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II/2014

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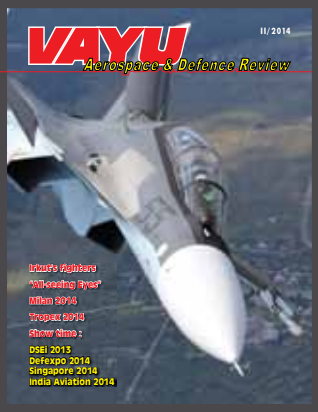

Sukhoi Su-30SM (photo courtesy Irkut)

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Looming military breakdown

In a nation where instances of admission of individual responsibility are depressingly rare, Chief of the Naval Staff Admiral DK Joshi's resignation following the tragic accident on INS *Sindhuratna* is welcome evidence that some officials, at least, still hold themselves to the highest standards. Behind his resignation, though, lies a terrifying story: India's military is, literally, on the verge of breakdown. In recent years, each military chief has told Defence Minister AK Antony of the growing danger that India might prove unable to fight future wars. Even as the Army has been instructed to be prepared to fight a war on two fronts, acquisitions of desperately needed armour and artillery systems have been endlessly delayed. The Air Force is warning that its combat fleet will start shrinking from 2017; squadrons are rationing flying time to prolong the life of aircraft for as long as possible. The Navy is well below strength, and its increasingly obsolescent platforms are dangerous.

Last year's explosion on board INS *Sindhurakshak*, one of 10 significant accidents involving the Navy in the last seven months, caused more damage than the Navy ever suffered at war. Perhaps most dangerous, all three services face large-scale deficits of officers, because the armed forces' pay scales and service conditions are too poor to attract the skilled young people modern militaries need. There are more than a few in the armed forces who are asking whether the civilian leadership is not just as responsible for the deaths on board the *Sindhuratna* as Admiral Joshi, whose resignation the Union government was so quick to accept.

Though Mr. Antony's years in office have seen him maintain his stellar reputation for personal probity—which is no mean achievement in itself—he has done little to address the looming crisis in Indian defence. Equipment purchases have stalled at the whiff of scandal, often forcing the forces to restart the acquisition process, that can last years. In fairness to Mr. Antony, the problem is not all of his making. The depreciation of the rupee against the dollar, and India's slowing growth, have stripped him of resources badly needed for modernisation. Yet, there is no glossing over the fact that too little has been done on defence reform and capacity-building. India can only hope it is not too late. The last Indian military chief to hand in his resignation was General KS Thimayya, who did so in 1959 to protest Defence Minister VK Krishna Menon's refusal to consider his plans to prepare the Army for a war with China. Prime Minister Nehru persuaded the legendary General to take back his resignation, but chose not to persuade his Defence Minister to take the threat of war seriously. The consequences still haunt India.

From *The Hindu*

Gone adrift

Admiral DK Joshi's resignation as chief of the Indian navy capped an extended sequence of incidents featuring the navy's frontline warships and submarines, beginning with the explosions in the torpedo compartment that sank the INS *Sindhurakshak* in August last year and killed 18 sailors. The incident on board the *Kilo*-class submarine INS *Sindhuratna* resulted in the death of two officers and injuries to other personnel.

These incidents or accidents—a minesweeper catching fire, a patrolboat firing at naval docks, a frigate colliding with a fishing vessel, submarines and warships running aground or colliding—occurred on Joshi's watch. It is only in the fitness of things that he has put in his papers. His tenure was overshadowed not only by the navy's safety record but also the manner in which these incidents were handled.

The very number and frequency of such incidents and the navy's manner of dealing with them—there were allegations of naval headquarters withholding information from civilian counterparts—were warning signals that the Union ministry of defence (MoD) ignored. While Defence Minister AK Antony did ask the navy to clean up its act and ensure that assets were "not frittered away", that warning came in late-November, more than three months after the mainstay *Kilo*-class submarine, the *Sindhurakshak*, was lost.

Joshi responded by claiming the navy's safety record was "not all that bad". And the drift continued, unchecked. The overall impact has been to put back by several years the emergence of the navy as a genuine blue-water force and jeopardise the protection of India's 7,000 kilometre-plus coastline. In fact, the mismanagement of the navy could be said to mirror the MoD's mishandling of the army. There, a government that was indifferent or weak or both had allowed distrust to escalate to a disquieting level. As reported two years ago and confirmed a few days ago by former DGMO AK Choudhary, the highest echelons of government were seized by panic over controversial troop movements in January 2012. Yet, crucial questions about that troubling episode in the vital civil-military relationship have remained unaddressed, the official denial and evasion continues.

Antony bequeaths an unenviable legacy to the next defence minister. His has been a tenure defined by inaction at best and poor judgement in fact. The next government must urgently repair the damage wreaked in the UPA's tenure on the internal vitality of the defence forces and on the civil-military relationship.

From *The Indian Express*

Revival has not taken off

Air India's need for surgery is obvious to its owner, the government, its management, and, to an extent, its employees. The recent sacking of 16 air hostesses and a flight purser for not following flight duty time limitation (FDTL) norms seems like another move in a game that will play out over the next couple of years as the bleeding flag carrier tries to make itself fit to fly again. FDTL norms are guidelines governing aspects such as the maximum daily flight duty period including flying hour limitations, rest period, staff-on-duty travel and number of landings allowed per pilot as

Saab

well as the crew. Any violations should call for action, which the Air India management has handed out.

Two years ago, the government announced a Rs. 30,000 crore cash-booster, infused over an eight-year period. This is not the first revival plan the airline has come up with and the metrics for future cash infusions should be iron-clad, and, therefore, before the government started signing over shiploads of rupees it rightly asked for some guarantees.

The condition : the national carrier has to turn profitable by 2018. With more than 30,000 employees and accumulated losses totalling more than Rs.30,000 crore, there is no disputing the fact that the Maharaja needs to do some serious soul-searching. Air India can survive if it is run like an airline, not as a fiefdom. Air India's employees and its myriad unions must be held to whatever terms they eventually settle on.

Nimble private airlines have eroded the former monopoly's market share, which now stands at about 19%, down from 50% in 2003 and the airline can ignore this only at its own peril.

The problems with employees are only one among a string of other issues that the carrier is struggling to sort out. The world over, an aircraft makes money in the air and loses it when on the tarmac. The unending glitches plaguing the Boeing 787 Dreamliner, the aircraft that the ailing national carrier is betting big on to turn around its fortunes, is giving sleepless nights to the flag carrier. It is in everybody's interest that a clear revival takes place, even if it is at the cost of some painful transition.

From *Hindustan Times*

Military Diet

In what could have major implications for geopolitics and global security, the US government has proposed defence spending cuts that would shrink its army to pre-World War II levels. Although the proposal needs to be approved by Congress, it represents a clear statement of intent vis-a-vis future US military priorities. Should the cuts be implemented, the size of the US army will shrink to around 440,000 after 2015 from a high of 570,000 post-9 /11.Along with pruning of specific military hardware such as A-10 attack jets, the austerity measures will ensure that the US no longer has the capability to fight two prolonged wars simultaneously. Given the impending US withdrawal from Afghanistan, the proposed military cutbacks further highlight the Obama administration's determination to shift away from the doctrine of putting boots on the ground.True,the Syrian conflict almost tempted the US into another foreign military intervention last year. But having lost more than 5,000 men in Iraq and Afghanistan, and faced with harsh economic realities, defence spending cuts confirm Washington's reluctance to take this route.

But what does this mean for the international community? While terrorism remains a major global concern,the military rise of China and an assertive Russia mean that American interests need defending in both Asia and Europe.The proposed defence cuts are unlikely to jeopardise US military superiority.In fact,they would result in a lighter but more advanced defence force capable of defending US territory and aiding allies.However,going forward we are likely to witness a palpable shift in US foreign policy,with greater emphasis on multilateral conflict resolution mechanisms.The ongoing nuclear talks with Iran are a case in point.Notwithstanding the willingness of several countries to see the US continue to play the role of a global policeman,this would certainly give peace a better chance.

From *The Times of India*

History will judge

The mild mannerisms of Defence Minister AK Antony can no longer shield him from answering pertinent questions about a crumbling civil-military framework under his leadership. During his arduous tenure as the country's longest-serving defence minister, Antony has presided over the destruction of a delicate fibre that held the democratic institutions together.

The armed forces have always carried a grudge against what is often referred by them as the wicked nexus between the "dhotiwalas" (politicians) and "babus" (bureaucrats) who pull the strings of military affairs in the Indian set-up. Under Antony, the schism has only widened as he gives an impression of being under the grip of the civil bureaucracy; a minister who prefers to be guided instead of guiding.

The complete lack of trust led the government to draw the preposterous conclusion that the errant Army chief of the time, General VK Singh, had moved two units of troops towards New Delhi on a cold January morning of 2012 to put an end to the row over his date of birth. The same distrust pushed Admiral DK Joshi to the wall after the Navy could not fetch a decent explanation for a series of mishaps. When he offered to resign on moral grounds, his plea was readily accepted.

One of the primary responsibilities of the defence ministry is to keep the armed forces fighting fit. The current state of battle-readiness of the three services clearly indicates that the defence ministry has fared poorly on fulfiling its key task. The hollowness of the Army, dwindling fighter aircraft strength of the Indian Air Force and the Navy's fragile submarine arm are signals of a full-blown crisis at hand. The defence ministry is seized of the matter but an overall atmosphere of gloom and lack of strong leadership at the top has slowed down the outflow of decisions.

Antony can pat himself on the back for achieving the healthy practice of exhausting defence budgets and giving a push to stuck projects like the development of Light Combat Aircraft and the Main Battle Tank Arjun. He can also take the credit for fulfiling the long-pending demand of the veterans for pension parity. But these issues only run the risk of addressing the national pride. Unlike Prime Minister Manmohan Singh who has left it to historians to analyse his legacy, the judgement on Antony's tenure is already out as he is being bracketed as among the worst of the lot.

From *Mail Today*

MBDA

Storm beneath the Silence

Admiral Arun Prakash assesses state of the Indian Navy today

As the initial shock of Admiral DK Joshi's sudden resignation wears off, the armed forces, and the nation, must applaud a rarity: a man who has held loyalty to service before himself and walked away from high office, following the dictates of conscience. Concerns about the putative 'line of succession' exist only in public imagination because there are clear-cut guidelines available to the government for ensuring a smooth and early succession to the navy's top job.

The dramatic changes in the navy's upper ranks are bound to unsettle its junior officers and sailors. The new chief's first major challenge, therefore, will be to restore the confidence of his service and the nation that the Indian Navy remains an efficient and combat-ready regional maritime force. He would be well advised to obtain a swift and authentic evaluation of how operations, maintenance and training are being conducted in the service and to ensure that shortcomings are speedily remedied.

From the freewheeling media speculation underway, we need to pick out three crucial issues for closer scrutiny and separate facts from fiction. The first relates to the succession of accidents that have badly dented the navy's shining image. Secondly, a widespread impression has taken root that our navy is operating 'old ships' and 'leaky submarines' that hazard their crews. Last, and most important, is the media commentary about the strained civil-military relationship that underpins the present crisis.

Of the 10 accidents cited, two, involving loss of life on board submarines, are indeed grave and warrant a thorough probe. The remaining eight were of a trivial nature—collisions, groundings and minor fires—that happen frequently in all active seagoing navies. With no common thread running through them, it was just an unfortunate happenstance that they occurred in rapid succession.

In any other country these may have rated passing mention, but India's intrusive visual media took it upon itself to project each incident as a disaster of Titanic proportions, subjecting it to shrill and ill-informed discussions. There can be little doubt that this sustained media focus panicked the MoD into pressuring the navy, with *Sindhuratna's* fire becoming the last straw that led to a despondent chief's resignation. The indecent haste with which the resignation was accepted clearly spoke of relief on Raisina Hill that a sacrificial lamb had presented itself.

Navies nurture their warships so they can squeeze the maximum life out of them. The USS *Enterprise* retired in 2012 after 52 years of service and our own INS *Viraat* will be 57 years old when she is decommissioned. By international standards, the Indian Navy is young. It has a large proportion of modern and newly constructed ships, with some approaching middle age and others nearing their stipulated retirement age. Aging ships are, however, 'modernised' and given a fresh lease of life. Moreover, 45 newly constructed warships will join the fleet in the coming decade.

New or old, no Indian Navy warship sails out unless it meets stringent safety and seaworthiness requirements, but accidents will happen at sea. Navies that have zero accidents are the ones that stay put in harbour. However, our Soviet-era vessels are quite old, and the accidents on two *Kilo*-class submarines call into question, not only Russian workmanship, but also our own operating and maintenance procedures.

Since 2008, the navy's operational tempo has mounted steadily on account of overseas deployments, anti-piracy patrols, tactical exercises and coastal security commitments. If this has brought excessive strain on personnel as well as ships and machinery, something is bound to give. It is the responsibility of naval commanders to ensure that commitments remain commensurate with resources and unwarranted pressures are not imposed on men and machines, nor are any safety norms violated.

That brings us to the crucial issue of civil-military relations at the heart of which lies the deeply flawed policy of subordinating the armed forces, not to political control, but to the tyranny of a lethargic and uninformed bureaucracy. Under current rules, the chiefs carry the full burden of responsibility for their service, operational and administrative, but lack standing and authority within MoD.

On the other hand, the defence secretary is vested with authority for 'defence of India and for the three armed forces HQs', but has zero accountability—especially when things go wrong. In practical terms, every single decision regarding weapons, equipment, infrastructure and personnel impinging on the navy's operational efficiency needs the approval of a bureaucrat.

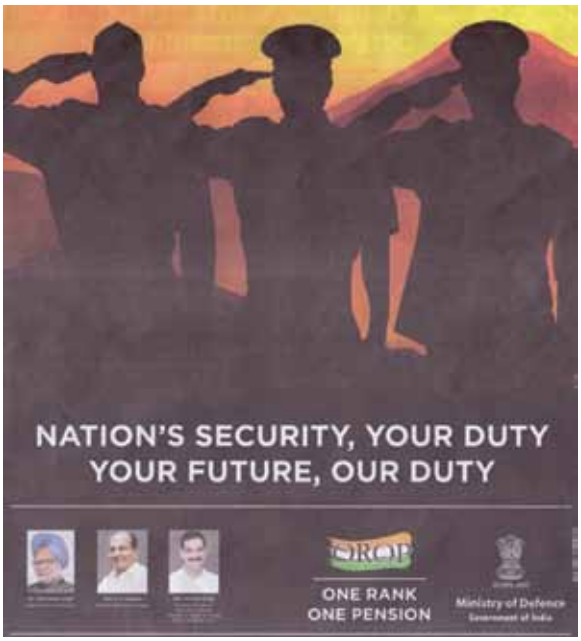
With ministers engrossed in electoral politics and bureaucrats lacking comprehension of complex military issues, critical cases are frequently cast into limbo for 5-10 years. It is the indifference of the politician, bureaucratic inefficiency and the civil-military divide that are stalling armed forces' modernisation and undermining national security, a $40-billion defence budget notwithstanding.

Like every other major democracy, India must integrate its service HQs with the MoD, and create a chief of defence staff for providing military advice to the government. This would require political sagacity as well as determination so that neither bureaucratic obduracy nor irrational suspicion of the military comes in the way of this long-overdue measure. In a truly integrated MoD the civil and military would accept joint responsibility for national security instead of engaging in futile blame games.

Cassidian / Airbus

OPINION

OROP: remembered only at election time!



Full page advertisements such as this appeared in most leading newspapers on eve of election announcement.

It is no revelation that the armed forces of the Union have, to an extent, been viewed by India's ruling elite as a necessary burden. Reportedly at one time our first prime minister even wondered if they were needed ! With this mindset it is little surprise that the armed forces have generally been kept out of national security policy making and showered with periodic superficial praise just to keep them in good humour. But beneath this veneer, not just their conditions of service but also their very status in the warrant of precedence have progressively–and by design–been degraded. It is, of course, a different matter when the country faces aggression and suddenly the armed forces become darlings of the ruling classes. It then becomes a race to be seen in the company of the uniformed fraternity, if only to get a few photo opportunity points. Television coverage of our *netas* lining up to receive our Kargil dead at the Palam military airport or gracing military funerals come vividly to mind.

On the other hand, India's people at large trust and respect the armed forces in far greater measure as frequent polls show. Clearly there is far greater affinity between the peoples of this country and their armed forces than there is between the government and its armed forces. Just as the *aam admi* ('mango people' as one near-neta was cynically learnt to label them)is treated with great respect in the run-up to the elections but he becomes irrelevant soon thereafter, the soldier suffers similar fate in the events of war and peace. In our system of national governance it could be said that the soldier is the *aam admi* within the government.

As election season dawns, it is no surprise that the flavour of the season is the genuine *aam admi* of the country being wooed by political aspirants of every shade. What appears new, however, are signs that for the first time in electoral politics the *aam admi* of the government, namely the soldier, is also finding political suitors.

When presenting the interim budget in the Lok Sabha, the finance minister stated, "Hon'ble Members are aware of the long standing demand of the defence services for one rank one pension. It is an emotive issue, it has legal implications, and it has to be handled with great sensitivity." He was, however, cautious in not providing the nation amplification of this very pregnant statement because at its heart lies everything that is wrong with how successive governments have handled vital issues of pay commissions for the armed forces, pensions, parity with their civilian counterparts and a host of allied problems.

'One rank one pension' or OROP has not only been a genuine demand of the services for nearly three decades, but has at various times been accepted in principle by political leaderships of various shades. Yet no government has delivered on this promise, resulting finally in veterans launching agitations and returning their hard-earned medals in their thousands to their supreme commander. For veterans to be forced to fall back on this extreme step for which they have no emotional appetite is a severe blow to their consciences and pride. But beyond this it also has deep national security underpinnings, as today's soldiers are tomorrow's veterans. Governments of the day have, however, remained unmoved. So the finance minister was justified in referring to this as "an emotive issue."

When the finance minister touched on legal implications, he failed to enlighten Parliament that there was at present a contempt petition admitted and being heard in the Supreme Court from the Retired Defence Officers Association against the erstwhile defence secretary that named officials of the ministry of defence for failing to implement apex court orders in the rank pay case. A case that the defence ministry had lost to the RDOA in every court including the highest. That the veterans had been compelled to fight their own ministry of defence in various courts and that even when the ministry had lost, it failed to implement the court's directives, makes us look worse than a banana republic. What a shame !

Finally, the sensitive leadership of a nation faced with huge external security challenges, such as India is, would no doubt have appreciated that a combination of these two factors could very easily result in a sensitive situation. So one must agree with the finance minister on this but, being fully conscious of the above background, he could at least have acknowledged that it goes to the undying credit of the professionalism and patriotism of our veteran soldiers that they have lived with this adverse, humiliating and sensitive situation without ever letting it become sensational or ugly.

The finance minister concluded with the statement, "I am happy to announce that government has accepted the principle of 'One Rank One Pension' for the defence forces." He estimated the budgetary requirement for the next financial year to be Rs 500 crore and as an "earnest sign of the UPA government's commitment" proposed to transfer this sum this year itself. Such display of commitment merely endorses guilt for past unkept promises.

