system may soon provide invaluable situational awareness for manned and unmanned surface and submarine platform applications.

The maritime applications of the EO/DAS involved the strategic placement of multiple EO/IR sensors onboard the Sperry Star III research vessel, a Northrop Grumman Naval and Marine Systems surface ship test platform. The test demonstration proved that, when employed at sea, high resolution, near-real-time images generated by Silent Watch can be displayed and relayed to friendly forces.

F-35A in-flight refueling with external weapons

On 21 April, a Lockheed Martin F-35A Lightning II conventional takeoff and landing aircraft completed the programme's first in-flight refueling mission while configured with external weapons at Edwards Air Force Base. US Air Force Lt. Col. George Schwartz piloted the test aircraft, known as AF-4, with two external inert AIM-9X weapons and four external stores. Internally, the jet was carrying two Joint Direct Attack Munitions and two Advanced Medium-Range Air-to-Air Missiles. The two-hour mission tested the flying qualities of the aircraft while maneuvering with external weapons, which test paves the way for weapons separation testing later in 2012.

NGC to upgrade Fire Scout Unmanned Helicopter

The US Navy has selected Northrop Grumman to produce the next-generation Fire Scout unmanned helicopter using the Bell 407 airframe. The new variant provides greater range, endurance and payload capacity to ship commander's intelligence-gathering efforts. According to a US Department of Defence news release on contract awards released 23 April, the company will produce a total of eight Fire Scouts within an amount not to exceed $262 million. The Navy plans to purchase a total of 28 aircraft under a rapid development effort. The Fire Scout endurance upgrade has been designated as the MQ-8C. Northrop Grumman is the prime contractor for the MQ-8C programme and major suppliers for new variant include Bell Helicopter and Rolls Royce.

Additional Saab Carl-Gustaf M3s for Australia

Saab has received an order from Australia for additional Carl-Gustaf M3 weapon systems, the order placed under a standing offer signed in early 2011 and amounts to MSEK 199. The Australian Defence Force selected the Carl-Gustaf M3 weapon system after extensive evaluation as their future multi-purpose weapon system. The Carl-Gustaf has been exported to more than 40 nations worldwide, and has been successively modernised and adapted to meet new requirements.

LM PAC-3 missile intercepts Cruise Missile Target

Lockheed Martin's PAC-3 successfully intercepted and destroyed a cruise missile target at the Utah Test and Training Range in an unprecedented interoperability demonstration utilising the Joint Land Attack Cruise Missile Defence Elevated Netted Sensor (JLENS) and the Patriot system. "The test demonstrated the PAC-3 Missile Segment's unique ability to detect, track, engage and destroy a cruise missile target at extended range in an integrated air and missile defence architecture that joins netted sensors and missile defence systems to provide greater capability for the warfighter".

Lockheed Martin achieved the first-ever hit-to-kill intercept in 1984 with the Homing Overlay Experiment, using force of impact alone to destroy a mock warhead outside of the Earth's atmosphere. Further development and testing produced the PAC-3 Missile, which won a competition in 1993 to become the first hit-to-kill interceptor produced by the US government. The PAC-3 Missile has been the technology pathfinder for the total conversion to kinetic energy interceptors for all modern missile defence systems.

NGC Electronic Attack Pod Upgrade Programme

The US Air Force has awarded Northrop Grumman a $52.8 million, 27-month engineering and manufacturing development (EMD) contract to upgrade its electronic attack (EA) pods. The programme has a potential value of $480 million including EMD, a low-rate initial production phase (LRIP) and five production options. Northrop Grumman's solution, an upgraded ALQ-131 EA pod, is fully capable of operating in support of A-10, C-130, F-15 and F-16 aircraft.

MH-60R/S cockpits and integrated systems

The US Navy has awarded Lockheed Martin a $1.05 billion, five-year contract to provide more than 200 digital cockpits and integrated mission systems and sensors for the Navy MH-60R 'Romeo' and MH-60S 'Sierra' helicopters. Specifically, the new multi-year contract includes 162 cockpits, integrated missions systems and sensors for the MH-60R 'Romeo' anti-surface and anti-submarine warfare helicopter. Also funded are 62 digital cockpits to complete the Navy's programme of record for 'Sierra' aircraft, used for ship-to-ship cargo resupply, search and rescue, and close-in defence of Navy ships.