Whilst many of those adorning the benches who mechanically thumped their

Elbit

The soldier serves the state

tables on this announcement may not have really understood the import of the finance minister's words, the defence minister would surely have been alive not only to every word spoken but, more importantly, to what remained unsaid. That he has been unable or unwilling to rein in his bureaucracy and let the situation come to this sorry pass is a story for another day.

It is no surprise that with this background, the finance minister's announcement of OROP is being taken with the proverbial pinch of salt, as is his earnest commitment to transfer money this year, because not only is there a huge gap between "acceptance in principle" and actual implementation, but also because the amount so magnanimously earmarked is nowhere near annual figures for the OROP as estimated by the ministry itself.

If one were to look objectively at the various unresolved issues flowing from the fourth, fifth and sixth pay commissions and the dogged battles that the defence ministry has fought in courts to deny the affected veterans their legitimate dues, the only conclusion that one can draw is that the announcement of the finance minister was divorced from any genuine concern for the welfare of the soldier and aimed solely at the forthcoming battle at the hustings. The current gaping trust deficit between the State and the veteran soldier must cause all political and national security pundits serious concern.

But the story does not end here. In a windfall announcement a few days later, the chief minister of Haryana announced a steep hike in the grant of monetary benefits to the recipients of gallantry and other medals and enhanced financial assistance for World War II veterans, their widows, and ex-servicemen and their widows. Not to be left behind, soon thereafter the chief minister of Himachal Pradesh announced the setting up of a war museum where busts of soldiers who had won prestigious medals right from the British era till recent times would be installed. He further said that the names of martyred soldiers belonging to the state would also be displayed in the museum so that the younger generation comes to know about their valour.

Viewed from the perspective of a veteran, this bountiful generosity is not being showered because of any great love for the profession of arms or in recognition of the sacrifice soldiers continue to make. These are mere political moves in the shadow of the elections and it is difficult to avoid the conclusion that in another dubious first in the history of Indian electoral politics the uniformed fraternity is being co-opted into the unique vote-bank system that has become the hallmark of Indian democracy.

In his book, *The Soldier and the State*, that has become the standard in professional and academic discourse, the political scientist, Samuel P. Huntington, suggests two types of civil-military relations in theory. In the subjective control model, the military is closely integrated with and participates in the political and social system, but its professionalism is minimal. Alternatively, in the objective control model, the respective political and military leaders focus on their areas of expertise with the military remaining separate from the political system. There is a clear division of labour resulting in maximised military professionalism. Whilst Huntington showed preference for the latter model, he was aware that in the United States of America the military and civilian government operate somewhere in between. There are other scholars who differ with this theory and argue that the best relationship between the civilian and military is one in which both cooperate and collaborate, but the military remains subordinate to civilians. That such a debate continues in the US as newer security challenges emerge signifies the strength of a vibrant democracy where national security institutions respect and have abiding trust and faith in one another and are willing to discuss and debate the changing dynamics of their relationship.

Unlike the USA, our system remains fixated on a compartmentalised model. Faced as we are with unresolved border issues and complex external security challenges, an engagement within our security institutions for a preferred model is long overdue, but this needs mutual institutional faith and trust. Instead, we are on the verge of introducing a destructive and self-defeating variable of vote -bank politics into this challenging issue of civil-military relationship. It is still not too late for our political leaders to take a deep breath and step back.

Air Marshal (retd.) Brijesh D. Jayal

India's defence budget 2014

In a nation not renowned for its strategic culture or security proactiveness, any measure by the government to beef up defence preparedness or reaching out to the armed forces, and by extension to the large number of ex-servicemen (ESM), is more than welcome.

Thus, amidst the economic gloom and doom scenario being spread by the Opposition, finance minister P Chidambaram's interim budget deserves kudos for dispelling the myth of India's economy being in the doldrums. His assertion of the reduction in the fiscal deficit and of 140 million Indians having risen above the poverty line is encouraging.

It requires no great wisdom to state that defence budgets have to be based on the nation's assessment of the external and internal challenges. The government has budgeted Rs. 2.24 lakh crore for defence which amounts to a 10% increase since the last fiscal year. On the surface, this increased allocation may appear adequate, but if calculated in real terms this amount does not adequately cater for the critical modernisation programmes of the three services. Last year, the government had allocated Rs. 80,000 crore for modernisation, out of which the armed forces had spent approximately 82% for their modernisation programmes. For the next fiscal the meagre increase for capital expenditure has been only 3.2%, that is a total allocation of Rs. 89,587 crore. It remains a sad commentary for the nation that India is now the largest importer of arms and ammunition in the world—a sorry state which must be rectified by indigenous production.

The interim budget, however, will always be remembered for the much delayed announcement of a long-standing demand of 'One Rank-One Pension.' About Rs. 500 crore have been allocated for implementing this decision from this fiscal year which will be more than welcomed by over 28 lakh ex-servicemen. This step will rightly ensure that all those who retire at the same rank, irrespective of their date of retirement, will get the same pension. That this decision, has been reportedly pushed for implementation by Congress vice-president Rahul Gandhi, is long overdue. The nation must never forget those who serve it with valour, sacrifice, discipline and selflessness and political parties must refrain from politicising national security matters.

Defence budgeting is an annual ritual but planning for defence preparedness is unquestionably a long-term exercise. India must factor in combat capabilities and the threats from countries in the neighbourhood. Budgetary allocations to confront these challenges thus have to be sought and made. It may be factored in by the Indian establishment that notwithstanding all the formidable challenges our defence spending relatively is low compared to our GDP than of nations which are way behind our economic strength. China spends on an average 7.5% of its GDP on defence, Pakistan spends over 5%, the United States spends 4.5%, while India spends under 2%. It may be noted that successive standing committees of Parliament on defence have recommended this allocation to be firmed up between 3 and 3.5% if our armed forces have to be adequately modernised. Nevertheless, out of these funds, additional allocations must be made to the Defence and Research Development Organisation and all those organisations that are capable or be made capable for producing state-of-the-art equipment.

The India story, once again, requires to be re-energised and our defence preparedness is sine qua non for its fruition.

Lt Gen (retd) Kamal Davar

India Must Think Big !

A Pinaka multi-barrel rocket launcher

No nation can aspire to great power status without being substantively self-reliant in defence production. Defence Minister A K Antony has repeatedly exhorted the armed forces to procure their weapons and equipment from indigenous sources. However, unless the government reorients its defence procurement policies, the import content of defence acquisitions by the Indian armed forces will continue to remain at over 80 per cent.

India's defence procurement has remained mired in disadvantageous buyer-seller, patron-client relationships like that with the erstwhile Soviet Union and now Russia. While India has been manufacturing Russian fighter aircraft and tanks under licence for many years, no weapons technology was ever transferred to India. Future procurement of weapons platforms and other equipment for defence modernisation must gradually lead to a transformative change in the country's defence technology base and manufacturing prowess.All new defence acquisitions must have a transfer-of-technology (ToT) clause built into the contract even if it means having to pay a higher price. The aim should be to make India a design, development, manufacturing and export hub for defence equipment within two to three decades.

Defence R & D

Though it seeks to encourage public-private partnerships, in fact the government continues to retain its monopoly on research and development and defence production through the DRDO, the ordnance factories and the defence PSUs (DPSUs). The private sector has shown its readiness and technological proficiency to take up the production of weapons and equipment designed and developed by the DRDO and must be trusted to deliver.The DRDO must concentrate its efforts on developing critical cutting edge technologies that no foreigner is likely to be willing to share; for example, ballistic missile defence (BMD) technology.Other future weapons platforms should be jointly developed, produced and marketed with India's strategic partners in conjunction with the private sector. The development of technologies that are not critical should be outsourced completely to the private sector. Also, the armed forces should be given funding support to undertake research geared towards the improvement of in-service equipment with a view to enhancing operational performance and increasing service life. Gradually, universities and the IITs should be involved in undertaking defence R&D. This five-pronged approach will help to raise India's technological threshold over the next two decades by an order of magnitude.

Defence Procurement Procedure

The Defence Procurement Procedure (DPP) manual was introduced in 2005. Since then it has been revised and modified several times based on the experience gained during its implementation. The Defence Production Policy was unveiled in 2011. Its objectives are to:

- Achieve substantive self-reliance in design, development and production of equipment, weapon system and platforms required for defence in as early a time frame as possible.
- Create conditions conducive for the private industry to play an active role in this endeavour.

- Enhance the potential of small and medium enterprises (SMEs) in indigenisation.
- Broaden the defence research and development base of the country.

However, the emphasis on self-reliance remains wishful thinking at present as most weapons and equipment continue to be imported.The Defence Procurement Procedure (DPP) was amended once again in April 2013 to reflect the current thinking on 'buying Indian'. However, in effect it still favours the defence PSUs over the private sector. MNCs are allowed to bring in only up to 26 per cent FDI as against 74 per cent for non-defence sector joint ventures. Though the procurement of weapons and equipment worth more than Rs 300 crore from MNCs has been linked with 30-50 per cent offsets, it is doubtful whether the economy is ready to absorb such high levels of direct offsets. For example, the MMRCA contract, which is likely to be worth $ 15-20 billion or more, will result in an offset obligation of upto $ 7-10 billion. This is much more than the Indian defence industry can possibly absorb over 10-12 years.

Indigenous Defence Production

The defence production process must provide a level playing field between defence PSUs and Indian private sector companies forming joint ventures with MNCs where necessary. The amount of FDI that MNCs can bring in must be raised to 49 per cent immediately and to 74 per cent in due course to make it attractive for MNCs. However, no MNC that is unable to provide transfer of technology – either due to the home country's restrictive laws or due to proprietary considerations – should be considered for future defence acquisitions.

India cannot leap-frog to a higher defence technology trajectory virtually overnight. Transforming a low technology base to a higher plane will need time, patience and large-scale capital investment. It will also need strong support across the political spectrum. In the interim period, inevitably, there will be a further dip in defence preparedness.This short-term weakness in capacity building will need to be carefully weighed against long-term gains that will be strategic in nature. The risk involved will require fine political judgement, backed by sound military advice.

India is a growing economic power-house and should no longer be satisfied with a buyer-seller, patron-client relationship in its future defence procurement planning. As the largest importer of arms and equipment in the world, India has the advantage of buyers' clout. This clout must be exploited fully to further India's quest for self-sufficiency in the indigenous production of weapons and equipment. In all major acquisitions in future, India should insist on joint development, joint testing and trials, joint production, joint marketing and joint product improvement over the life cycle of the equipment.

Indian policy planners must "think big" in keeping with the country's growing economic clout and plan for the future with a level of confidence that they have not dared to exhibit before. In 10 to 15 years India must begin to acquiremost of its defence equipment needs from Indian companies—with or without a joint venture with an MNC. Only then will the era of self-reliance in defence acquisition truly dawn on the country. It will be a difficult quest, but not one that a great nation cannot realise.

Brigadier (retd) Gurmeet Kanwal

The Russian T-90S, on offer to the Indian Army

Interim Defence Budget 2014-15

Finance Minister P Chidambaram presented the Interim Union Budget 2014-15 to Parliament on 17 February 2014, allocating Rs 2,24,000 crore ($ 37.15 billion) for national defence. The interim defence allocation, which represents a 9.98 per cent increase over the 2013-14 defence budget, is exclusive of Rs 53,582.15 crore for defence pensions that includes Rs 500 crore on account of the government's acceptance of the armed forces' long-standing demand for One Rank One Pension (OROP) principle. Although the interim budget is relevant till the new government presents a regular budget after the 2014 general elections, it nonetheless sets a broad roadmap for various ministries and departments.

Among the three services, the Army with an approximate budget of Rs. 1,18,231 crore accounts for 53 per cent of the total interim defence budget, followed by the Air Force (Rs 54,262 crore; 24 per cent), Navy (Rs 37,627 crore; 17 per cent), the Defence Research and Development Organisation (DRDO) (Rs 11,960 crore; five per cent) and the Ordnance Factories (Rs 1,873 crore; one per cent). Among the three armed forces, Army has the highest (19 per cent) increase in the budget. While the Navy's budget has been increased by a modest 3.5 per cent, the Air Force's budget has actually been contracted by 5.6 per cent. The DRDO on the other hand has got a 13 per cent hike in its budget.

In an analysis, experts opine that the 10 per cent hike in the overall defence allocation notwithstanding, there has only been a marginal increase in the capital acquisition budget of the armed forces. Of the three armed forces, the Army is the only service which has got an impressive hike in its modernisation budget. Much of its growth is however concentrated on 'Other Equipment' which caters to missiles and artillery guns among others. This may provide a cushion to the Army to finally pursue its long-delayed procurement deals for the ultra-light howitzer, anti-tank guided missile and night vision equipment.

Compared to the Army, both the Navy and the Air Force have witnessed a decline in the capital acquisition budget, with the latter bearing a heavy brunt. The sharp decline of the air force's modernisation budget, especially from the 'Aircraft and Aero Engines' head is noteworthy, considering that it was on the verge of signing several multi-billion dollar deals including for medium multi-role combat aircraft (MMRCA) for which the French Rafale was declared 'L-1' in end December 2011. Given that its budget has been reduced sharply, it is uncertain whether the IAF could formalise this deal in 2014-15. Some of Air Force's other programmes which are likely to be affected include the multi-role tanker aircraft and heavy and attack helicopters.

'Freeze' on new acquisitions

With national elections announced by the Chief Election Commissioner on 5 March, to take place over the period 7 April to 12 May, the Ministry of Defence have 'frozen' all activities concerning future capital acquisitions. It is also foreseen that it would be several months after its formation that a new Government will be 'fully functional' which will naturally impact on various major acquisition programmes. According to sources in South Block,

Dassault Rafale at the Aero India 2013 Show

Defence Minister AK Antony has 'left it to the next government to take a call on hardware acquisitions and was unwilling to give any future commitment to any country or defence contractor".

Obviously, this will impact on both the MMRCA and additional C-17 heavy lift aircraft: it is learnt that the French have even suggested that contracts for an initial batch of Rafales be formalised "without any financial commitment" while Boeing have used diplomatic and military channels to convey that it could hold on to six of the C-17s of the 14 being produced, for sale to the IAF if the Government of India "signed a letter of intent even without financial commitment". The IAF have already contracted for 10 C-17 Globemaster IIIs, with the option of buying six more.

IAF Boeing C-17 Globemaster III at Long Beach, California.

FM to MoD: 'spend wisely'

Finance Minister P Chidambaram has advised that the defence ministry should spend the funds allocated to it "more wisely" and "more efficiently on essential matters". Speaking at a recent function, Chidambaram said the finance ministry has provided "the maximum amount that we can afford–and a little more" to the defence ministry. In the last budget, he said the allocation for defence was Rs 2.25 lakh crore, which is a "lot of money".

Chidambaram continued in the vein that enough funds had been provided. "There is no such thing as enough. Our requirements are so large. We require money for defence, old age pension, scholarships, paying wages. It is a question of allocating money. How is that money spent? If Rs 2.25 lakh crore is allotted to defence, how is it spent? Should it be spent on maintenance, acquiring new equipment, training, raising a new battalion—these are questions which are decided by the very senior officers of the Army, Navy and the Air Force, he opined.

IJT delayed, IAF issues global RFI

On 10 February 2014, Defence Minister AK Antony noted in the Lok Sabha that the Intermediate Jet Trainer (IJT) programme was among a number of delayed national aerospace programmes. He said that said that while the IJT is "planned to replace the Kiran Mk.I, owing to repeated revisions in the time line set for the IOC of IJT, and also considering the present state of the project regarding induction of the IJT in IAF it has been decided to extend the use of the Kiran Mk.I."

HAL HJT-36 Sitara seen at Aero India 2007 (photo: Sergey Krivchikov)

The MoD has decided to extend use of the IAF's HJT-16 Kiran Mk.I and Mk.II trainer aircraft by four years into the 2017-18 timeframe. Antony informed Parliament that after study of the fatigue life spectrum of Kiran Mk.I aircraft, the Regional Centre for Military Airworthiness (Aircraft) has "recommended extension of Total Technical Life of the aircraft. This will help IAF to utilise the fleet till 2017-18, though in gradually reducing numbers."

Antony said that the IJT programme has also been affected owing to the loss of a prototype in 2011, which necessitated major changes to the flight control system and increased number of design iterations for recovery and resolution. The HJT-36 Sitara IJT has now been under development for over 14 years with no clear indication of entry into service. The Indian Air Force is concerned enough with this development that they have approached the Defence Ministry to consider an imported alternative to fill the widening gap in training capabilities. To this end the IAF issued an RFI for an IJT-class aircraft to global vendors, with responses to be filed by 4 April 2014.

RFI for an IJT

In its request for information for an intermediate jet trainer aircraft for the IAF, the MoD has directed that the last date of acceptance of the completed documentation would be 4 April 2014 after which an RFP would be issued to the shortlisted vendors. The direct purchase of the selected IJT would be in batch sizes of 10, 20, 30 and 50 aircraft and the cost for a comprehensive annual maintenance support, considering utilization rate of 300 hours per aircraft per year is sought. There would also be the procurement of one fixed base full mission simulator.

The RFI has naturally energised the world's aviation industry which are bound to react with offers to meet the IAF's urgent requirement. Various types that could be considered include the FMA IA 63 Pampa from Argentina and M-311 from Italy. The Pampa design was overseen by the erstwhile Dornier GmbH which had developed the Alpha Jet in cooperation with Dassault but was single engined with the Garrett TFE731. The Pampa prototype first flew on 6 October 1984.

The Italian M-311 is also a small tandem two-seat shoulder-wing monoplane with a retractable tricycle landing gear, powered by a single Pratt & Whitney Canada JT15D-5C turbofan, based on the earlier S-211, with the addition of both structural and equipment improvements and first flew in June 2005.

Other options could include the venerable Czech L-39 or Polish I-22 Iryda, although both these have long been out of production, the former has evolved into the L-159 which was a late contender for the IAF's AJT requirement. Although the Chinese Hongdu JL-8 (Nanchang JL-8), also known as the Karakorum-8, could well fit the requirement, its inclusion in the competition is unrealistic for obvious reasons!

FGFA delayed by workshare disagreements ?

Along with the LCA and IJT, Defence Minister Antony has also admitted in Parliament that the Fifth Generation Fighter Aircraft programme between Russia and India could also be "considerably delayed". He attributed this delays to disagreements with Russia over workshare for joint production as well as programme costs, noting that there had been little headway made since completion of the FGFA's preliminary design phase in mid-2013. India has also expressed concerns to Russia regarding Russian reticence in sharing of FGFA design technology.

Under the 2007 Inter-Governmental agreement on the project, India would contribute half the programme's cost (an estimated

Sukhoi T-50 PAK-FA prototype (photo: Dmitry Zherdin)

$11bn) but will only have 15 per cent of the programme's workshare. While both these aspects are reportedly "unacceptable" to HAL and the IAF, Antony said that India remained committed to resolving the issues. Nevertheless, the delays have derailed the programme's schedule and the arrival of the first three evaluation prototypes (based on the Russian Sukhoi T-50 PAK-FA) planned for 2014 will doubtless be postponed.

President's Standard to 112 HU and Colours to 4 BRD

President of India Pranab Mukherjee, awarded the Standard to No.112 Helicopter Unit and Colours to No.4 Base Repair Depot at a ceremonial parade at Air Force Station Kanpur on 11 March 2014. Commanding Officer of 112 Helicopter Unit, Wing Commander Manish Sharma received the Standard while Gp Capt S Shrinivas, Commanding Officer of 4 Base Repair Depot received the Colours.

No.112 Helicopter Unit is the senior most unit flying Medium Lift Helicopters (MLH) and were the pioneers with Mi-8 helicopters. They are now charged with conversion training of Pilots, Flight Engineers and Flight Gunners. No.4 Base Repair Depot, were established at Kanpur on 1 December 1965. Since its inception, the Unit has "kept pace with the technological advances and gained domain expertise in the field of aero engine overhaul."

Rustom II progresses

Prototype of the Rustom II unmanned aerial vehicle (UAV) was displayed at Defexpo 2014 (*see article in this issue*) with running engines. A second prototype is carrying out taxi trials at Kolar with DRDO projecting its first flight in June 2014. The Rustom II programme director is Mr APVS Prasad who was present at Defexpo along with Mr P Srikumar, Director of the Aeronautical Development Establishment (ADE).

Air Chief flies with No.18 Squadron at Kalaikunda

Chief of the Air Staff, Air Chief Marshal Arup Raha seen above after a sortie in a MiG-23U aircraft of No.18 Squadron at Kalaikunda airbase on 14 March 2014. Alongside is Gp Capt Ashish Rana, Commanding Officer of the Squadron.

OFB's 'Dhanush' 155mm Howitzer

According to Ordnance Factory Board (OFB) chairman MC Bansal, winter trials of the indigenous howitzer 'Dhanush' were successfully completed in Sikkim and after trials to be held in the Rajasthan desert during the summer of 2014, this weapon would be cleared for operational use. The 155mm/45 calibre howitzer has a modified double baffle muzzle brake, a modified loading trough and auto laying systems, with muzzle velocity of 885 m/s and maximum range of 38 kms. The 'Dhanush' would be produced at the Gun Carriage Factory in Jabalpur, with the Army having placed an initial order for 114 such guns.

With the MoD stressing indigenous technology, the OFB has also planned to increase production capacity for making 5000 rockets for the Pinaka multi-barrel weapons system. "Our capacity expansion programme is underway," Bansal said, adding that production capabilities for T-90 and T-72 tanks and engines for armoured fighting vehicles to meet urgent requirements of the Army were being augmented.

Stating that "core competency of OFB was in ammunition", Bansal said that making hardware as per the needs of the armed forces was being looked into. An Ordnance Factory Project was underway at Nalanda for bi-modular charges while the Korwa project would manufacture carbines. According to officials, the OFB is planning production of a new range of products including new generation assault rifles, CQB carbines, 155/52 artillery guns, 155/52 mounted gun systems, Smerch rockets, Grad rockets, successor to the L-70 AD gun, very short-range air defence missiles and latest generation ammunition for 84mm rocket launchers "through transfer of technology."

DRDO to acquire HAL-Dornier 228 as flying test bed

Defence Research and Development Organisation (DRDO) are to acquire a new flight test bed (FTB) in the form of a modified HAL-built Dornier 228 aircraft, with two specially designed operator consoles integrated in the cabin.

The platform, being manufactured by Kanpur-based Transport Aircraft Division (TAD) of Hindustan Aeronautics Ltd (HAL), is likely to be with the DRDO by the first week of April, will be on establishment of the Electronics & Radar Development Establishment (another DRDO laboratory) and flown by test pilots

of the Aircraft Systems Testing Establishment of the Indian Air Force.

Incorporating various modifications, the FTB will cost about Rs 100 crore (approx $ 17 million), which is far lower than an equivalent imported aircraft. A large number of SMEs and various Government agencies are developing critical components and systems which need to be flight tested for validation.

With the new Do 228/FTB, the DRDO believes that development time for various projects will be greatly reduced. "The FTB will come handy for all airborne system evaluations. We hope to test various systems of the Tejas LCA and unmanned air vehicles on the FTB. In addition, radars, antennas, radio altimeters, data links and ATOL systems (automatic take-off and landing) will now take the FTB route".

Indian Navy/AF join sea search for MH 370

In response to Malaysia's request for joining search for the missing Malaysia Airlines B-777-200 airliner with 239 on board, the Indian Government immediately deployed five warships and five aircraft, including the newly acquired P-8(I) long range reconnaissance plane and an IAF C-130J Super Hercules, in the designated area of search. Under 'Operation Search Light', Indian Navy warships began the search of over 35,000 square km in the southern Andaman Sea, with specific coordinates provided by the Malaysian authorities.

Indian Coast Guard HAL-Do 228 at Port Blair

The southern tip of the designated search area was just about 60 nautical miles from Campbell Bay in the A&N archipelago, with its northern edge 267 nautical miles from Port Blair. The search that started in the Gulf of Thailand later shifted to the Andaman Sea. The search continued for three days at a stretch after which Indian forces awaited further decisions whether to continue there or take a different tack.

The first aircraft over the designated area were Coast Guard Dornier 228s from Port Blair while the P-8 (I) was deployed from Arakkonam in Tamil Nadu and the C-130J Super Hercules from Kalaikunda in West Bengal.

India's aviation market "on high growth trajectory"

According to an analysis done by global consultancy KPMG and the Federation of Indian Chambers of Commerce and Industry (FICCI), India's civil aviation sector could grow into becoming the third largest aviation market by 2020 and world leader by 2030. According to the report, the Indian civil aviation industry is on a high growth trajectory, albeit with minor aberrations. The industry has ushered in a new wave of expansion driven by low-cost carriers, modern airports, foreign direct investments in domestic airlines and regional connectivity.

"The Indian civil aviation industry is among the top 10 in the world with a size of around $16 billion (Rs 99,200 crore). This is a fraction of what it can actually achieve," according to the report which noted that the next generation of aviation growth in India will be triggered by regional airports. At present, there are around 450 used/un-used/abandoned airports and airstrips spread all over the country. Many Indian states, especially in eastern India, have started taking proactive measures to promote air connectivity.

"India is blessed with a great geographic location, a large upwardly mobile middle class and immense tourism opportunities. Our challenges are primarily related to policies, procedures, regulations and taxes," said Amber Dubey, KPMG's India aerospace head. "We've just touched the tip of the aviation iceberg," added Dubey, noting "access to aviation is still a dream for nearly 99.5% of India's 1.2 billion population."

Spicejet places $4.4 billion order for 42 Boeing 737s

At the inaugural of *India Aviation 2014* at Begumpet airport, Spicejet signed a deal with Boeing to procure an additional 42 737 MAX-8 airliners in a deal worth $4.4 billion. Delivery of the new jet liners will begin in 2018, according to SL Narayanan, chief financial officer at Spicejet's parent, Sun Group.

Narayanan said that some payments for the latest order would be adjusted against an ongoing order for 737s. Spicejet, controlled by billionaire Kalanithi Maran's Sun Group, is seen as an attrative investment for foreign airlines following the Government of India's relaxation on investment by foreign airlines. It has reported interest from potential investors but has not named any. The long-awaited fleet renewal plan and possible stake sale have become intertwined, industry sources state, with the airline seen as potentially more attractive once it gets the new airliners.

Jet Airways, Air India considering B-737 MAX

According to the Boeing Company, Jet Airways and Air India are in discussion concerning procurement of 737 MAX jetliners. In August 2013, it was announced that Jet Airways had concluded a purchase agreement for 50 737 MAX-8, the first 5 numbers of which would be delivered in 2017. At list prices, the deal was worth $ 5 billion, but Jet was still negotiating for financing options.

Presently, Jet Airways have a fleet of some 114 aircraft, including 73 Boeing 737s (all variants) but the Centre for Asia Pacific Aviation in its 2013-14 *India outlook,* have estimated that the airlines would order an additional 200 airliners including 10 Boeing 777-300s and 50 Airbus A320neos. However, "Jet Airways' fleet plan will take a mature shape on conclusion of its deal with Etihad," opined Kapil Kaul of CAPA.

Cyber attack on Russian systems, impact on India files

A large scale attack on Russia's communication systems by anonymous hackers has led to much sensitive Indo-Russian correspondence being leaked. The breach, which was detected by Indian agencies on 8 March, released a large number of documents that dealt with the purchase, overhaul and repair deals for Su-30MKIs and MiG-29s. Among the leaked papers is correspondence between United Aircraft Corporation (UAC) president M Pogosyan and Dr RK Tyagi, Chairman HAL. "Too much time is being spent on formula escalation", read one of the letters between Pogosyan and Tyagi, referring to the delay in the contract for MiG-29 engines. In another discussion regarding Sukhoi engines, Pogosyan says that he "agrees this project causes great concern."

This is the second instance of classified Indian documents ending up in the wrong hands in recent months. Officials from National Technical Research Organisation (NTRO) said Chinese hackers had recently leaked sensitive files from a server in Guandong. Most of them relate to discussions of the Cabinet Committee on Security as well as deals between DRDO, BEL and price negotiations with MBDA.

200 low-cost airports in next two decades

It is planned to build 200 new 'low-cost airports' over the next 20 years to connect tier-II and tier-III towns in many areas of India. This was one of the focus areas at the seminar held during India Aviation 2014 at Hyderabad, at a special session on *Enhancing Air Connectivity and Looking Beyond Metros.*

G. Ashok Kumar, joint secretary, Ministry of civil aviation, said that "low-cost, small and no-frill airports would be built in tier-II and tier-III cities, which are expected to spur development of the aviation sector in the second phase. The non-metro airports in India presently account for only about 30 percent of the total air traffic, but are expected to rise to 45 percent in the next few years. The government also plans to construct 15 additional airports in the country under the 'Greenfield Airport Policy', by identifying the most suitable low cost viable model. Airports Authority of India plans to invest Rs.1,500 crore in the development of non metro airports during the 12th Plan".

Overall, India is planning to invest over Rs 7.344 lakh crores in the development of airport infrastructure; improvement in connecting infrastructure; development of world class air navigation services infrastructure and other related activities to improve the air connectivity. The Indian airport system is poised to handle 336 million domestic and 85 million international passengers by 2020, from the current level of 121 million domestic and 41 million international passengers.

Nuclear submarines in focus after mishaps

Construction of nuclear submarines at Indian shipyards is being reassessed following a series of mishaps over the last several months owing to "lack of proper quality controls, safety audits,

File photo of the Indian Navy's nuclear submarine INS Chakra

accountability and monitoring during construction". However, the MoD, essentially DRDO, are confident that matters are well in hand and the latest mishap at the highly sensitive Ship Building Centre (SBC) at Visakhapatnam, where India's first three nuclear submarines are being built, was an aberration. "The accident is in no way related to any nuclear-related activity. The submarines are safe and the accident does not adversely affect the project", the defence ministry has stated. There was an unfortunate accident when the hatch of a tank to be installed in INS *Aridhaman,* the follow-on submarine to the first one, INS A*rihant*, was blown off during its hydro-pressure testing.

The mishap came at a time when the hull and full form of INS *Aridhaman*, presently designated S-3, is ready for launch into water. It will also be powered by a miniature 83 mw pressurised light-water reactor like the 6,000-tonne INS *Arihant* (S-2),whose enriched uranium-fuelled reactor went critical on 10 August 2013. The long delay in the sea acceptance trials of INS *Arihant,* which was launched in July 2009, has itself been questioned but the explanation, is that since the submarines reactor went critical last August, its self-sustained power was being gradually raised by 5% to 10% at a time in a deliberate and calibrated manner. INS *Arihant's* fully operational status is vital for completing India's long-standing quest for a nuclear weapons triad : the capability to fire nuclear weapons from land, air and undersea.

AI may discontinue 'loss-making' flights

Air India may discontinue some of its domestic flights to decrease the number of flights making variable losses, under pressure from the independent directors on its board, who also want Air India to reduce the number of routes. There are around 19 routes, of which an international sector includes

Delhi-Sydney, while domestic loss-making routes include metro routes of Mumbai-Kolkata and Bangalore-Delhi. On the other hand, according to a spokesman, "our Delhi-Tokyo flight has started making money after we changed the equipment to a Boeing 787, and other international flights can also be made profitable this way".

AirAsia India face "resistance"

AirAsia India, which plans to start services sometime during 2014 is faced with major resistance from existing Indian carriers. The latest round is being fought in the Directorate General of Civil Aviation (DGCA), with the incumbents strenuously objecting to the grant of an air operator's permit to AirAsia India and complaining that the new entrant will disrupt industry "equilibrium".

IndiGo is the country's largest airline by market share at present and along with the Federation of Indian Airlines have objected to AirAsia's entry, their letters in response to a public notice from DGCA seeking objections and suggestions on granting the permit. A DGCA official has stated that their views would be taken into consideration and a decision arrived at "soon".

According to the submissions of both IndiGo and FIA, the accumulated losses of existing airlines as of March 2013 have hit Rs 77,000 crore. A senior aviation ministry official said the objections were not a surprise. "We had expected such comments from the airline industry, but we have been very clear in the FDI policy: however, the final call remains with the DGCA."

Air Costa orders E-Jets E2s

On 13 February 2014, Embraer signed a definitive agreement with Indian startup carrier Air Costa for 50 E-Jets E2s with purchase rights for an additional 50. Air Costa is based out of Vijayawada, in Andhra Pradesh. The acquisition is a mix of 25 E190-E2s and 25 E195-E2s and has an estimated value of $ 2.94 billion based on 2014 list prices. The purchase rights are for an additional 25 E190-E2s and 25 E195-E2s, bringing the total potential order up to 100 aircraft which can reach $ 5.88 billion if all are exercised. This transaction raises the total E-Jets E2 orders to 200 firm and 200 options/purchase rights since the launch of the E2 programme in June 2013. Air Costa's jets will be powered by the Pratt & Whitney PurePower Geared Turbofan (GTF) engine.

Air Costa has become the first customer for E-Jet E2s in the Indian market and will take delivery of the E190-E2 in 2018. The E195-E2 is scheduled to enter service in 2019. At present, the airline flies four E-Jets: two E170s and two E190s. Air Costa is currently connecting cities in southern India such as Bangalore, Chennai, Hyderabad and Vijayawada, as well as key secondary cities in the north and northwest of the country. The airline plans to link "under-served markets" with more direct flights, increasing frequencies and routes, thus serving growing metropolitan areas, as well as key secondary and tertiary business centres.

Singapore Airlines' A380 services to India

The Civil Aviation Ministry has cleared an air services agreement with Singapore that will allow Singapore Airlines to operate its Airbus A380 mega airliner to India. The double-decker Airbus A380 can seat as many as 800 passengers in an all-economy configuration and aviation analysts opine that big international carriers will use this opportunity to tap the high-volume and price-sensitive Indian market but simultaneously this could affect national flag carrier Air India and set back Delhi airport's dream of becoming an aviation hub in the region.

Singapore Airlines has almost exhausted its existing seats allotment and the airline may look to replace some of its existing services with A380 flights. In the new service agreement, Singapore Airlines has been permitted to fly the A380 to any Indian airport equipped to handle the aircraft. At present, only Delhi, Mumbai, Hyderabad and Bangalore airports have the infrastructure to handle the A380s, but a clause in the new agreement could be interpreted to mean that Chennai airport, which is ready to handle A380 flights, can also be used for the service.

The double-decker Airbus A380 can seat as many as 800 passengers in an all-economy configuration.

Emirates, which flew in its A380 to the Hyderabad air show, said it "will be reviewing our existing operations, and look forward to serving Indian travellers with our flagship aircraft in the near future. India is a volume market with high price elasticity. You want to be able to offer the lowest possible cost per seat product. (And that the) A380 has the lowest possible cost per seat."

Commissioning of ICGS *Abhinav*

ICGS *Abhinav*, third of the Fast Patrol Vessels (FPV) being built by Cochin Shipyard for the Indian Coast Guard was commissioned on 15 January 2014. The contract for construction of 20 Fast Patrol Vessels (FPV) for the Indian Coast Guard was signed on 20 October 2010. ICGS *Abhinav* was delivered on 13 January 2014.

The FPV is a small vessel in terms of size compared to the large vessels that CSL has built, but is very complex and extremely challenging to build and provides communication links and escort of convoys during hostilities and during wartime. This ship is propelled by water jets and powered by three main engines, each of 2720 KW, and built to the dual classification requirements of ABS and IRS.

Akash SAM system tested

Akash, the indigenously designed, developed and produced surface to air missile was once again successfully flight tested on 24 February 2014 at the Integrated Test Range (ITR), Chandipur. These were part of a series of trials being conducted in various engagement modes from the first of production series being produced to equip two regiments of the Indian Army.

INS *Sumedha* commissioned

On 7 March 2014, INS *Sumedha* was commissioned into the Indian Navy at Goa *Sumedha* is third ship of the indigenous Naval Offshore Patrol Vessel (NOPV) Project to be inducted into the Indian Navy. Its induction is aimed at meeting the increasing ocean surveillance and patrolling requirements of the Indian Navy and to undertake EEZ surveillance, anti-piracy patrols, fleet support operations, providing maritime security to off shore assets.

The ship's weapon and sensor outfit includes a SRGM 76.2 mm gun, close in weapon systems, latest navigational and early warning radar, chaff launching for self protection and an integrated ESM system to undertake assigned missions. She is also equipped with two rigid inflatable fast motor boats and is capable of carrying a helicopter onboard.

French Navy exercises off Goa

The French Navy's Air Defence Destroyer FS *Jean Bart* was on port call in Goa from 16 to 20 March 2014 after which it participated in exercises at sea with the Indian Navy, which involved surface ships from the Western Fleet as well as MiG-29K fighters from Dabolim.

The FS *Jean Bart* has been deployed in the Indian Ocean since March 2014 and has joined the international Combined Task Force (CFT) 150, engaged in the fight against terrorism under 'Operation Enduring Freedom'. CTF 150 monitors sea traffic in an area extending from the Red Sea to the Gulf of Oman in order to deter movements of terrorist groups and to fight illegal trafficking.

The French have a permanent military presence in the region, including tri-service (army-navy-air force) bases in the United Arab Emirates, Djibouti and Reunion Island.


(photo: Norbert Bourhis)

Lt Gen PR Kumar takes over as DGMO

Lt Gen PR Kumar took over as the Director General Military Operations (DGMO) on 1 March 2014 from Lt Gen Vinod Bhatia. Earlier, Lt Gen PR Kumar was Director General Army Aviation (DGAA) and had been interviewed by *Vayu* (see Issue I/2014). He was commissioned into The Regiment of Artillery on 15 December 1976, and during his long and illustrious career, has held a variety of Command, Staff & Instructional assignments. The General Officer is an Aviator and has commanded 316 Medium Regiment, 80th Infantry Brigade in the North and 23rd Infantry Division in the East. He later commanded I Strike Corps ('Strike One'), before taking over as Director General Army Aviation.