Aegis BMD System Evolution

The US Navy has certified the latest evolution of Lockheed Martin's Aegis Ballistic Missile Defence (BMD) system, currently installed on the cruiser USS *Shiloh*. Initially deployed as an anti-ship missile defence system that ultimately revolutionised surface warfare operations, Aegis has grown to become an integral component of the US Navy's missile defence system on land and sea.

This latest configuration, known as Aegis BMD 4.0.1, enables the Navy and the US Missile Defence Agency (MDA) to counter longer range and more sophisticated ballistic missile threats. This second-generation system introduces the Aegis BMD signal processor to improve target identification capabilities and to enhance tracking data, using open architecture standards to integrate commercial-off-the-shelf technology.

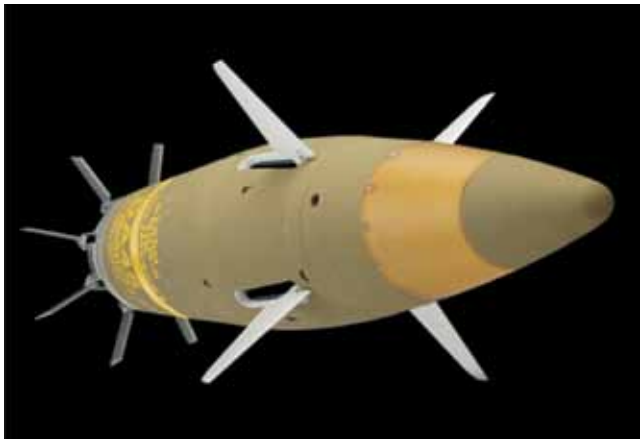
The Navy's 22 Aegis BMD-equipped ships provide surveillance and tracking of intercontinental ballistic missiles and work with other BMD system elements to provide advanced warning for the defence of Continental USA deployed US forces and allies. The Navy plans to modify 12 additional ships to perform ballistic missile defence over the next three years.

Sikorsky and Terma extend MoU

Sikorsky Aircraft and Terma "have extended and broadened their previously announced Memorandum of Understanding (MoU) to explore additional potential collaborations on aircraft programmes". Both the original MoU, signed in February 2010, and the new MOU are conditioned on the Danish government's decision to procure Sikorsky MH-60R Seahawk helicopters via a Foreign Military Sale with the US Government, which is currently under consideration.

Raytheon fires Excalibur from G6 self-propelled howitzer

Raytheon has fired four Excalibur 155mm precision-guided artillery projectiles from the Denel-manufactured G6 self-propelled howitzer as part of a field trial demonstration.



Multiple rounds of the combat-proven Excalibur successfully fired from the G6 155mm wheeled howitzer out to a range of 38 kilometers (23.6 statute miles), with all rounds landing within 5 meters (16.4 feet) of the target. Successfully fielded in 2007, the Excalibur 155mm precision-guided, extended-range projectile is the 'revolutionary' artillery round used in theatre today by the US Army and Marine Corps. Using GPS precision guidance technology, Excalibur provides accurate, first round, fire-for-effect capability in an urban setting. Excalibur is considered a true precision weapon, impacting at a radial miss distance of 6 meters from the target.

17th CC-130J Super Hercules for Canada

The Royal Canadian Air Force formally accepted the 17th Lockheed Martin CC-130J Super Hercules in ceremonies on 8 May, completing the order placed in December 2007. The original contract called for all 17 aircraft to be delivered by the end of 2012. The first CC-130J was accepted in June 2010 and this acceptance "demonstrates the success of the programme and the completion of deliveries ahead of schedule".

GE Aviation participation in AAI's Shadow UAS

GE Aviation has been awarded a contract by AAI Unmanned Aircraft Systems, an operating unit of Textron Systems to provide the stores management system for a demonstration involving *Shadow*. The contract includes the engineering, manufacturing, installation and data development of GE's Stores and Payload Controller (SPC) used to control the new stores management system. GE Aviation provides the stores

management system for the MQ-8B Fire Scout unmanned helicopter and has provided mission/stores management solutions to a wide variety of military aerial platforms for more than 40 years. GE has delivered more than 4,500 systems to numerous fixed- and rotary-wing military aircraft operators worldwide.

Rolls-Royce Trent 1000 powers into service with record reliability

Rolls-Royce Trent 1000 engines powering Boeing 787 Dreamliners operated by Japan's largest airline, All Nippon Airways (ANA), have now completed 4,000 flying hours in just five months of revenue service with a record 99.9% despatch reliability. This means less than one in 1,000 flights has experienced a delayed departure due to an engine issue.

The Trent 1000 powered the Boeing 787 Dreamliner's first flight in December 2009 and entered service with ANA on 26 October 2011. The turbofan, which ran for the first time in 2006, was granted Federal Aviation Authority (FAA) certification in August 2007. Rolls-Royce gained Extended Twin Engine Operations (ETOPS) approval from the FAA for the engine in May 2011. The Trent 1000 was granted 330 minutes ETOPS approval, which allows more direct routings, shorter flight times and reduces fuel consumption and emissions. The engine, the quietest and most efficient available on the 787 Dreamliner, has been selected in 8 of the last nine 787 Dreamliner engine decisions and now has a total of 24 customers.

Advanced CFM56-7BE highly successful in-service record

The CFM56-7BE-powered Boeing Next-Generation 737 has maintained a highly successful entry into commercial service. Since the first aircraft was delivered to China Southern Airlines in July 2011, approximately 250 aircraft have been delivered to more than 50 operators worldwide. This fleet had logged more than 300,000 flight hours to date without a single engine-related issue.

The CFM56-7BE-powered Next-Generation 737 enhanced aircraft/engine combination is providing a 2 percent improvement in fuel consumption, which, in turn, equates to a 2 percent reduction in carbon emissions. Additionally, the enhanced -7B will provide up to 4 percent lower maintenance costs, depending on the thrust rating. CFM has used advanced computer codes and three-dimensional design techniques to improve airfoils in the high- and low-pressure turbines for better engine performance. In addition, the company improved engine durability and reduced parts count to achieve lower maintenance costs.

Eurolot signs for up to 20 Bombardier Q400 NextGen airliners

Bombardier Aerospace has recently announced that Eurolot S.A. of Warsaw, Poland has signed a firm order to acquire eight Q400 NextGen airliners. The transaction includes options for an additional 12 Q400 NextGen aircraft. Based on the list price for the Q400 NextGen airliner, the firm order contract is valued at approximately US$246 million. The contract value would increase to US$625 million should all 12 options be converted to firm orders.

Qatar Airways chooses Recaro CL3620

Qatar Airways and Recaro Aircraft Seating have signed a contract for the delivery of several thousand Comfort Line 3620 seats for the airline's brand new B787 and A350 fleets. "Qatar Airways places high priority on cabin interiors. This is why we chose the Recaro CL3620—a seat that sets new standards in ergonomics and design for long-haul flights", said Qatar Airways CEO Akbar Al Baker. Thanks to the seat's lean shape based on the single beam concept, passengers can enjoy more legroom even with a relatively short seat pitch. The ultra-thin backrest offers outstanding comfort. Other features include flexible materials in the headrest and in the backrest as well as the latest in-flight entertainment (IFE) system integration.

Boeing delivers 1,000th 777

The Boeing Company with more than 5,000 employees, suppliers, customers and government officials celebrated the 1,000th 777 airliner at a special event. "As the largest 777 customer, it's very appropriate that Emirates is the recipient of our milestone 1,000th 777," said Jim Albaugh, President and CEO of Boeing Commercial Airplanes. "Emirates has set an industry high bar in providing excellent customer service and we're honoured that the 777 is central to its efforts to be a global airline leader" he added.