The General had articulated on the long term perspective planning (LTPP) of the Army Aviation Corps which is envisaged to make it "a matching component of the Combined Arms Team to operate in full spectrum of operations." In addition to Reconnaissance and Observation role, the Arm will also have capability of providing attack and lift capability in the battlefield. "The Arm is structured to provide each of these capabilities as an integral component at the operational level in each Corps."

John Brosnan is Managing Director of BAE Systems India

BAE Systems has appointed John Brosnan to be Managing Director of the Company's India operations. Dean McCumiskey who has completed his tenure leading the company's India presence will be taking on a new assignment within BAE Systems. Further, Mark Simpkins has been appointed Vice President & General Manager for India and will lead the Company's business development activities in the country.

John Brosnan joined BAE Systems from the UK Government where he worked in a variety of roles, including over ten years in the UK Ministry of Defence on equipment acquisition, logistics and international security collaboration. He also worked in UK Trade and Investment (UKTI) as a Regional Director and Business Development Director.

Dr. Srinivasan Dwarakanath appointed CEO of Airbus India

Dr. Srinivasan Dwarakanath (Dwaraka) has been appointed CEO Airbus India. Mr Charles Champion, EVP Airbus Engineering and member of the Airbus Executive Committee, is appointed the Chairman of Airbus India. The existing Delhi Airbus liaison office will remain under the leadership of Ajay Mehra. "Partnership is the binding ingredient for success, and the establishment of Airbus India underpins our strategy to foster even closer ties," said Dwaraka. "Building on our significant engineering presence in India, the new company structure will add a strong customer facing element making us more agile, bringing us closer to stakeholders, suppliers, and also to new talent. The Airbus India organisation will foster innovation, respond quickly to growth and to seek out new cooperation opportunities in India."

"India has one of the world's greatest aviation growth potentials and with an abundance of engineering talent is a strategically important market," said Kiran Rao, Airbus EVP Strategy and Marketing. "Airbus has been extending its industrial cooperation partnerships with India since the early 1970s, and today Indian engineering and manufacturing companies nationwide, representing more than 5,000 people, contribute to all Airbus aircraft programmes."

Aparna Srivastava is Indian Head of RR Communication

Rolls-Royce, the global power company which is providing integrated power solutions for customers in civil and defence aerospace, marine and energy markets, has appointed Aparna Srivastava as head of communications for India.She assumes the responsibility of leading the media relations and external communication initiatives for the company in India and South Asia.

A communication professional with an experience of more than 13 years, Aparna has joined Rolls-Royce from Alstom India where she was working as the Deputy General Manager, corporate communications and most recently as Acting Manager for Corporate Communications Director for India & South Asia.

Mr.Kishore Jayaraman,President, Rolls-Royce India, said, "I am pleased to welcome Aparna to Rolls-Royce. She is an

experienced communication professional with valuable knowledge and expertise. India is an important market for Rolls-Royce, with great potential built on a distinguished history across all of our business sectors. Our relationship is growing on many levels and this appointment reinforces the Group's commitment towards the country."

Nexter Systems, L&T and Ashok Leyland team up on CAESAR SP gun

At Defexpo 2014, Nexter Systems showcased the CAESAR 155mm/52 Cal. mounted gun system being offered to the Indian Army. Nexter Systems, Larsen & Toubro and Ashok

Leyland Defence, are partnering to propose a CAESAR based on the 6x6 Super Stallion chassis from Ashok Leyland. Larsen & Toubro is leading the team and as prime contractor will absorb Transfer of Technology from Nexter to assemble and produce in India the CAESAR for the Indian Army. The highly effective firepower performances (accuracy, range, rate of fire) are as per the current CAESAR in service with the French Army and with two other Armies.

BEL, Textron Systems sign MoU for MicroObserver

Bharat Electronics Limited (BEL) has signed a MoU with Textron Systems Corporation as a step toward providing the Textron Systems MicroObserver Unattended Ground Sensor (UGS) system to Indian security agencies. "The MicroObserver UGS system brings a new level of covertness, ease of use and performance for border security, surveillance and critical infrastructure protection missions." Textron Systems reports that its MicroObserver system has been fielded around the world in

Senior executives of BEL and Textron Systems after the MoU signature

support of these applications. "We're looking forward to working with BEL to bring this critical surveillance system to Indian government agencies that will benefit from its wide range of proven capabilities," explained Ian Walsh, Textron Defense Systems' senior vice president and general manager. "Bharat Electronics Limited expects the benefits of this system to filter down to various agencies responsible for the management of the Indian borders, thus fulfilling our overall objective of bringing in cutting-edge technologies to India," said BEL Director of Marketing PC Jain.

RFI for Basic Trainer Aircraft

On heels of the IJT RFI, the IAF has issued a similar RFI for a basic trainer aircraft with the difference that it has actually identified the Pilatus PC-7 Mk II as the type. This would be for 106 aircraft (to follow the 75 already contracted for with the Swiss OEM). The programme, which is classified as 'Buy and Make (Indian)' calls for an Indian vendor to "supply certain number of PC-7 Mk II aircraft in flyaway condition as the 'buy' portion followed by licensed production/indigenous manufacture in India under the 'make' portion."

The RFI calls for deliveries to begin by 2015-16, with the entire complement of 106 aircraft to be delivered by 2020-21. Since the aircraft is to be license produced in India, it must have a minimum of 50% indigenous content on cost. The selected vendor should also supply three fixed based full mission simulators (FBFMS), two cockpit procedure trainers and three avionics part task trainers.

Saab and Ashok Leyland team up for SRSAM

Saab and Ashok Leyland have teamed up to compete for the Indian Army's Short Range Surface to Air Missile (SRSAM) air defence programme, with a new solution that combines the Saab BAMSE missile system with Ashok Leyland high-mobility vehicles. The Saab BAMSE SRSAM is an all-weather, all-target, air defence missile system which can be deployed to protect fixed and mobile assets.

BAMSE shown at Saab's stand during Defexpo 2014

Ashok Leyland will deliver high-mobility vehicles to transport the BAMSE SRSAM solution, being integrated with the Super Stallion 8x8, a high-mobility vehicle capable of operating in all types of terrain under all weather conditions. As Saab's Head of Market Area India Lars-Olof Lindgren said "the tie-up brings together two great engineering companies with front-end technologies that together could serve the Indian Army well. The BAMSE is a proven air defence missile system and the Ashok Leyland platform is a very suitable all-terrain vehicle. The need for mobility for air defence units is essential for flexible and optimal deployment. We look forward to working closely with the company to deliver to the needs of the Indian Army."

India to become "largest operator of Heron UAS"

The Indian Government has cleared procurement of 15 additional IAI Malat Heron-I medium-altitude long-endurance unmanned aerial systems (UAS), making the country largest operator of this UAS type.

There are over 40 Heron-I UAS already in service with the Indian Air Force and Navy, and the Army is now looking to contract for an unspecified number of longer-range UAS. The Indian Army currently operates Searcher Mk.2 drones, but given the increasing demands on unmanned surveillance, is looking toward higher performance platforms. The 40 aircraft in service are reported to have integrated well with tri-service military operations.


An IAF Heron-I on approach for landing

At Defexpo 2014, IAI Malat showcased the longer-range Heron-TP UAS for Indian consideration, this platform being suitable for 'loitering' missions involving extended airborne border surveillance and patrolling in the northern and western sectors.

BEL receives CoMPASS purchase order from Elbit/ELOP

Elbit Systems subsidiary ELOP has issued a Purchase Order to Bharat Electronics Limited (BEL) for the manufacture of CoMPASS systems intended for the ALH programme. BEL had previously entered into a Technical Collaboration Agreement with ELOP for collaboration, licenced manufacture and D-level maintenance of the Compact Multi-Purpose Advanced Stabilised System (CoMPASS) electro-optical turret for the Advanced Light Helicopter programme.


SK Sharma, Chairman and MD, BEL, with Bezhalel Machlis, President and CEO, Elbit Systems

BEL has established facilities for the manufacture of CoMPASS in its plants in India and will provide Indian users with local maintenance and support. CoMPASS has already been selected and integrated with Indian Army Aviation and Air Force variants of the HAL Dhruv Advanced Light Helicopter.

BEL MoU with Sagem

Bharat Electronics Limited (BEL) has signed a Memorandum of Understanding (MoU) with Sagem Défense Sécurité of France, which aims to explore co-operation in the production and supply of navigational sensors to the Indian Navy for various platform under consideration for future induction.

The MoU was signed by PC Jain, Director (Marketing) at BEL, and Bruno Even, CEO of Sagem. With the Indian Navy's ambitious plans for inducting large numbers of ships and

submarines into the service in the near future come equally significant requirements for on-board equipment such as inertial navigation systems, optronic masts, periscopes and radar masts. BEL and Sagem co-operate in the field of navigational sensors for ships and submarines will help in meeting these coming needs of the Indian Navy and the MoU will help in understanding and absorbing critical technology used in these sensors. The MoU will facilitate collaboration between BEL and Sagem for a period of 24 months and if considered necessary, this duration can be extended to a further period agreeable to both the companies.

Pipavav and Atlas Elektronik in partnership

Pipavav Defence and Offshore Engineering Company (PDOC) and Atlas Elektronik of Germany have signed a deal to partner in offering an advanced heavyweight torpedo for the Indian Navy. PDOC and Atlas will create a joint venture company in which Atlas undertakes Transfer of technology while PDOC will handle domestic manufacturing and business development. Atlas will transfer technology to meet the Buy (Indian) and Buy and Make (Indian) criteria. Atlas is offering the *SeaHake mod4* torpedo for the Navy's heavyweight torpedo requirement. The *SeaHake mod4* is an advanced heavyweight torpedo, capable of ranges in excess of 140 km and is compatible with all current and future Indian Navy submarines including those of the *Scorpene* and *Shishumar* classes. Atlas has previously worked with the IN having supplied the successful SUT torpedo for the *Shishumar* class submarines.

HAL Dhruv for GSI heliborne surveys, mineral exploration

Dinsha Patel, the Minister of Mines "dedicated" a custom-made Dhruv-ALH, *Garuda Vasudha* to the nation. Hailing efforts of HAL in making this possible, he said the helicopter should be used to get maximum benefits in larger economic interests of the country. "With the most modern equipment fitted, this helicopter will help in exploration and mapping of mineral wealth in India".

The ALH is integrated with geo-systems and utilised mainly for geological and geophysical exploration and mapping, environmental and nuclear surveillance, mineral, oil and gas exploration. Presently India is dependent on manual surveying or ground based vehicles surveying or by fast moving aircraft.

DDMB holds first meeting

The first meeting of newly constituted Design & Development Management Board (DDMB), directed by the Government "to strengthen design and development in aerospace and promote self-reliance in the critical areas of India's defence preparedness" was held in Bangalore on 20 March 2014.

The Board comprises key members of India's premier defence organisations involved in research, production and manufacturing activities. "We need to have a clear road map

to take on the challenges in defence sector as issues concerned range from basic and applied research, involvement of academia, production, spotting and retaining talent", said Chairman of DDMB, Dr R.K. Tyagi who is also Chairman of HAL. Dr K. Tamilmani, DG (Aeronautics), Dr C.P. Ramanarayanan, Director, GTRE, Dr Ajit Kalghatgi , Director (R&D, BEL), Dr Shyam Shetty, Director, NAL, Mr P Srikumar, Director, ADE and Mr. T. Suvarna Raju, Director, Design and Development of HAL (who is Member Secretary of the Board) were present and are seen in the photograph above.

Exercise Milan 2014

Andaman & Nicobar Command hosts largest-ever biennial international maritime exercise

Indian warships launch flares at dusk in the waters off Port Blair

A Saryu-class offshore patrol vessel leads a formation of warships conducting a passage exercise

Hailed as an "unequivocal success," *Exercise Milan* 2014 had ships from 17 nations converge upon the Andaman and Nicobar Command (ANC), making it the biggest edition of this biennial exercise since its inception in 1995. The six-day event started on 4 February 2014 and had the maritime forces of India, Australia, Bangladesh, Cambodia, Indonesia, Kenya, Malaysia, Maldives, Mauritius, Myanmar, New Zealand, Philippines, Seychelles, Singapore, Sri Lanka, Tanzania and Thailand "come closer professionally and culturally, cementing friendship and building confidence in interoperability." Milan 2014 was the first time that countries from the western IOR participated, including two African nations (Kenya and Tanzania) as well as the island nations of Mauritius, Maldives and Seychelles. It was also the first time that Cambodia and the Philippines have participated.

The exercise included an international seminar on humanitarian assistance and disaster relief (HADR) with participating nations such as Bangladesh, Indonesia, Myanmar and Philippines sharing lessons from their recent experiences in

Marine Commandos conducting an operational demonstration during Milan 2014

Sandhyak-class survey vessel INS Investigator (J15) taking part in a passage exercise during Milan 2014

Indian Navy Marine Commandos (MARCOS) deploy from a helicopter.

handling natural disasters such as cyclones, earthquakes and tsunamis.

In his keynote address, then Chief of Naval Staff, Admiral DK Joshi, emphasised the need for developing capabilities and procedures based on common principles and considerations. He noted that rapid deployment, co-ordination, logistics and medical aid are cardinal considerations for founding common procedures for HADR operations. He expressed appreciation for the concerted efforts to enhance HADR co-operation and training in the region, such as the ADMM-Plus HADR exercise hosted by Brunei in June 2013 and *Exercise Komodo,* being hosted by Indonesia, and stated that "this seminar and the table top exercise being conducted under the aegis of *Milan* would contribute to these efforts." He also mentioned that work is in progress towards developing a standard operating procedure (SOP) for HADR under the Indian Ocean Naval Symposium (IONS). The proceedings of the seminar focused on 'Maritime Cooperation for Disaster Preparedness and Response', 'Capacity Building for Coordinated HADR Operations' and 'Mechanisms for Sharing of Best Practices through fora such as *Milan* and IONS.'

A table top exercise on HADR called *'Rahat'* was conducted on 8 February, in which delegates from the participating nations/ships were presented with a

INS Baratang (T68), a Bangaram-class patrol boat, seen with other vessels in the background during Milan 2014

Indian Navy Chetak hovers over Port Blair's Marine Drive

topical situation on HADR operations. Delegates, grouped into multinational teams, evolved a combined response to the eventuality and various options were analysed during the course of the exercise. This was followed by a discussion on various key issues like preparedness and response strategies for maritime forces in disaster-prone regions, logistics management issues, strategies for HADR kits and supply chain management of relief stores and regional cooperation between maritime forces during HADR operations. As different nations have evolved their own mechanisms and procedures for conduct of such operations a substantial gain was accrued from sharing these experiences and expertise. The exercise was a milestone step towards enhancing the confidence levels for co-operating and building the framework for establishing SOPs for such operations.

Milan, with its emphasis on building professional relationships and understanding between personnel at the tactical level, also presented ample opportunities for the sailors to build personal bonds of friendship through cultural programmes and sports activities. This edition was also the first time that *Milan* included a jungle survival drill and a special sporting event in the form of a triathlon, which saw healthy participation.

The afternoon of 8 February had Marine Drive in Port Blair transformed into a festive site for the impressive International City Parade, showcasing the heritage of the Andaman and Nicobar Islands and giving the visiting Navies a glimpse of Indian culture and its Armed Forces. In addition to a flypast by aircraft of the Indian Navy and the Indian Air Force, the parade included an operational demonstration of the Indian Navy involving covert operations by Marine Commandos, a search-and-rescue demonstration and a display by the IAF's Akash Ganga skydiving team. The march past parade had contingents from the Indian Army, Navy, Air Force and the Coast Guard, along with military bands and contingents from the visiting Navies.

The success of *Milan* 2014 was evidenced from the reactions of a number of high-level delegates, both civil and military, who were in attendance and can be measured from the response received from the delegates/ special guests. The High Commissioner of Bangladesh to India, Tariq A Karim, praised efforts of the Indian Navy in creating an event which fostered the spirit of *'milap'* (friendship) between friendly navies. The Commanding Officer of the Malaysian patrol vessel KD Kelantan simply said "fantastic experience," whilst Cdr David Guy McEwan of New Zealand extolled the organisers for doing an "outstanding" job in bringing together so many countries amid an amiable environment. Cmde Aung Zaw Hlaing of the Myanmar Navy was particularly pleased that *Milan* gave his sailors an opportunity to meet and interact with sailors of numerous other navies.

On 9 February, all participating ships manoeuvred in perfect synchronisation through the clear Andaman Sea on a balmy morning, making for a striking finale of Milan 2014. After a few manoeuvres at sea, the ships formed up in a column and steamed past the flag ship with sailors manning the sides of each ship and presenting a traditional "man and cheer ship" salute to the presiding officer, Commander-in-Chief Andaman and Nicobar Command (CINCAN), Air Marshal PK Roy.

(Information and photographs courtesy PRO Indian Navy)

The Seminar at Port Blair

This was conducted in three sessions, the first focused on 'Maritime Cooperation for Disaster Preparedness and Response' which was moderated by Vice Admiral (Retd) Anup Singh. Air Vice Marshal (Retd) Kapil Kak presented the first paper in this session, followed by First Admiral Amarulla Octavia of the Indonesian Navy.

The second session was on 'Capacity Building for Coordinated HADR Operations' and was moderated by Captain George Amba of the Philippines Navy. Vice Admiral (Retd) Anup Singh presented the first paper and was followed by a Dr (Mrs) Janki Andharia, Chairperson of the Centre for Disaster Management at the Tata Institute of Social Sciences (TISS). Dr Andharia's input at the seminar was widely hailed as invaluable for the agenda under discussion, particularly in the cooperative international context.

'Mechanisms for Sharing of Best Practices through fora such as Milan and IONS' was deliberated upon in the third session, which was moderated by Mrs Punya Salila Srivastava, Commissioner cum Secretary, Andaman and Nicobar Administration. Dr P K Ghosh, Senior Fellow at the Observer Research Foundation, and Captain Robert Plath, Commander Mine Warfare, COMMHP, Royal Australian Navy presented papers during this session.

Elettronica

"Blue Versus Blue"

TROPEX 2014

V Adm Anil Chopra, FOC-in-C ENC, and then-CNS Adm DK Joshi witness flying operations while aboard INS Viraat

Live firing from a Shivalik-class frigate

The Indian Navy's major annual exercise 'TROPEX' (Theatre-level Operational Readiness Exercise) which concluded on 28 February 2014, involved large-scale naval manoeuvres in all three dimensions (surface, air and underwater) across the Bay of Bengal, Arabian Sea and the Indian Ocean.

The month-long exercise was aimed at assessing the operational readiness of naval units, validating the Navy's war fighting doctrine, and integrating newly inducted capabilities in its 'Concept of Operations' (CONOPS). Some 60 ships and submarines, and 75 aircraft took part in this exercise, along with units from the Indian Air Force and Indian Coast Guard.

The exercise also saw the debut of the newly acquired Boeing P-8I long-range maritime patrol aircraft and the leased nuclear attack submarine INS *Chakra*. The manoeuvres were conducted by two

ASW rocket being fired from a Delhi-class destroyer during TROPEX 2014

INS Mysore (D60) and INS Ranjit (D53) conduct underway replenishment with fleet tanker INS Jyoti (A58)

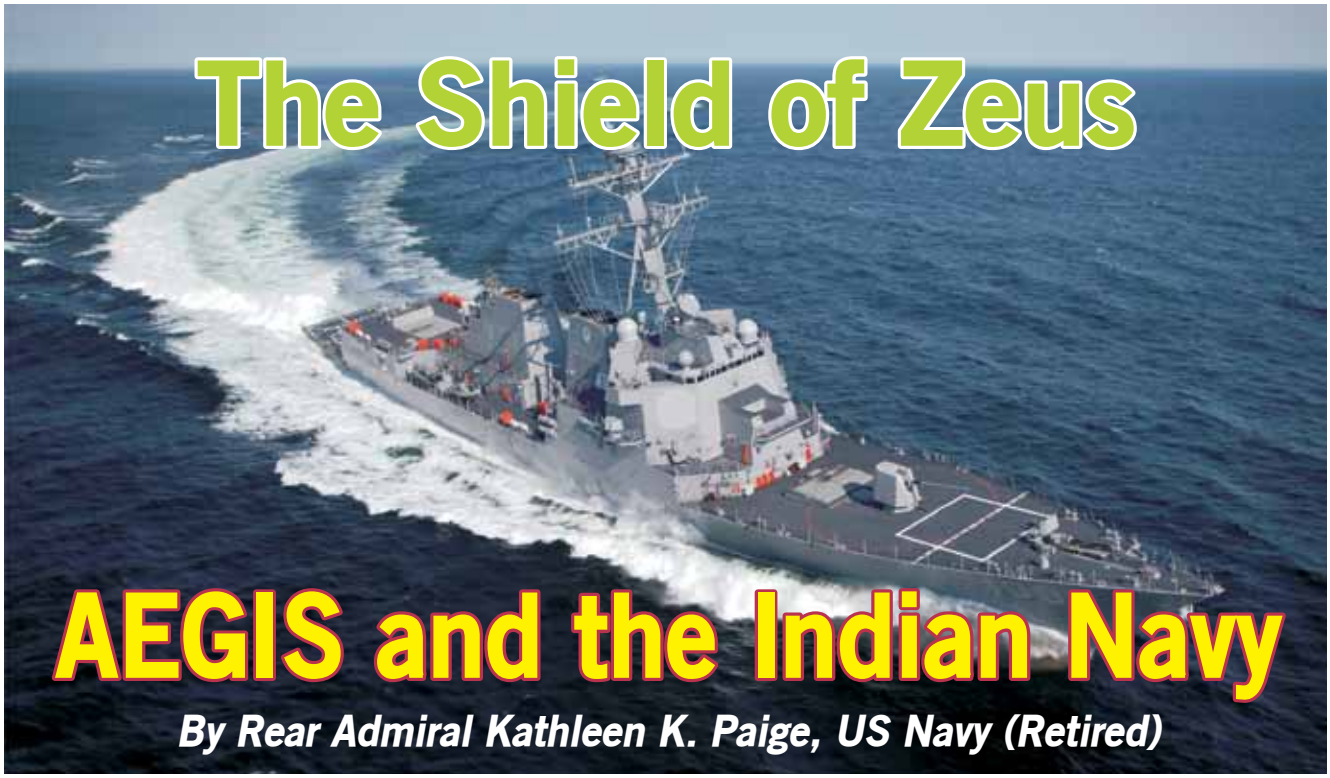
completely networked fleets that were widely dispersed across the Indian Ocean Region, and operating in a dense maritime environment. Live firing of a range of missiles, torpedoes and guns was undertaken from almost all assets involved in the exercise. In addition to the first-time employment of INS *Chakra* and the P-8Is of INAS 312, the Navy's BAE Hawk trainer aircraft were also involved in the exercise. Other aircraft included a range of Indian Navy UAVs, Ka-31 AEW helicopters, IAF Il-78MKI tankers, Jaguar strike fighters and Su-30MKI fighters.

The exercise also provided the Indian Navy with an opportunity to validate its network centric warfare capabilities, with effective utilisation of the recently launched Indian Navy satellite, GSAT 7.

Destroyers INS Rana (D52) and Ranjit (D53) sail in formation with Khukri-class corvette INS Kuthar (P46) and Austin-class LPD INS Jalashwa (L41)

INS Mysore (D60) and INS Ranjit (D53) conduct underway replenishment with fleet tanker INS Jyoti (A58)

The nuclear-powered attack submarine INS Chakra underway during TROPEX 2014, with Adm DK Joshi on the bridge



The Shield of Zeus

AEGIS and the Indian Navy

By Rear Admiral Kathleen K. Paige, US Navy (Retired)

Maritime nations have been watching the Indian Navy methodically grow in size, capability and stature for many years. India's procurement strategy for its naval forces has matched that measured pace with a logical, incremental programme for shipbuilding and force structure. National and regional security events of the recent past, however, have added new urgency to shaping a naval force that can react to ever more serious threats and a wide variety of missions from strategic deterrence to combating piracy, both independently and in concert with other nations.

I have watched the resultant procurement debate among India's naval leadership with interest, albeit from afar and while there is quite naturally a fair degree of disagreement about the shape of the Indian navy's future combat systems, the most important consensus appears to have already been reached: India's navy will advance more boldly than incrementally. As well stated by Admiral Arun Prakash, "with Asia-Pacific in ferment, India can no longer afford to be shy."

The civilian and military leadership of India is heavily engaged in reviewing an array of fundamental choices for procurement of its future vessels and supporting combat systems. In important ways, some overarching choices have already been made. Clearly, India's embrace of carrier aviation and submarine modernisation in particular will continue to add effectiveness and reach. And there is a healthy consensus with regard to accelerating the pace of procuring frigates to add presence through numbers; as the US Navy has learned throughout its history, just "being there" can have tremendous deterrent effects. One of the choices that appears yet to be made, however, is the selection of a common command and control and force protection system that can bring a high level of interoperability for both indigenous and allied naval forces. The political and military leadership of India have increasingly stated their desire to exercise and operate with allied navies wherever its ships can help to deter and ultimately counter the threats that exist.

The procurement challenge for India is an increasingly familiar one caused by an operational environment that combines a wide variety and number of threats, both strategic and tactical: how to go about acquiring more vessels and supporting systems that have improved organic offensive and defensive capabilities, and thereby create a fleet that can operate as an effectively networked force wherever it sails, both doctrinally and technically?

My own naval career involved immersion in a not altogether different challenge, and an ensuing debate and long procurement path for the US Navy. The outcome from a technical standpoint was the decades-long evolution of the AEGIS Weapon System – ultimately a revolution in terms of combat reach, power and interoperability for the nations that have since embraced the technology. The system could be a logical next major procurement step for the Indian Navy.

Already deployed by 5 nations and under contract to a sixth nation, Aegis is nearing a half century of evolution that began with an organic anti-ship missile defence, and has become a networked system with proven ballistic missile defence (BMD). That history has most recently led to two historic decisions: the first, by Admiral Gary Roughead, the former US Navy Chief of Naval Operations, to re-start the AegisArleigh Burke Destroyer shipbuilding construction programme, and to evolve the future US Navy surface combatant fleet from these ships and combat systems. The second was the decision by the US President to make Aegis-BMD the centrepiece of the US BMD distributed architecture, including the addition of Aegis 'Ashore,' along with other land systems based in allied nations, in what has been called a "phased adaptive approach" to ballistic missile defense. In the U.S. Navy alone, over 30 ships (destroyers and cruisers) are Aegis-BMD capable in early 2014, with the Pentagon planning to upgrade many more ships in the coming years. In short, Aegis' long, successful evolution has led to a revolution in how naval forces are linked and employed, both together, and with joint and coalition assets.

It is instructive to look at history of the Aegis programme, for what it reveals beyond

the warships it has produced, and for what the system's integration could mean for benefitting India's indigenous defense industry.

Aegis, named after the shield of the Greek god Zeus, was initiated over 40 years ago based on the need to provide surface combatants with powerful area air, as well as ship self-defence, capabilities to protect aircraft carriers, other fleet assets and themselves against a growing anti-ship missile threat. Given the scale of the Aegis system, its increasingly broad use in fleets worldwide and the scope of what it has been asked to do, its successful employment by sailors in missions as diverse as humanitarian relief; maritime air traffic control; BMD surveillance, tracking and engagement (and even, with special temporary modifications, the unprecedented shoot-down of an errant US satellite in February 2007, demonstrating the rapid adaptability of the system) is perhaps counterintuitive to those who have experience with the acquisition and management of such complex systems in any nation's defence programs.

Indeed, Aegis has maintained a coherent, iterative path from the beginning, weathering more than 40 years of evolving requirements, budget fluctuations and transferred programme ownership, yet remains a gold standard for defence programmes, both operationally and programmatically.

Three overarching factors have been keys to its programmatic and operational success:

- An organisational structure imbued with strong, consistent leadership and constructive government-industry relations, epitomised by R/Adm Wayne E. Meyer (the "Father of Aegis" and namesake for the commissioned DDG108), Vice Adm. James Doyle (the requirements and resource sponsor responsible for Aegisin the early days, and namesake of the AegisCombat Systems Engineering Development Site)), and their industry counterparts.
- Solid initial assumptions of necessary engineering and technological underpinnings for warships realised through a relentless commitment to disciplined systems engineering and programme management processes
- Enduring relevance - which has brought continued political support and related funding at appropriate levels.

The many ways in which Aegis equipment and computer programmes perform in the hands of well-trained sailors todayis impressive enough on its own merits. But taken in context with its original conception this is testament to the designers' understanding of systems engineering and what AEGIS might be capable of if built with the ability to 'accommodate the imagination'.

Some predecessor research and development efforts for solving the increasing air defence problem led to failures due to the limits of the then available technologies but rather than frustration, the strength of the commitment to progress spawned a culture of in-depth experiments to understand an operational problem and the technology available to address those problems, before committing to engineer a solution.

In the mid-1960s to early 1970s the US Navy was learning a hard lesson in the world of countering faster, more capable threats: there is no "final" response to the threat, both because the threat continues to adapt to the defence's capabilities, and because technological advances offer both sides new means to meet their end objectives. Rather, the defence needs to keep pace with the advancing threats, which means using a process of iterative requirements versus allowing "requirements creep" in any single development iteration. It was this stark reality that perhaps forced the initial engineers and leaders of Aegis to imagine their designs against a broader view of the operational warfighting environment as well as in the context of other systems: sensors, missiles, integrated digital computer networks, and tactical data links among others. Aegis was, from the beginning, an example of systems engineering at its rigorous, yet practical, best. The Navy, the industry and leaders in the Aegis programme have continually built on these lessons. Tools and processes have emerged from that culture, including predictive analysis and modeling, the involvement of fleet operators in testing, and user and technical feedback from real world operations.

A culture of continuous experimentation has also led to the active imagining of problems yet to come – such as the once-in a lifetime problem of needing to kill a failed satellite traveling 10 *kilometres* per second in space with just one missile. And that imagination seems not to have diminished in the Aegis community over time, thanks to a conscious effort by the Navy and industry team to maintain leadership continuity as much as possible in key positions. The result is an inherently agile and versatile weapons system and one that is eminently tailorable to a variety of hull-forms. *Ticonderoga* (CG 47) class cruisers, followed by the *Arleigh Burke* (DDG 51)–class destroyers, were the first surface warships to be system engineered as a "fighting integer," from keel to masthead. That level of maturity then helped it to evolve well through the Cold War and into today's emphasis on distributed warfighting network capable architectures.

Finally and arguably the most influential element to the Aegis programme's success has been an organisational structure imbued with strong, consistent leadership and cooperation not only among the industry and government partners, but also with its international partners. Aegis has stood the test of time even as programme oversight shifted and turnover naturally occurred. That mindset included several important aspects, including the enduring commitment to systems engineering; the need to maintain a strong government-industry partnership, and effective communication, transparency and trust to go with it and a core belief in the importance of the programme for the US Navy's future, and frankly, for the security of the US which translated to a commitment to getting the job done beyond the letter of the contractual obligations. From this has come clarity of purpose and commitment to mission, both of which have attracted some of the finest people in all the disciplines necessary for success. For navies that acquire the now mature Aegis Weapon System, the process of its integration into nation-specific hull forms and doctrines brings with it the opportunity to augment the technical and management practices of the nation's indigenous defense industry.

Aegis stands out as a revolutionary system attained by evolutionary means, and now serves many purposes in the global battle space. The programme, maturity, proven performance in five of the world's premier navies, open architecture, interoperability, and systems engineering emphasis, all make it a weapons system worthy of a nation that is embracing strategic naval doctrine that embodies more versatile combat capability and enhanced relevance on the world stage.

As India pursues its next generation of naval combat systems, the Aegis Weapon System is a logical choice to help provide that level of excellence and given the urgency of the threats that the nation faces, it may be the most suitable and near-term solution for a fleet responding to Admiral Arun Prakash's call for "boldness."

Chariots of Fire

The Hermes 900

Elbit's Hermes UAS

Through the year 2013, Elbit Systems supplied scores of Hermes 450 and 900 UAS to customers around the world. In fact, 2013 was an especially successful year for Elbit Systems' unmanned aircraft systems operations, where the Hermes family, particularly the most advanced of the UAS family - the Hermes 900-reported major achievements.

Production rate of the Hermes UAS reached one per week, with platforms sold to operators in Israel, Europe and Latin America. Hermes 900 systems were delivered to three different operators, including the IDF itself which are already gaining invaluable contribution from their operational Hermes 900 systems. Deliveries of Hermes 450 UAS continued through 2013, including deliveries for "an undisclosed customer" that ordered a synergetic UAS system combining both Hermes 450 and Hermes 900 platforms.

All Hermes systems have been equipped with a broad range of advanced payloads, including SAR\GMTI and maritime patrol radars, SIGINT systems and innovative electro-optical systems.

Overall, the Hermes UAS family has accumulated over 500,000 flight hours, 85,000 operational flight hours of which were flown by the British Army over Afghanistan and Iraq. In fact, at any given time, there are over 20 Hermes platforms airborne, executing operational duties worldwide.

The SKYFIX SKYJAM on a Hermes 450

New Mission Capabilities

Elbit Systems will soon provide one of its customers with a unique Area Dominance system that enables simultaneous operation of two multi-sensor unmanned platforms, exploitation and analysis of all intelligence data received through two dedicated separate data links.

Elbit Systems wholly-owned subsidiary, Elbit Systems EW and SIGINT, Elisra Ltd. (Elisra) produces the SPS-65V5 system, supporting self-preservation and improving UAS survivability. It also contributes to UAS intelligence gathering capabilities through advanced sensors integrated in the system. The system relies on Elisra's extensive experience with the development of similar systems installed on various operational platforms (fighter aircraft, helicopters and transport aircraft) used by customers around the world.

The new maritime patrol configuration is designed for large area coverage and is capable of carrying advanced multiple sensor suites weighing up to 350 kg, including a maritime patrol radar, high resolution long range observaton system, electronic surveillance systems and Automatic Identification System (AIS). The Hermes 900's aerodynamic efficiency enables frequent flight profile adjustments and mission execution at ranges up to 1,000 nautical miles using satellite communication.

New hyperspectral capability for the Hermes UAS enables the gathering of high resolution data at a very broad spectral range. The system supports the identification of low signature military activity, camouflaged objects, invisible obstacles and hazardous materials. It does so at a high level of accuracy, providing high resolution documentation at a very broad spectral range of up to 2,500 nm.

Elad Aharonson, General Manager of Elbit Systems' UAS Division stated that "the Hermes UAS continues to play a major operational role worldwide. We are constantly enhancing our systems and developing innovative capabilities to enable our customers to cope with modern operational challenges and enjoy the outstanding reliability, operational flexibility and high survivability of the Hermes UAS. The on-going inflow of orders we have received since launching the Hermes 900 four years ago is the best evidence of the system's outstanding operational capabilities, demonstrating this system's operational success".

The Hermes 900 is capable of an extended flight ceiling of over 30,000 ft. with a large internal payload bay that is suitable for carrying a large amount of payloads and is also capable of flying in harsh weather conditions. The UAS allows for autonomous liftoff and landing and to control two platforms, using two ground data terminals under Elbit Systems' Universal Ground Control Station (UGCS). The Hermes 900 utilises innovative avionic and electronic systems, such as electro-optical systems and laser pointers, ELINT sensors, COMINT, LOS communications and satellite communications.

Representative payload on the Hermes

DRDO's Rustom-II with engines on at Defexpo'14

"Make Indian !"

The increased participation of private firms at Defence Expo 2014 is an indicator of their enlarging footprint on the Indian defence industry. A wide array of equipment, ranging from vehicles, radar systems, 155 mm guns, remotely controlled sensors, missiles to helicopters and aircraft systems highlights the growing interest of the private sector in defence production. A responsive and participative private defence industry base will ensure that quality equipment will be available to the armed forces in the required timeframe and at affordable cost and will no longer be dependent on the "take what is available" syndrome dictated by the defence PSUs.

It is common knowledge that much required equipment has remained at the development stage for decades, at DRDO or the defence PSUs and most have yet to reach production level. The Tejas LCA and Arjun MBT are two examples of "timelessness" in research and development. A large number of indigenous components must form the backbone of a robust repair chain in future so that the armed forces will not be dependent totally on foreign companies especially during the repair or overhaul stage.

The reconnaissance and surveillance segment had two major systems on display; the first was a vehicle–mounted surveillance system by Mahindra Telephonics, which can detect a moving target upto a range of 12 km and a vehicle upto 30 km. Effective within 15 minutes of deployment, the system can have useful employment along our porous borders. The second was a remote controlled, ground reconnaissance vehicle having an operational range of 50 km being developed by Kalyani Forge. Three 155 mm indigenous artillery guns, Trajan of L&T, Bharat-52 of Kalyani Forge and Dhanush developed by OFB are an important step towards achieving self-sufficiency. A capable indigenously-manufactured 155 mm gun will be able to accelerate the Army's artillery's modernisation programme and have a profound impact on combat effectiveness. Also on display was a vehicle mounted 105 mm gun, the Garuda. Having a range of over 14 km with a fire and move capability, it could well render the infantryman's artillery, the 81 mm mortar, an outdated concept in coming years. A battery of these guns as an integral part of an infantry battalion can alter the contact phase of battle.

Survivability enhancing systems such as Tata's APC, a mine protection vehicle (MPV) and Mahindra's MPVI are already in service with units in Naxal-affected states. Improved small team protection platforms like the Scorpio-based Marksman vehicle or the new RakshakPlus are available at "affordable prices" and comparable with equivalent platforms. Tata's wheeled amphibious vehicle, Kestrel, developed jointly with DRDO could well meet requirements of India's armed forces in the near future. Amongst troop mobility platforms were featured the new Ashok

Leyland Garuda, equivalent to existing 2.5 ton vehicle, and the improved Stallion 6x6 besides a 10x10 vehicle capable of carrying upto 42 tons of palletised load. Personal protection gear featured an improved helmet manufactured by Tata Advanced Materials effective against 9mm bullets unlike the present FRP helmet, besides other protection equipment like light weight bullet proof jackets.