6th Sukhoi Superjet 100 with Aeroflot

Aeroflot Russian Airlines has put its sixth Sukhoi Superjet 100 aircraft (SSJ100) in service. The Sukhoi Superjet 100 MSN 95013 (registered number RA-89005) was delivered to Aeroflot under contract with the VEB-Leasing JSC on financial lease. The delivered aircraft is configured to 87 passengers in a comfortable two-class layout (12 business class and 75 in economy class). Aeroflot currently operates six SSJ100 aircraft serving routes from Moscow to 13 Russian cities as well as to Minsk, Budapest, Oslo and Stockholm. Aeroflot spokesperson states that the aircraft "perfectly match their requirements in terms of high frequency departures on regional routes".

GE90-115B in 1000th engine milestone

GE Aviation has celebrated completion of the 1000th GE90-115B engine at its facility in Peebles, Ohio, USA. The engine's 1000th mark was recorded eight years after it entered service with International Lease Finance Corporation's customer Air France. More than 1,500 GE90-115B engines have been ordered by customers for their Boeing 777-300ERs, 777-200LRs and 777 Freighters, including a record-setting Emirates' order announced in 2011 for 50 GE90-115B-powered Boeing 777s. In 2011, the GE90 engine experienced its most successful year and accumulated airline and freighter operator commitments for 400 engines. This surpassed the 2007 record of 250 engine commitments in a year.

Argentina service centre for Twin Otter

Viking Air Limited of Victoria, BC, Canada has finalised a military service centre agreement with *Fuerza Aerea Argentina*, "welcoming the Argentine Air Force" as the first South American and First Factory Endorsed Military Service Centre (FEMSC) representing the OEM for the Series 400, Guardian 400 and legacy Twin Otter aircraft in Argentina. This agreement authorises *Fuerza Aerea Argentina* (AAF) to provide world- class OEM backed support services for the Twin Otter programme with respect to Government and military maintenance, warranty work, and Viking recognised modifications at their base in Quilmes, Argentina.

Second AW139 helicopter for Bel Air

Bel Air of Denmark has taken delivery of its second AW139 medium twin helicopter. The 12-seat configured aircraft will perform offshore transport operations and joins the first helicopter, named 'Spirit of Agusta'. A number of additional AW139s are expected to enter service with Bel Air in the future. Delivered in 2009, the first helicopter has performed exceptionally well, logging over 12,000 landings in offshore operations so far, whilst delivering Bel Air's customers with "outstanding reliability by achieving a 99.8% availability rate". With a second AW139 now about to enter service, Bel Air will further expand its offshore transport business. Bel Air has also placed an order for two AW189 8-tonne class helicopters.

Vision Flight Deck on Global 6000

Bombardier Aerospace has announced the first customer delivery of its Vision Flight Deck on a Global 6000 aircraft. The aircraft, to be operated by Wideworld Services Ltd., was delivered during a special ceremony at Bombardier's facilities in Dorval, Canada. Bombardier Aerospace and Rockwell Collins are the first to certify synthetic vision imagery on a head-up display (HUD) as part of the Pro Line Fusion avionics system on the Vision Flight Deck. The Vision Flight Deck is installed on Global 5000 and Global 6000 jets.

CFM celebrates 30 years of commercial service

On 24 April 1982, Delta Air Lines made aviation history when it flew the very first McDonnell Douglas DC-8-71 aircraft powered by CFM International's CFM56-2 engines into revenue service on its route between Atlanta and Savannah, Georgia.

CFM International (CFM) had been formed as a 50/50 joint company between Snecma (Safran group) and General Electric in mid-1974. In March 1979, just two weeks before the programme was to be officially cancelled, Delta, along with United Airlines and Flying Tigers, chose the fledgling company to re-engine DC-8 Super 70s. Within weeks, the US Air Force had selected the CFM56-2 to re-engine its fleet of KC-135 tanker aircraft, and the programme was "go".

Few realised at the time what they had created. Over the past 30 years, CFM has become the model for successful international joint ventures and the CFM56 product line has become the best-selling commercial engine in history. The CFM56 family encompasses six engine models that power 30 different commercial and military applications for more than 500 customers around the world.

With an eye to the future, GE and Snecma renewed the partnership agreement in 2008 to the year 2040 and officially launched the LEAP engine programme. The LEAP-1B and LEAP-1C were selected as the sole powerplants for the Boeing 737 MAX and COMAC C919 aircraft, respectively, while the LEAP-1A is offered as an option on the Airbus A320neo. These airplanes are set to enter commercial service in the 2016-2017 time frame. To date, CFM has received orders for more than 3,400 LEAP engines. Total CFM56 engine orders currently stand at 28,875 engines, of which more than 23,300 have been delivered. Through March CFM has received orders for approximately 600 engines in 2012.

Large orders for Russian shipbuilders

Andrei Dyachkov, General Director at "Rubin" Central Design Bureau for Marine Engineering

Addressing an expanded meeting of Russia's Defence Ministry Board on 20 March 2012, the Russian President Dmitry Medvedev said development of the country's military organisation will remain "a state policy priority" and that substantial funds will be channeled for national defence through till 2020, amounting to at least 2.8% of the GDP. Substantial funds have been allocated for implementation of the programme: over 23 trillion rubles [US $ 800 billion]. "By 2015, the share of new armament must increase to 30 percent, and by 2020, to 70 to 100 percent," Medvedev emphasised.

By late 2011/early 2012 substantial contracts were placed for naval equipment including four Project 955A Borey-A strategic missile underwater cruisers and five Project 885M Yasen-M cruise-missile submarines with nuclear propulsion. In early 2012, decisions were made for the refit and modernisation of the Project 1144 nuclear-powered cruisers and Project 949A cruise-missile submarines. These commitments total some US$10 billion and represent the highest-ever orders for naval equipment placed by the Kremlin after collapse of the Soviet Union.

As a result, the share of Russia's largest naval enterprise, Sevmash, has risen to above 70%. During 2011, another prominent establishment, the Admiralty Shipyard, laid down hulls for three improved Project 636 diesel-electric submarines for the Russian Navy's Black Sea fleet. The Russian Defence Ministry intends to increase this order to six hulls. The Project 955 and 636 are developed by St. Petersburg-based 'Rubin', which are also responsible for modernisation of the Indian Navy Project 877EKM submarines, ten of which are in service.

In February 2012, the Russian Navy confirmed its interest in the further improved Project 677 *Lada* diesel electric submarine with independent air propulsion (AIP). Andrei Dyachkov, General Director at 'Rubin' Central Design Bureau for Marine Engineering, the submarine developers, states that bench testing of a technology demonstrator unit is complete, so as to prove technologies for generation of hydrogen on-board the submarine through the recycling of diesel fuel. The hydrogen is fed to an electrochemical generator charging the submarine's batteries. The next step would be construction of a full-size AIP in 2012-2013.

Russian Navy seeks AIP solution

In a recent interview the Russian Navy Chief, Admiral Vladimir Vysotsky has said that the lead vessel of the Project 677 *Lada*, at St Petersburg, continues on operational trials, but that its propulsion system needs "further improvement". The next two hulls, the *Sevastopol* and the *Kronshtadt* are being completed at the Admiralty Shipyards and will use a new propulsion system featuring an air independent propulsion (AIP) system. "Our key task is to create non-nuclear submarines with locally-developed air-independent propulsion system. We have already achieved some positive results. AIP development goes at high speed, even above our expectations".

The Admiral referred to bench prototype under testing at 'Rubin' Central Design Bureau for Marine Engineering. The Bureau is experimenting with recycling of diesel fuel so as to eliminate the need for onboard storage of hydrogen for fuel cells. The Admiral further stated that completion of the follow-on Project 677 hulls is "worth it" since the submarine has potential for further improvement. "If we install the new propulsion in the *Lada*, it will expand functions and capabilities and, in the end, we will get a good ship".

First example of the completely operable AIP shall be ready for installation into submarine hulls in 2014. The Admiral concluded that the new achievements in AIP development "give boost to accelerated materialisation" of the respective non-nuclear submarine programme. The lead vessel of the *Lada* project was accepted by the Russian Navy in May 2010 and thereafter the St Petersburg-based organisation resumed operational trials in deep-water oceanic testing ranges. Export version of the *Lada,* dubbed the *Amur 1650*, is competing for the Indian Navy's six advanced non-nuclear submarines programme. Compared to previous Project 636/877EKM designs, the newer submarine has smaller displacement, at 1,765 tons, resulting in lower signatures, further reduced through use of electrical motors on permanent magnets. At the same time, the submarine has much more powerful sonar, the Electropribor-developed *Lira* with quasi conformal antennae.