Indigenous infantry simulators can vastly improve firing standards of the jawan. An indoor computer based small arms simulator marketed by Zen Technologies is capable of imparting basic firearms training as well as honing firing skills before a soldier carries out live firing practice. Unlike older, rudimentary simulators, this simulator does not require any modifications to the personal weapon. A carbon dioxide gas filled magazine provides a realistic recoil effect and the shooter can choose between types of target as well asrealistic computer generated scenarios including night patrolling, ambushes and so on. One such system at unit or formation level can revolutionise training methodology. Visualise a scenario wherein a soldier carries out zeroing of his personal weapon and checks his firing efficiency at different ranges before commencement of live firing. The live firing can then confirm the results. 24x7 availability can provide unlimited fire correction opportunities besides colossal savings of training ammunition.

The evolving regional and internal security environment requires high state of preparedness and readiness for a quick and decisive response. The operational effectiveness of the Indian armed forces must not be constrained and held captive by limited inventory of the defence PSUs. Indian armed forces are likely to buy military equipment worth almost $100 billion over the next decade. It is imperative that the armed forces get the best value for money, high quality equipment to counter potential threats to national security. One of the emphasis of DPP 2013 was the preference categorisation *Buy Indian, Buy and Make Indian and Make Indian*. Private indigenous defence firms, with serious government encouragement can play a major role in providing a cost effective, modern and efficient defence production base for the country.

Col Ashwani Gupta
(courtesy: CLAWS)

Arjun Mk-II MBT at Defexpo'14

The Tata Kestrel on display

Kalyani Group's Light Strike Vehicle

Modern Targeting Pods

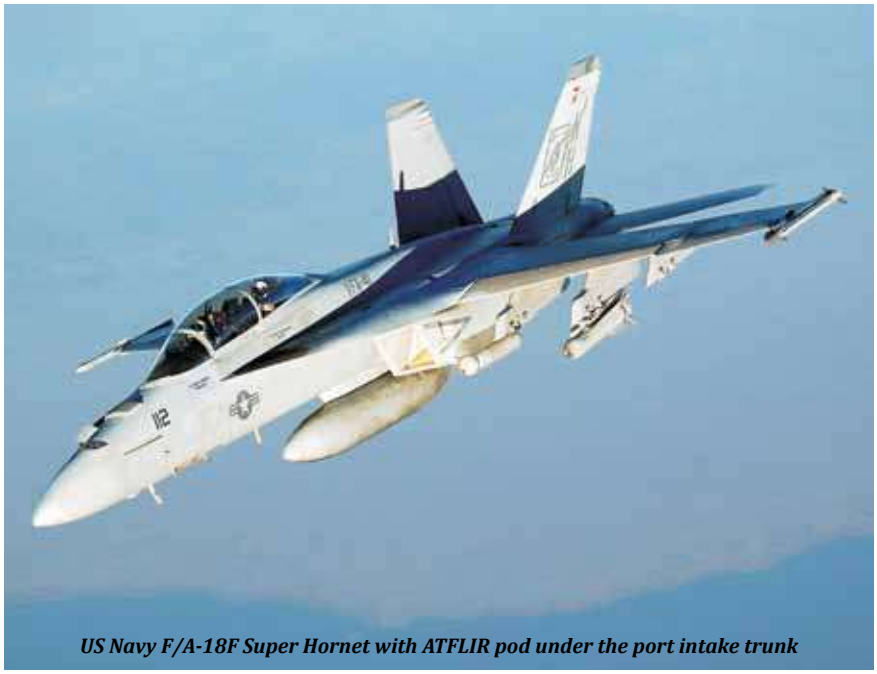
"All-seeing Eyes"

French Aeronavale Rafale M seen with Damocles pod

Targeting pods are fast becoming ubiquitous in the world of military aviation. Initially used by ground-attack aircraft for identifying targets and vectoring precision-guided munitions (PGMs) to those targets, the increasing importance of multirole capabilities have seen targeting pods become *de rigeur* on almost all modern combat aircraft types, as well as endowing older types with precision air-to-ground ability. The first targeting pods were developed in conjunction with the earliest generation of PGMs in the mid-1960s and their development, particularly in the West, has come a long way.

The simplest pods conduct a single task, usually nothing more than laser tracking or designation for LGBs. However, with massive strides made in both computing hardware and software, the past few decades have seen increasingly impressive capabilities packed into ever-shrinking pods. From the enormous, heavy pods of the Vietnam war era, there are today a variety of solutions available that are both compact and lightweight. Virtually all contemporary targeting pods have seen combat in some form or another.

For instance, laser designating/tracking capabilities are now augmented by an array of elecro-optical sensors, such as TV and FLIR (forward-looking infrared) that aid in closer and more accurate identification of targets before, during and after engagement and particularly during adverse conditions such as inclement weather and darkness. Not only does this make combat more efficient, it adds a limited element of reconnaissance and surveillance without needing dedicated aircraft for those tasks.



US Navy F/A-18F Super Hornet with ATFLIR pod under the port intake trunk

USAF B-1B Lancer bomber with Sniper pod seen attached under the fuselage

Additionally, a number of modern pods are capable of recording targets post-engagement for battle damage assessment (BDA).

With the increasing importance and widespread adoption of targeting pods, a few countries have emerged as key suppliers of these systems.

The USA operates a mix of pods, from the older Lockheed Martin LANTIRN, first fielded on US Navy and US Air Force fighters in the 1980s, to the more recent and far more advanced Raytheon AN/ASQ-228 ATFLIR and Lockheed Martin Sniper XR, the successor to the LANTIRN.

The Sniper pod contains a laser designator and tracker along with a third-generation FLIR receiver and a CCD television camera. FLIR allows observation and tracking in darkness, while the CCD camera allows the same functions during daytime operations. Offering a massive capability increase over the various legacy systems fielded in the USA, the Sniper now equips a variety of USAF aircraft ranging from the B-1B bomber to fighters including the F-15E, F-16, as well as the A-10 Thunderbolt II attack aircraft. Variants of the pod are also employed by aircraft of a number of other nations, notably those of Egypt, Turkey, the UAE, Pakistan, Saudi Arabia, Poland, Belgium, Canada, Singapore and Thailand. Plans in the USA call for over 500 Sniper pods to be acquired.

On the Naval side, the Raytheon AN/ASQ-228 ATFLIR (Advanced Targeting Forward-Looking Infrared) equips US Navy F/A-18E/F Super Hornets and the earlier F/A-18C/D as well as US Marine Corps F/A-18C's when the latter are deployed on aircraft carriers. It is a multi-sensor, electro-optical targeting pod incorporating infrared, low-light television camera, laser rangefinder/designator, and laser spot tracker used to provide both navigation and targeting. It replaces the earlier AN/AAS-38 and LANTIRN pods

LITENING pods on a pair of USAF A-10C Thunderbolt II attack aircraft

Rafael's Reccelite pod on the F-16

in US Navy service, adding improved capabilities along with better reliability and maintainability. 410 ATFLIR pods have been delivered to the US Navy, along with export deliveries to nations such as Switzerland and Australia.

Across the Atlantic, there are a number of systems in use and under production. In France, older pods such as the Thomson-CSF ATLIS-II TV and laser day-only system and the night-optimised PDLCT pod used mostly by Mirage 2000D ground attack fighters are long gone, with the cutting-edge Thales Damocles now the primary system in use for French fighters. In fact, domestic supremacy aside, the Damocles has also been chosen by the unlikeliest of export customers – Russia. As with its American counterparts, the Damocles is a day-night pod with laser designation/tracking capabilities as well as high-resolution FLIR and visual imaging. It also features a significant reconnaissance capability, allowing images to be transmitted in real time to ground stations for analysis.

Britain's Ferranti Defence Systems began developing the TIALD (Thermal Imaging Airborne Laser Designator) pod in the 1980s, and pressed it into service during the 1990 Gulf War. However, in recent years, the pod has been sidelined by improved weapons as well as the introduction of the US-Israeli LITENING pod, which is becoming the standard navigation and targeting pod on all British fighters.

In fact, LITENING can probably be considered far and away the most successful of all modern targeting pods. Beginning as a wholly Israeli project led by Rafael Advanced Defence Systems, the initial variant of the LITENING was produced in Israel and adopted by the Israeli Air Force. Then in 1995, Northrop Grumman teamed with Rafael to further develop and market the pod worldwide and the rest, as they say, is history. The pod has seen massive improvements to its sensors, as well as addition of new systems such as secure datalinks. That countries such as Britain and the USA, with a history of domestically meeting defence needs, are among the largest customers of the LITENING underlines to the pod's performance. Additionally, its wide export success has made it one of the most adaptable systems in existence, being compatible with everything from legacy MiG-21s (in Romanian service) to current-generation fighters such as the Saab Gripen and Eurofighter Typhoon. With 24 customers across the globe, the LITENING is the most widely used contemporary targeting pod, with well over a thousand units delivered.

Angad Singh

Recce-U from Rafael on the IAI Heron

Rafael

Irkut's

New generation fighters and airliners

Su-30SM for the Russian Air Force

The Su-30MKI and SU-30MKM new generation fighters, produced by Irkut, now constitute backbone of the Indian and Malaysian Air Forces. The Indian Air Force operates over 190 of these air dominance fighters, with plans to induct a total of 272 Su-30MKIs. The aircraft are equipped with phased array antennae and have super-agility, as has been experienced by pilots from a number of western nations who have had opportunities to acquaint themselves with this superior fighter during joint exercises.

Irkut has been awarded orders for over 330 aircraft of the Su-30MK family, including several in knockdown kits for assembly under licence at the facilities of Hindustan Aeronautics Limited (HAL). Su-30SM, the new multirole fighter recently ordered by the Russian Air Force, is a further development of the Su-30MK family. The Russian Air Force has ordered 65

Interior of the MC-21

of this aircraft thus far, with 16 already delivered and there is increased worldwide interest in the Su-30MK family.

As an appropriate lead-in fighter trainer, the Yak-130 which is also produced by Irkut, is currently in service with the Russian Air Force as also some other air arms including Algeria. The Yak-130 advanced jet trainer has been developed by the Yakovlev Design Bureau, a structural unit of the Irkut Corporation. 67 of these aircraft are on order by the Russian MoD, the Irkutsk Aviation plant having delivered around half of these. With senior generals of the Russian Air Force having recently visited the Russian Air Force's training base as well as the Irkutsk plant, Irkut expects the Russian AF to considerably increase its order of Yak-130s. The outstanding features of the Yak-130 have earned it the sobriquet of 'flying computer' from its Russian pilots.

Civilian Programme

On the civil airliner front, Irkut Corporation is set to commence series production of the MC-21 family of narrow-body jetliners and despite tight schedules for meeting its export contracts as also fighters for the Russian MoD, production of the MC-21 will not be compromised. After years of experience gained from producing components for the A320 family of airliners, with constant increase in production volumes, timely development and delivery of the MC-21 is ensured. Fuselage sections and wing caissons, as well as other components and sub-assemblies, have been subjected to strength and analysis tests in 2013. The German Company Durr Systems has supplied digital technology equipment for establishment of the aircraft assembly line.

The extensive use of composites in the MC-21 has dramatically reduced weight of the aircraft as compared with other aircraft of similar configuration. Much of the wing of the MC-21 family is constructed from composites, the lighter weight allowing a wing of extended length. The reduced weight as well as the increased lift area of the wing means that the MC-21 offers improved economic efficiency, in comparison with existing narrow-body aircraft, the MC-21's fuel consumption is lower by almost 25 per cent,

Pratt and Whitney's PurePower PW1400G engine will power the MC-21 family of aircraft, while customers can also opt for the PD-14 engine developed in Russia, both featuring improved fuel efficiency. Among key advantages of the MC-21 project is its wide fuselage, offering passengers 30 per cent additional space, wider seats, more spacious luggage racks and several other facilities.

The Irkutsk Aviation Plant has manufactured the first four MC-21 prototypes, three of these being used for test flying, and one for static testing. Maiden flight of the MC-21 is scheduled for 2015, while certification and first deliveries are being expected to take place in 2017.

Irkut's present order book for the MC-21 airliner is already healthy, with 276 ordered, 175 of them being "firm" .

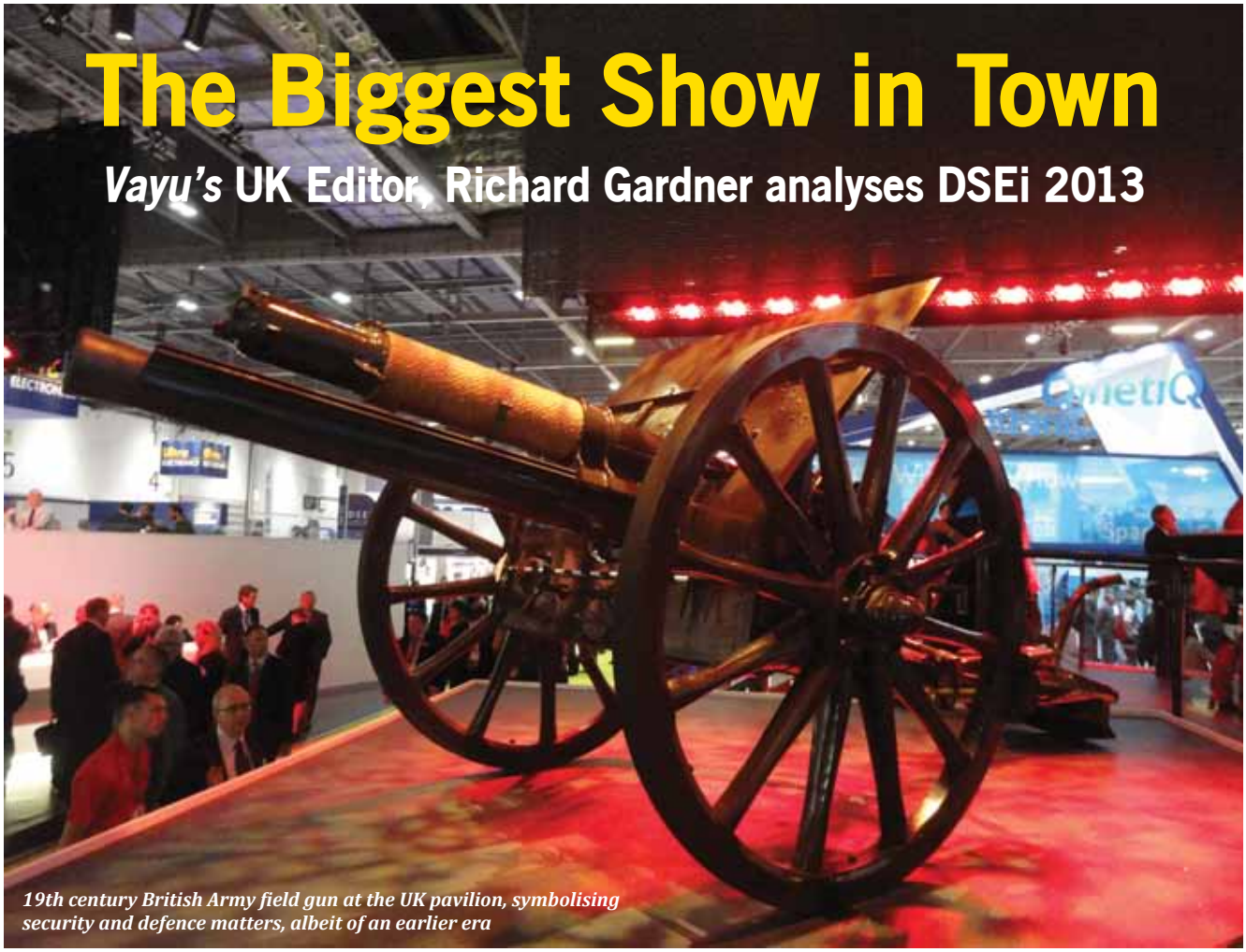
The Irkut Corporation is among Russia's leading aviation industries and part of United Aviation Corporation (UAC). Over the past century, Irkut has cemented its position as a leader in the Russian aviation sector, with the introduction of several large-scale projects. The company is headquartered in Moscow, while most of its manufacturing takes place at the legendary Irkutsk Aviation Plant in Irkutsk City, Siberia. Irkut also has two other manufacturing bases located in Ulyanovsk and Voronezh. With annual revenues for the past three years consistently hovering around the $1.6 billion mark, and with a pending order log book valued at $20 billion, the company is confidently set to achieve new records in the years to come. Their consistent efforts in the export sector have resulted in Irkut being nominated for the 'Best Exporter' award in the aviation sector by the Russian Industries and Trade Ministry for the last five years consecutively.

Inputs from the Irkut Corporation

Yak-130 advanced jet trainer

The Biggest Show in Town

Vayu's UK Editor, Richard Gardner analyses DSEi 2013



19th century British Army field gun at the UK pavilion, symbolising security and defence matters, albeit of an earlier era

The 2013 Defence & Security Equipment International (DSEi) show in London saw the largest ever participation by international companies and the biggest ever contingent of visiting warships from Europe and as far away as South Korea. India's defence R&D and production sector featured strongly at the show, highlighting its growing capabilities and products, especially in missiles and warships. The show was the largest ever to be held since moving the venue to London's Docklands and included many national pavilions and an Unmanned Systems Showcase and theatre, which offered an opportunity for visitors to see the small systems up close as well as to hear about progress on larger systems. This area included a special demonstration zone where small UAVs and micro-vehicles were put through their paces, with presentations by leading experts as well as, in many cases, the engineers who had developed these new products and military operators who were using them under evaluation or on a day to day basis.

This poster depicting the BrahMos integrated on the Su-30 MKI, was prominently displayed at DSEi 2013

The organisers of DSEi claim that the calibre of international visitors was also "high" with representatives from the Middle East, India, South America, South and Far East Asia, Australasia, United States and Europe. Nations making their debut among the record 40 international pavilions included Japan and South Korea. Other newcomers included Chile, which joined Brazil in representing Latin American growth markets. There was a rise of 13 per cent on the previous record number of visitors totaling some 32,000. There were 1,489 exhibitors from 54 countries, and 97 official delegations from 56 countries - which was a 30 per cent increase on DSEi 2011, while the number of 'VIPs' who attended increased by 20 per cent.

In past years, the DSEi show has always been focused on the naval and land-based defence sector, but at the 2013 show there was, for the first time, incorporation of

Vayu self Ad

a large Air Systems zone, which allowed exhibitors to expand their marketing efforts to aerospace related products, systems and equipment and services on a larger scale than had been possible before. The show highlighted how much transformational innovation was now coming through into new development programmes as well as next generation production contracts. The last two decades have seen governments concentrating on fighting insurgents, pirates and irregular forces, supported by extremists, and less on conventional forces. Because of this change, the market for clandestine, low profile equipment for special forces has seen a surge in demand, as has the need for precision weapons and sophisticated intelligence gathering, surveillance, targeting and command and control platforms and equipment. The rise in Unmanned Air Vehicles has seen more mini- and micro-UAVs emerging, some ingeniously disguised as birds, able to be used for close-in urban engagement scenarios, where they provide quiet, cheap reconnaissance capability, generating clear images on operator screens, being able to see around the next corner by day or night.

Numerous armoured infantry support vehicles were on display

Developed in Spain, the Expal Shepherd-Mil is a hand-launched 2.8kg bird-like electric vehicle. Fitted with miniaturised data-linked systems, it can remain aloft , flying silently, and able to use thermal lift like a bird, for up to one hour and the entire system comes complete with ruggedised controls in two suitcases. In the UAV Medium Endurance market sector, Selex ES announced a 40 million Euro contract for a quantity of Falcos for an un-named Middle East customer.

The need to provide highly mobile wheeled reconnaissance vehicles with maximum protection from insurgent-placed explosive devices has created a big market and the show had a huge range of vehicles on show, from both Eastern and Western suppliers. From UK manufacturer Supercat was the new LRV 400 which is designed to offer an overall capability close to that of the Jackal but with an ability to be carried aboard a CH-47 Chinook and a lower baseline price tag.

The Republic of Korea was well represented at the show, and brought a full size missile destroyer and support ship to London to underline its global intent. South Korea has now broken into the UK

Cassidian's Optronic Mast System for Submarines

At DSEi 2013, Cassidian Optronics GmbH, previously known as Carl Zeiss Optronics, presented its new OMS 200 low-profile optronic mast. Using newly developed passive sensors the system improves reconnaissance capabilities, especially when visibility is poor. At the same time, the optronic mast features optimised stealth characteristics resulting from its highly integrated, compact design. Thus the OMS 200 is able, as a single system, to carry out the attack and reconnaissance tasks previously assigned to separate systems. The OMS 200 can be installed into all types of submarines, not just in newly built units, but also into existing submarines, as part of upgrade programmes.

Elbit Systems solutions at DSEi 2013

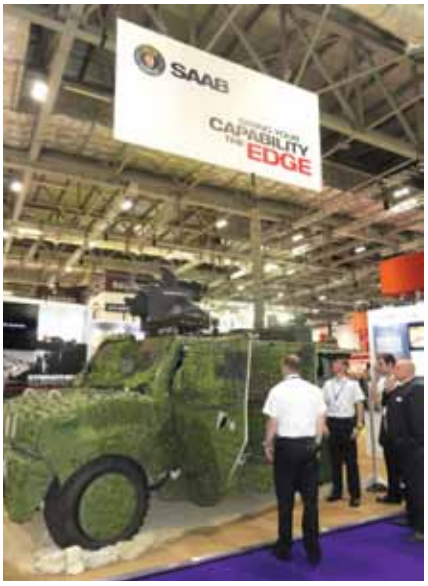
Enhanced tactical computers

This world leading provider of innovative, cutting-edge, battle-proven solutions for all sectors of the defence and homeland security market, Elbit Systems builds on the foundations of its existing UK based companies, reflecting their commitment to offer and support a wide range of technologies and capabilities.

Displayed in the 'communications' section was the new ELSAT2000E (a lightweight, rugged bi-directional Tactical Military Satellite Communications (MILSATCOM) Satellite-On-The-Move (SOTM) antenna), Tadiran SDR-7200HH (a voice & video or voice & data over a single narrowband tactical channel), Tadiran PNR-1000A (Personal Network Radio for Infantry and Special Forces), Tadiran GRX-4000 (a dual-band high-capacity line-of-sight (HCLOS) broadband radio relay system), MIPR (Military IP Radio next-generation tactical IP radio that delivers high-speed broadband-data communications to the battlefield) and Tadiran THF-8000 which is a multi-adaptive HF radio system for continuous long-range communications

In the 'Solutions for Fighting Vehicles' Section was the Kinetics Auxiliary Power Unit (APU) for MBTs and AFVs, Kinetics Life Support Systems (LSS) for AFVs and MBTs, Kinetics Environmental Control Units (ECU) for military and other heavy duty shelters Elbit Systems' Laser Warning System (E-LAWS) which is fully customisable, detecting laser and radar-guided threats and has a Threat Detection System (TDS) that accurately detects, categorises and pinpoints laser sources such as rangefinders, designators, beam riders, infrared illuminators and trainers.

In the Electronic Warfare (EW) and Signal Intelligence (SIGINT) by Elisra Section was the new MRJ which is a new EW system that blocks Remote Controlled Improvised Explosive Devices (RCIEDs) activated against armoured and VIP vehicles; Spectrolite (SPS-65V-5) which is a unified, all-in-one, EW suite for helicopters, fighters, VIP and transport aircraft that provides protection against the full range of types of threats via advanced EW capabilities packed into a single LRU and the AN/PRC-648 PLB. A SAR and data links over-the-horizon Personal Locator Beacon is intended for non-combat SAR missions, designed to provide ultra-reliable performance in severe environments.



Saab's Barracuda Mobile Camouflage system seen on a CBRN vehicle at Saab's vehicle stand

defence market in a big way, supplying the Royal Navy with four new logistic fleet support vessels, a controversial decision as might be expected. If the UK government thought this order might encourage a Typhoon selection in the ROKAF's fighter competition it must have been disappointed when it learnt that the Boeing Silent Eagle F-15 had been chosen instead, although the competition was subsequently re-opened and it has now been decided to order the Lockheed Martin F-35A. No doubt the growing Pacific reach of the Chinese armed forces greatly influenced this decision, but as a result of acquiring a small number of stealthy supersonic aircraft, the South Koreans are keeping open the prospect for further fighter orders by splitting the bid into two segments. It now looks as if the Typhoon will once again have to fight it out with the Boeing F-15SE for remainder of the F-4 replacement programme. As the

Grrr ... !

ROKAF already operates a large F-15 fleet, Boeing must be in a good position on this next re-bid.

The Royal Navy had a Type 23 frigate and a *River*-class patrol ship on display and a MOD contract was signed for an initial production run of the new generation MBDA Sea Ceptor CAMM (Common Anti-Air Modular Missile) vertically launched air defence weapon to replace the VL Sea Wolf aboard the Type 23s and later the new Type 26s. This new weapon, which claims to have major operational (and cost) advantages over legacy competitors owed to its advanced performance and 'soft-launch' silo capability (which requires no efflux management system) and does not require dedicated tracker/illuminator radars as it has an active radar system, has now been selected as the preferred solution for the Royal New Zealand Navy's ANZAC Frigate Systems Upgrade. Though still to receive final approval by the NZ government, the intention is to fit Sea Ceptor to the two frigates, HMNZ *Te Kaha* and HMNZ *Te Mana*, to protect not only the host ship but also combined allied forces in the vicinity. Sea Ceptor has a very effective, fast reacting 360-degree capability against anti-ship missiles, cruise missiles and aircraft.

Another important new MBDA missile development is a low-cost maritime version of Brimstone, for use against single or multiple sea threats. The launchers can be mounted on small, fast, patrol boats or fixed locations such as coastal sites as well as larger vessels. Fast reacting multiple launches were demonstrated in a patrol-boat bridge simulator to show how Brimstone could effectively deal with swarms of hostile small fast boats, as favoured by pirates or assault forces. In this threat environment it fills a gap between much larger and more expensive anti-ship weapons and guns which have limited visual range. The live-fire trials have shown that the new Brimstone can be devastatingly effective against small vessel targets.

Aboard the Swedish multi-role frigate *Vingra*, Saab presented their remote vehicle Double Eagle mine countermeasures device optimised for 'brown-water' littoral waters. This carries a variable depth sonar and is very successful clearing mines of all types. The Mk.3 version has been selected by the Belgian and Netherlands navies and this has

Cassidian's new TRSS naval radar can detect even swimmers !

Cassidian, now Airbus Defence and Space, introduced a new naval X-Band radar optimised for the detection of extremely small objects and countering asymmetric threats. Based upon the latest Active Electronically Scanning Array (AESA) radar technology, the new Tactical Radar for Surface Surveillance (TRSS) substantially increases the detection capabilities, and thus the protection level, of navy ships and coast guard vessels. TRSS with its low weight, power consumption and space requirements makes the AESA technology affordable for small- and medium-sized vessels. This is beneficial particularly to ships operating in littoral waters which previously could not accommodate radars at all or had to use conventional mechanically rotating models. AESA technology and electronic beam steering enables the radar to fulfil several tasks at the same time while increasing detection capability substantially.

DSEi 2013 saw a host of visiting naval ships on the river Thames, ranging from the HMS Tyne and HSwMS Ulvon to the RoKNS Dae Jo-Young

A smiling sailor from the HMS Tyne

Saab contracted for Multispectral Camouflage Systems

Defence and security company Saab has been contracted for Multispectral Static Camouflage Nets from the Canadian Department of National Defence (DND). The order amounts to MSEK 54 with the right to exercise several options for potential orders of MSEK 44 over 5 years. Saab Barracuda's advanced camouflage technology products have been exported to more than 50 countries, for Saab offers a unique package of camouflage systems and force protection solutions with the purpose to decrease the enemy's ability to detect and engage. These solutions protect camps, vehicles and personnel against hostile sensors and enemy target acquisition.

Dr A Sivathanu Pillai, CEO and MD BrahMos Aerospace, seen here at the BrahMos pavilion

an autonomous operating capability as well as a very low magnetic signature. Civilian versions are being made available for use for underwater inspections and diving support activities. Different sonars can be carried for different missions. Stable at any attitude the vehicle can produce high resolution images of ship hulls or sea platform legs.

In the main exhibition hall, highlights of the *India Pavilion* had featured the Indo-Russian BrahMos long-range supersonic cruise missile displayed very prominently. Large scale models depicted its optional launch arrangements including deck-mounted or in vertical silos on naval ships, or vertically launched from submarines, or surface or air–launched. There is no doubt that BrahMos is going to be a highly effective and much-feared long-range weapon in the projection of Indian air and sea power and for the defence of ships at sea, coastal bases and land assets. Ship-launched variants are in service in the Indian Navy and integration of the air-launched version is underway on the Su-30MKI with live air test firings of the missile due in 2014. The submarine version has also been test fired successfully from a sub-surface platform earlier in 2013.

A prominent model of HAL's maritime patrol Dornier Do 228 on display

MBDA adds Brimstone anti-FIAC Capability to CWSP Naval Warfare solutions

In 2010, MBDA launched the CWSP (Compact Warfare System Package) to provide fast patrol boats and logistics ships with an integrated combat system for both self-defence and the means to secure sensitive coastal zones. In this respect, CWSP's common architecture has up to now incorporated MBDA's automated, twin turret Mistral missile SIMBAD-RC air defence system and a twin launcher Marte Mk2/N missile system for the anti-ship role. However, in recognition of the growing complexity of operations in the littoral, MBDA is now offering CWSP with an additional capability, provided by Brimstone, to counter agile high speed craft operating in potentially large numbers often in well co-ordinated formations. These Fast Inshore Attack Craft (FIAC), when operating together, can overwhelm the defences of well armed naval craft equipped with medium calibre gun systems.

Daniel Petit and Loic Piedevache of MBDA at DSEi 2013

In May 2013, MBDA successfully carried out a surface-to-surface, rapid salvo firing of three Brimstone missiles in a trial scenario representing just such a FIAC attack. Each of the missiles hit its intended target. This trial followed on from two previous Brimstone successes against FIAC targets. With its all-weather, fire-and-forget, single button–push salvo firing capability, Brimstone is considered as both a logical and significant addition to the capability already offered by CWSP.

At the show's seminar sessions, top level industry and military speakers were active with a series of presentations on a variety of topics. One of the most detailed sessions was centred on the forthcoming Royal Navy *Queen Elizabeth*-class aircraft carriers, the first of which is nearing structural completion, with a launch due in 2014. It was revealed that the UK's two carriers could each operate up to 40 aircraft from their four acre flight decks. The highly mechanised magazines and weapons handling systems help keep each ship's crew size down to 679, which is remarkably 50 less than aboard the *Invincible* -class carriers even though the new ships are three times as large. The future planning for joint air groups envisages embarked options that

The Royal Navy depicted its future 'Queen Elizabeth'-class aircraft carrier

will be applicable over the ships' 50 year lifespan. Initially, a Littoral Air Manoeuvre group will comprise 3 Chinooks, 12 Merlin Mk 4s, 8 Apaches and 6 Wildcat helicopters. A Maritime Force Protection air group will consist of 9 Mk 2 Merlins and five Merlin Crows Nest AEW/CC helicopters. The combat support package would include 24 F-35Bs. In the Strike Carrier Force configuration, up to 36 F-35s could be carried plus the Merlin Mk2s.

The first new carrier will start sea trials with the F-35B in 2017. DSEi included a detailed programme update on the F-35B from Lockheed Martin, with video footage of recent successful deck trials flown by a Royal Navy pilot aboard the USS *Wasp*. The US Marine Corps is more

Rolls-Royce unveils new maritime patrol vessel design

Rolls-Royce unveiled a new design of maritime patrol craft at DSEi. The first of a 'protection vessel family' of designs, is the new 55-metre craft featuring a range of equipment from Rolls-Royce (stabilisers, thrusters, steering gear, fixed pitch propellers) and MTU (diesels, diesel generators, Callosum IPMS), offering a cost-effective design that can be tailored to mission requirements. Weighing around 500 tonnes, the new vessel is suited to patrol, search and rescue and interception duties. A 90-metre version of the craft will be on offer, with a 75-metre design following in 2014. Garry Mills, Rolls-Royce, Chief of Naval Ship Design, said, "Coastal protection and offshore patrol vessels is a growing sector and this new design offers multi-purpose capability, incorporating core design elements that are replicated across the family of vessels."

than delighted that the UK is firmly back in the F-35B club, with RAF and RN pilots now flying the aircraft in the USA, and plans are evolving to further develop close training, support and operational cooperation between the RAF/RN and USMC. Compared to the Harrier, the F-35B, which has a digital flight control system developed in the UK, offers a "care-free" automated flying performance, with flight envelope protection, that removes most of the pilot workload and allowing him to concentrate on the mission. The first Royal Navy squadron within the Joint RAF/RN F-35B force would be No.809 NAS, which previously flew Sea Harriers and Buccaneers. The QE-Class carriers are now described by the Royal Navy as being of 70,000 tons displacement and the RN's First Sea Lord has indicated that he wishes to see the first new carrier deployed with a large aircraft complement so as to fully exploit its operational capabilities "as early as possible".

The RN's Type 26 is evolving into a highly flexible blue-water 6,000 tonne ship, more like a destroyer than a frigate. It will have highly modular design features with open systems architecture so that over its intended 30-40 year life it can be upgraded and adapted without major structural and internal modifications. It will be suitable for independent operations or working within a larger task force. There will be provision

The M777 155mm howitzer took centre stage at the BAE Systems pavilion

India's Pilotless Target Aircraft, Lakshya, seen at the ADE-DRDO stand

There was no shortage of ceremonial livery as seen on this mannequin in British Army colours produced by a Pakistani private firm

Raytheon's new technologies

Raytheon unveiled its a new technology that improves forward looking infrared (FLIR) sensors used by warfighters in the battlespace. Multispectral Reflective Lightweight Optics Technology metal mirror development improves the accuracy, weight and cost of FLIR systems on multiple platforms. Additionally, Raytheon and Falck Schmidt Defence Systems debuted a remotely operated, mast-mounted, long-range reconnaissance and surveillance (LRRS) forward looking infrared (FLIR) system. The new system provides greater situational awareness while enhancing soldier safety by allowing the operator to stay under cover.

The company also announced that the US Navy had awarded them a $136.2 million contract to remanufacture, overhaul and upgrade 19 Phalanx Close-in Weapon Systems and produce four SeaRAM Anti-ship Missile Defence Systems. This contract includes a $94.8 million option for FY14 covering an additional 12 Phalanx and four SeaRAM systems. The option, if exercised, would bring the cumulative value of the contract to $231 million.

AN/TPY-2 ballistic missile defence radar

for a vertical-launch missile silo and the rear deck will be large enough to operate a helicopter up to Chinook size. At the show it was announced that design development agreements had been reached with Rolls-Royce, MTU, David Brown Gear Systems and Rohde & Schwarz. BAE Systems is the lead contractor on the programme, which is intended to cover the construction of 13 ships. Exportability will be an aim and the ships have at their heart, what is described as 'Flexible Mission Space' so they can fulfil many different roles.

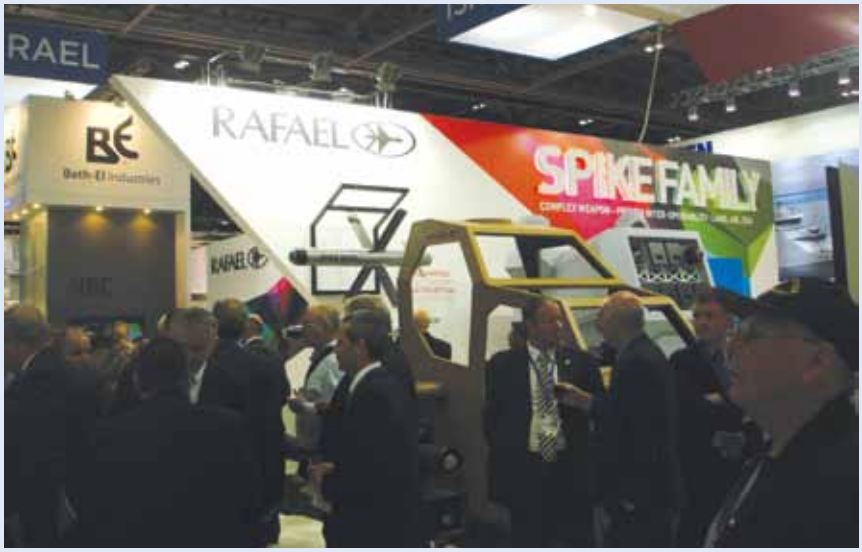
Airbus Military is proposing a multi-role MPA version of the C295 and no doubt Boeing hopes that in due course the RAF might adopt the P-8, already being delivered to India and selected to replace the P-3 Orion by Australia. It is believed that the RAF is looking at a future generic Multi Mission Aircraft that could replace a number of existing air platforms and which could carry out a wider range of tasks than current small fleets of highly specialised aircraft. The platform could be jet or turboprop-powered but the major factor will be 'flexibility.' If surveillance is to be a requirement however it would seem a jet platform aircraft might be preferred as it would offer greater speed and the ability to fly higher, increasing radar coverage.

Future British Army infantry soldier...

... and present Royal Fusilier

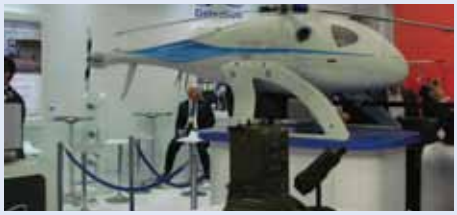
Around DSEi

The UK Pavilion was dominant–as was to be expected!



Rafael unveiled its SPIKE-NLOS system: the longest range member of its guided missile family, the SPIKE-NLOS has air, sea and land applications.