25 Years Back

From Vayu Aerospace Review Issue III/1987

First Dornier 228s for IAF

The first batch of Dornier 228-201s for the Indian Air Force were completed by HAL Kanpur Division, by the end of March 1987. Incorporating a 'wide door' modification, designed and manufactured by HAL, the IAF. Dornier 228s will be operated for a variety of logistic support and utility tasks and are to replace the DHC-3 Otters in squadron service as also the remaining DH Devons for communication purposes.

Pakistan-China nexus

According to the IISS of London, India's defence capabilities along its long borders with Pakistan and China were tested twice in the last twelve months and "are now balanced to meet any simultaneous Sino-Pakistani attack" The focus of tension has shifted to be north as India once again found itself in border disputes with China.

The report, however, stated that so far China did not seem to have felt that further action was called for in the Arunachal Pradesh (NEFA) area and neither side wanted to see tensions escalated over remote border quarrels.

LCA programme "crucial"

Stating in Parliament that the Light Combat Aircraft programme was crucial to the revival of the aeronautics industry, the Minister of State for Defence (R&D) said that the LCA involved a lot of complex technology including composite materials for primary structures and fly-by-wire control systems. Some experience had been gained in instrumentation, cockpit display weapons and sensors including lasers but much more development was necessary. So far as the powerplant was concerned, the laboratory working on the engine (GTRE) had produced a good (prototype) but, as the Minister observed, "it would not be good enough for the LCA" in the interim, it was necessary to select another engine and for this ten engines (the General Electric F-404), plus one for the test bed were being imported from the USA. "This was exactly the path being followed by countries like France for its own LCA type aircraft."

Defence R & D projects

Minister of State for Defence (R&D) Arun Singh has referred to the new indigenous surface to air missile, light combat aircraft, main battle tank, airborne early warning system, anti-armour ammunition and various other projects concerning electronic warfare, naval sonars, radars, communications equipment as well as high-altitude warfare equipment. The budget allocation for Defence R & D had gone up from Rs 74 crores ($ 60 m) in 1980-81 to Rs 650 Crores ($520m) for 1987-88 and while funds were "no problem, efforts must be made to ensure that no money was wasted."

"Squadrons of the Year"

The Defence Minister KC Pant presented Squadron of the Year trophies to fighter and transport squadrons and units of the Indian Air Force for their flight safety and maintenance record for the year.

The best performing supersonic fighter formation was No.14 Squadron (Western Air Command), while the OCU of Eastern Air Command received the trophy for the transonic fighter category. The transport trophy went to No.43 Squadron and the best Helicopter unit of the Air Force was No. 111 HU.

German Navy Do 228 trials

Dornier has reported satisfactory conclusion to the nine-month evaluation by MFG 5 of the German Navy from Kiel-Hotlenau of the Do-228-201 light turbo-prop transport, which completed more than 940 hours of flight between January and October, 1986 on liaison and supply tasks, as well as offshore reconnaissance missions. In addition to numerous staff transport and courier flights between bases in the FRG and the neighbouring NATO countries, the Do 228 also flew spares and other items to German naval units.

US AEW and ASW aircraft for Pakistan

The United States is likely to sell "in the immediate future" several maritime reconnaissance aircraft and other naval equipment to Pakistan, including 3-4 Lockheed P-3C Orion MR/ASW aircraft that the PAF has requested to augment its maritime reconnaissance capability. The US had also agreed in principle that Pakistan needed an aerial warning capability, but no decision had been taken on whether it should be the E-2C or the E-3A. "However, we consider that this is an urgent need of Pakistan and we hope that we and Pakistan can make a decision soon".

Denying that the US was attempting a military balance between India and Pakistan, he said US help to Pakistan was only for coastal defence "in view of the threat from the Soviet Navy in the Indian Ocean". Pakistan does not have a blue water navy, and the only such in the region belonged to India. "Pakistan only has coastal defence capability".

F-7M upgrading by Grumman

Grumman Corp has been awarded a contract to undertake a technical feasibility for the Pakistan AF's proposed modernisation of Chinese-supplied F-7 fighters. Chengdu Aircraft Corp. the Chinese manufacturer, with collaborate with Grumman on the study, which was scheduled to start in March and expected to take about six months to complete.

The avionics upgrade requirements include a multimode (look-up/look-down) radar for air-to-air and air-to-ground capability, new cockpit displays and a new navigation system.

Grumman has said. "the improved aircraft would be a cost-effective alternative to replace some of the fighter aircraft currently in the Pakistan Air Force inventory. The PAF wishes to hold the flyaway cost to well below that of modern Western-built fighters".

Tale Spin

Come Calling !

Profuse thanksgiving followed the safe return of a young Bangladesh Air Force air cadet back home after he had earlier 'lost his way' and force landed his piston-engined PT-6 trainer of Chinese-origin near Murshidabad in West Bengal. The delicious background to this event is that just a month earlier, Senior Air Cadet Rashed Sheikh of the BAF had been selected to brief the visiting Indian Air Force Chief NAK Browne at the Jessore Air Force base.

'Charlie' Browne later interacted with the cadets and hoped that there would be friendly exchanges in the future including visits to India. But little could he expect that cadet Rashed would take this literally, and shortly visit India in unorthodox fashion, losing his way during a routine training sortie and then force landing his aircraft on a paddy field across the border. But all was well, Rashed was picked up by an IAF helicopter, medically checked out and flown back to Bangladesh by an IAF aircraft. The BAF Air Chief conveyed his and the family's gratitude.

Next time, Rashed, just take a commercial flight to Kolkata !

Fantasy becomes Fact

Often dreamt of and fantasised by frustrated car drivers stuck in traffic jams, who wished they could take off and fly over to their destinations, well, there is now the flying car ! Inventors have been trying to translate fantasy into fact for the past eight decades but now an American company has done it !

Terrafugia Inc. of Woburn, has designed the 'Transition' hybrid car which has two seats, four wheels and folding wings. The apparition drives like a car but then unfolds its wings and takes off, climbing out to well over 1000 feet. The Transition can touch 70 miles per hour on the road, but 115 mph in the air, uses normal automotive fuel, consuming five gallons per hour in the air as opposed to 35 miles per gallon on the ground.

But here is the catch : the owner must pass various tests and complete twenty hours of flying to get his licence.

Awesome Technology

Imagine this: the Global Hawk Unmanned Aerial Vehicle takes off from Edwards AFB in California, flies to targets in West Asia, launches its weapons and then flies back to California, all nonstop, under its own power and controlled by data link from a command centre, 10,000 miles away !

There is no radio chatter because everyone is fused together electronically, there is real time 360 degree situational awareness, there are no blackouts, pilot fatigue, ejection seats and most of all no human casualties or POWs.

But no gallantry awards nor citations either.

Dragon Fly

Born in Beijing, performing worldwide is Li Wei who has always pushed the boundaries of art, but now has really taken his latest work literally to new heights. The Chinese photographer dressed up as a monk and suspended himself in the air by wires to perform this illusion. He then

bellowed red smoke from his shoes to create the effect of flying. The pictures were taken over the Fontaine of Lyons at La Villette in Paris.

The Paris Air Show will never be the same again !

Fly high on Vanaspati

If Australian airliner Qantas can make country's first commercial flight on biofuel, between Sydney and Adelaide using a mix of conventional fuel and refined cooking oil, why not Air India ? A Qantas spokesman said that the flight was a commercial first in Australia, and would have produced far less carbon emissions than if conventional jet fuel were used. "We're talking about a 60% reduction in overall life cycle of the fuel, so that's a substantial improvement".

In fact, the troubled Indian flag carrier, facing huge financial losses, especially owing to high fuel costs, could well consider stocking up with Vanaspati and so powering its fleet !

Only problem, would there be enough refined cooking oil at western airports ?

Afterburner

Saab

ShinMaywa