Lockheed Martin's varied range of ground vehicles on display at DSEi 2013


Bruker Detection displayed chemical and radiological detection equipment integrated into the UMAT (Unmanned Mission Avionics Test Helicopter)

Diehl and Australian Munitions to develop new hand grenade

Thales-owned Australian Munitions and German company Diehl will co-develop an insensitive munitions variant of the Australian in-service fragmentation hand grenade. Insensitive Munitions (IM) are designed to only detonate when deployed against a target, and will not detonate as a result of mechanical shocks, fire or impact from shrapnel. The project follows on from work undertaken by Australian Munitions during its rapid development of a blast variant of the current Australian in-service fragmentation grenade to meet an urgent operational requirement.

The Diehl stand at DSEi

The C295MPA has recently been upgraded with up-rated engines for better hot and high performance, and now has winglets to improve range and fuel economy. The company's offer to the UK would feature a new mission system equipped cabin with four multi-function consoles and electronic racks and room for sonobuoy launchers and racks. Air Sea Rescue equipment could be carried on the rear ramp, and a sea-search radar would be carried with other sensors if required. The fully integrated tactical system is already developed and in service with many operators. The C295 can be air refuelled to give an endurance of up to 12 hours. Also competing in this market is the ATR 72-600, which type has just been delivered to the Turkish Navy, and another alternative might be an MPA conversion of some of the RAF's relatively young C-130Js.

At the show BAE Systems proposed a lightweight air tanker converted from existing 146/RJ airframes. This is proposed as a trainer for air tanker crews, and also a low-cost tactical tanker able to refuel fast jets and helicopters. Recently BAE Systems supplied two converted 146/RJ aircraft to the RAF to supplement C-130K and J Hercules transports in Afghanistan. BAE Systems is now proposing to offer refurbished former civil 146/RJ aircraft to export customers as low cost tactical transports that could carry out routine military passenger and cargo operations at far lower cost than larger and much more expensive specialised transport aircraft.

With increasing threats from new generation weapons, such as medium and long-range ballistic missiles, and supersonic cruise missiles, the need for constant situational awareness is becoming a paramount strategic requirement across the Asia Pacific region. Lockheed Martin has developed a whole portfolio of ISR tools with which to counter a multitude of threats. These have been brought together under the collective title of *The Dragon ISR Family* and comprise seven different configurations, in ground and air formats, to meet all emerging customer needs. This offers a unique approach for customers to tailor their individual mission requirements to meet their budget, sensor, communications and platform needs. The most recent option in this family of solutions is known as Dragon Dome and links ISR, air operations and missile defence systems at the battlefield

Thales offers new system of targeting and surveillance with SOPHIE Lite

Thales UK have launched a new lightweight multifunction surveillance and target locator system, SOPHIE Lite. Weighing a class-leading, fully-operational weight of only 1.6kg, SOPHIE Lite can be deployed in a variety of operational scenarios by both military and civil users. The new ultra-compact system has a fully-integrated suite of sensors, including an uncooled thermal imager, TV/Near Infra-Red (NIR) sensor, high-performance eyesafe laser rangefinder, digital compass and GPS. Operational roles for the SOPHIE Lite include force protection, forward observation, forward air control, covert surveillance, asset protection and homeland security. SOPHIE Lite is the latest addition to Thales's family of SOPHIE cameras, which collectively offer the widest range of capabilities to meet any operational requirement for handheld surveillance and targeting. Thousands of Sophie cameras are now in operation with armed forces, including the British Army and security teams around the world.

Thales at DSEi

management level, allowing users to work together in a shared environment to optimise defence operations. Dragon Dome can be easily integrated with coalition forces to greatly expand a given nation's defensive capabilities and improve its performance in collaboration with allied nations. It gives a given nation a national advanced C2 system that can network quickly and efficiently. In addition to Dragon Dome, the Diamond Shield system can be integrated into the chosen transport aircraft platform or in Dragon Star configuration, in a mid-range executive jet platform. All these Dragon configurations are net-centric to support 'out-of-the-box' interoperability. Dragon Shield is a highly flexible application designed to be fitted into any medium size transport aircraft, typically a C-130 or C295.

Tata Steel's lightweight armour steel "can take a punch"

Tata Steel has received orders for more than 200 samples of its perforated armour steel, which has been exported to a number of countries worldwide including Germany, France and the USA. This revolutionary armour steel, formerly known as Super Bainite, has also undergone a number of design improvements and has taken on a new brand name, PAVISE SBS 600P, and was exhibited at DSEi. PAVISE, which provides an efficient and cost-effective armouring solution for military vehicles, as well as for defended infrastructure such as watch towers or sangars, has now been tested up to STANAG Level 4 to create armour capable of resisting both small arms and heavy machine gun fire with armour-piercing projectiles.

The ballistic performance of PAVISE - the way it deals with the effect of projectiles - is at least twice that of conventional rolled homogenous steel armour. The perforated design of the steel creates a large number of edges which disrupt the path of incoming projectiles, significantly reducing their potency. Dr Henrik Adam, Tata Steel's Chief Commercial Officer in Europe stated that "Tata Steel has spent significant effort developing this unique product and we are delighted with its performance. As a company we are well positioned to support the market, both in the UK and the wider European markets, and we look forward to receiving the feedback of all the companies currently testing PAVISE."

A major participant at DSEi 2013 was FLIR Systems which earlier in the year received a $23 million contract to support the US Coast Guard's need to maintain an effective surveillance capability for maritime and littoral use on H-60 and H-65 helicopters. The latest USCG order is for the Talon 9-inch stabilised multi-sensor gimbal system and delivery will take place before the end of this year. This system was developed commercially but is also military qualified. Another recent order , worth $81 million, was from the US Army for a Talon-based mission sensor to be installed on Blackhawk helicopters used on life-saving Medevac operations.

Another exhibitor with a global customer base in enhanced vision systems was L-3 Wescam. The L-3 MX Series provides high-definition electro-optical and infra red imagery with high magnification, large aperture optics to give a superior range performance, with image blending to uncover more detail by combining the EO and IR images into one image stream. The systems accurately steer, point and track to targets with minimal operator involvement. This is proving to be popular for such specialised roles as airborne gunships, such as the modified C-27J and C-295 platform aircraft, where the fully digital MX-15D, fitted in a single LRU configuration provided a multi-sensor, multi-pectral targeting system in a turret weighing only 113lbs. There is a GPS receiver built into the unit, which is ideal for medium altitude, covert intelligence, surveillance and reconnaissance, armed reconnaissance and target designation. This system supports all standard MX-Series command and control, moving map, radar and searchlight interfaces. The individually optimised optics maximise performance in each sensor (with a payload of up to 10 sensors). The precision zoom low light, HD colour and short wave IR spotter optics give day or night positive target identification. There is also an 'add on' laser illuminator (the D designation in MX-15D), dual mode rangefinder/ designator and spot tracker. Enhanced haze penetration is provided by the short wave IR imaging. All sensors feature advanced image processing and image blending. The MX-20 and 20D offer long-range multi-sensor capability and are optimised for high altitude, long range maritime patrol and persistent surveillance applications offering true HD digital imaging, with no

degradation due to compression. US C-130 gunships use two MX-20Ds to line up the downward firing guns. The Series 10 and 15 versions have been selected by Saudi Arabia and Jordan for use on their Selex Falco UAVs. Other operators are in the market for surveillance systems for use in the MPA role. L-3 has supplied MX-20 systems for the new Boeing P-8As, and MX-15s have been selected for use on the Australian Coast Watch Dash-8 aircraft. The latest MX-RSTA product is a highly modular system that can be configured in different ways for land use. Ideal for reconnaissance, surveillance, target acquisition and force protection missions, it can be fitted in amphibious or armoured vehicles and can be mast mounted. Qualified to US Military standards, the system is fully integrated with built-in vibration and shock isolation, with the option of GPS. It has the same 4-axis steering and stabilisation features as other MX Series with HD colour sensors with multi-sensor imaging and laser payload options.

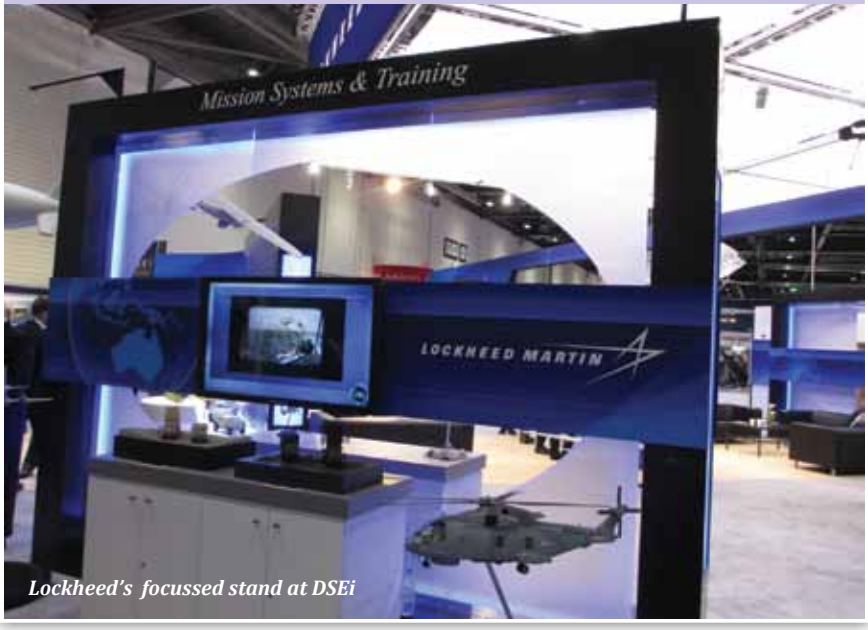
At DSEi were showcased a massive range of military and para-military products and services which clearly indicated that despite a widespread re-examination of defence procurement and support needs, the international defence equipment sector is as innovative as ever and actively working to offer even better solutions in the future, but at realistically affordable costs. Keeping the right balance between performance, efficiency and affordability will continue to be key factors in defence procurement over the coming years.

Lockheed Martin's C4ISR, cyber security and other defence capabilities

With considerable insight into all aspects of C4ISR – from signals intelligence to military communications; from sending operationally relevant data to tactical forces to providing persistent surveillance for disadvantaged users – Lockheed Martin are developing next generation systems that meet the challenges of current asymmetric threat environment.

Dragon ISR: Lockheed Martin's Dragon ISR configurations have offered a unique approach for customers to tailor mission requirements to meet their specific budget, sensor, communications and platform needs and the newest addition to Dragon ISR was also announced at the Show.

Defensive Information Technology: Building upon successes upgrading some of the largest military networks in the United States, customers are enabled to create extremely secure, modern networks.



Lockheed's focussed stand at DSEi

Northrop Grumman's defence and security capabilities

Northrop Grumman highlighted their capabilities in command, control, communications, computers, intelligence (C4I), border security, unmanned ground systems, cyber security as well as navigation and maritime systems at DSEi. On display was a range of command and control capabilities for applications from strategic headquarters to deployed foot soldiers' situational awareness tools. These included Integrated Tactical Command and Control Services (I-TaCCS) and Integrated Joint Operational Command and Control Services (I-JOCCS) applications. The core software components of I-TaCCS are in service in more than 40 countries with 100,000 users offering multinational interoperability. The computer-aided dispatch system CommandPoint for border security and emergency services command and control operations were highlighted.

Northrop Grumman's cyber capabilities were also showcased. The exhibit included the CUTLASS, Andros Titus and Wheelbarrow Mk9 unmanned ground vehicle (UGV) systems. CUTLASS is the latest generation UGV for the remote handling and surveillance of hazardous threats; Andros Titus is the company's newest, lightest, fastest, strongest and most intelligent member of the Andros family of UGVs and Wheelbarrow Mk9 is the enhanced version of Northrop Grumman's Wheelbarrow vehicle for the remote handling of hazardous threats including bomb disposal, tactical and surveillance operations.

Nexter's new 6x6, TITUS

As heir of a multi secular national industry, Nexter remains European leader of land defence and the Nexter group masters a wide range of land defence systems which equip more than a hundred armies all over the world.

As an important asset of the French Army in the Afghan, Lebanese and Malian theatres, the 8x8 Infantry Fighting Vehicle VBCI was not only present at the Nexter stand but also on the static display where a conference dedicated to the VBCI during Operation Serval held by the French forces.

Nexter's 8x8 Infantry Fighting Vehicle VBCI at DSEi

New from Nexter: the TITUS

During the DSEi Exhibition, Nexter Systems unveiled its brand new armoured wheeled vehicle: TITUS, "the versatile armoured vehicle of the 21st century." Continuing a famous long lineage of innovating systems, including the Leclerc MBT, VBCI and CAESAR, all combat proven in many theatres of operation, Nexter Systems combined the best of its experience and technology in TITUS.

TITUS is able to fulfill the full range of missions from infantry transport to combat missions, combat support and combat service support functions, in any kind of type of commitments likely to occur in a hybrid conflict. Fire power has not been neglected since TITUS can be equipped with any kind of Remote Control Weapon Station from 7.62mm to 20mm, plus 40mm Grenade Launchers as well, depending on the level of threats and type of missions. TITUS is fully integrated within the C4I network through last generation vetronics. Nexter Battlefield Management System FINDERS provides situational awareness, enhanced by a perimetric camera system, and reconnaissance robot (NERVA LG), allowing a safe dismounting.

Rafael at DSEI 2013

Typhoon MLS-NLOS for sea-to-shore fire support or sea-to-sea targeting.

Rafael exhibited its Multi-Purpose, Tactical, Guided Missile System which included the Spike Family : Electro-Optic, Tactical, Precision-Guided Missile Systems.

Rafael's Spike Missile Family consists of precise tactical missiles for ranges of 0–25 km. The Spike Family missiles are multi-purpose, multi-platform electro-optic systems featuring real-time data links. The Spike missiles can be used by infantry units as well as mounted on combat vehicles, attack helicopters and naval vessels.

Spike missiles can be used by infantry units as well as mounted on combat vehicles

Typhoon MLS- NLOS Medium-Range, High-Impact Naval Missile System; is a complete Naval Missile System which includes Spike-NLOS missiles, a fire control system and an electro-optic payload. The compact system can be installed on a range of platforms from fast attack craft to larger ships. Spike NLOS is an electro-optically guided multipurpose missile for ranges of up to 25 km having pinpoint accuracy with midcourse navigation. The missile offers the unique advantages of hitting Non Line-of-Sight (NLOS) targets and an ability to switch between targets during missile flight and abort missions.

Typhoon MLS-NLOS can be operated in both offensive and defensive scenarios. In addition to attacking hidden targets, the Spike NLOS missile can provide real-time tactical intelligence and battle damage assessment. Featuring day and night, all-weather target engagement capability, Typhoon MLS-NLOS is the ideal solution for sea-to-shore fire support or sea-to-sea targeting.

Spectacle, Sans Substance

Defence Minister AK Antony, flanked by Minister of State Jitendra Singh, Secretary Defence RK Mathur and Secretary DP GC Pati lighting the symbolic lamp to formally inaugurate Defexpo 2014.

Review of Defexpo 2014

Defexpo India 2014, eighth in the series of biennial Land, Naval and Internal Homeland Security Systems Exhibition, was held at Pragati Maidan New Delhi, from 6th to 9th February 2014. Organised by the Defence Exhibition Organisation of the MoD and FICCI, the attempt was "to showcase not only existing defence equipment and systems but development of futuristic and critical defence technologies". To be afforded such opportunity, over 620 companies took part, some 370 of them being foreign, with country pavilions from France, Germany, Hungary, Israel, Italy, Norway, Poland, Russia, South Africa, South Korea, UK and the USA.

Vayu Aerospace & Defence Review, which is currently marking its 40th year of publication and having an enormous readership in India and globally, was the lead media at Defexpo 2014. Vayu's Editorial team covered the event, recording inaugural speeches and ministerial conferences, moving from Hall to Hall, interviewing senior executives, investigating technology and operational claims and, till the late hours at night, putting together pertinent material for the Show Dailies which were then distributed extensively at the Show every morning.

This review of Defexpo 2014 is for those readers who were not present at Pragati Maidan those days – but nevertheless are interested !

Even as the Indian Air Force band struck up brave martial tunes at the Hamsadhwani Open Theatre in Pragati Maidan in an effort to liven up the Defexpo India 2014 inaugural proceedings, Defence Minister AK Antony, flanked by his Minister of State and various Defence Secretaries, symbolically lit the lamp before delivering his inaugural address. The Minister stressed that the coming together of these many countries of the world at Defexpo at 2014 (some 30 of them participating, with 12 country pavilions and 511 delegates from 52 countries) indicated "the continued importance of this biennial Show", which was held in the heart of India's capital, notwithstanding the traffic jams considering that another Expo on automobile components was being concurrently held at Pragati Maidan.

The three Service Chiefs of India with visiting military dignitaries

Still, almost on cue, Mr Antony had to apologise for the utter chaos at the main entrance to the Show where hundreds of exhibitors and officials were squeezed into single lines, their exhibition passes squinted at by poorly briefed personnel. A well known defence commentator had been prophetic in his statement before the Show *: If the experience of past editions of Defexpo is anything to go by, get ready for a fight to get into the show. There will be a single baggage scan and too few turnstiles for entry into the venue. This, of course, does not apply to VIPs, who will have a separate entrance. Just because Delhi has an Aam Aadmi Party (AAP) government doesn't mean anything's changed !*

Mr Antony brazenly continued in that "efforts are being continuously made to accelerate the pace of indigenisation in the defence sector, with the Government encouraging joint public-private participation in defence sector, while thrust is also being given to the private sector to make a far more meaningful and substantive contribution".

The Minister repeated that "regular reviews of the Defence Procurement Procedures (DPP) are being carried out with certain objectives in mind among which balancing the competing requirements of expediting procurement, developing a robust base for indigenous defence sector and to adhere to the highest standards of transparency, probity and public accountability are some of them". In the latest Defence Procurement Procedures approved in 2013, for instance, "emphasis has been laid upon to provide a boost to Indian defence industry both in public and private sector by according preference to the 'Buy' (Indian), Buy and Make (Indian) categories of acquisitions". Antony threw a bait that at the same time, "the industry should also come forward to create the necessary capability to take advantage of the provisions of DPP 2013". He said the latest Defence Offset Guidelines articulated the key objectives of the policy document, besides adding some new features and modifying some of the earlier provisions.

That was the sweet part. An hour later, Defence Minister AK Antony, with all his secretaries on stage, was confronted with some rather sour fare by the demanding media gathered to quiz the many issues that remained unaddressed in his earlier, formal, inaugural speech. The vexed matter of the MMRCA attracted most questions to which the Minister soberly stated the obvious : "while the process of reaching finalisation on technical issues continues, the contractual negotiation stage is still ahead, and certainly will not take place within the current fiscal year".

Dassault's Rafale seen in model form at the Thales stand

There are clear cut procedures being followed but as for life cycle costs, which had determined selection of the 'L-1', the Minister was somewhat ambiguous which left many to speculate on what he actually meant ! Clear however, was his statement that 92% of the current Defence budget had been spent by February 2014 which is the good news, considering that in the past, monies were actually surrendered. But the startling fact is that Rs 7870 crore ($ 1.26 billion) has had to be transferred in January 2014 from the Capital to the Revenue account to meet the exigencies of pay & allowances, maintenance and fuel costs etc.

The Minister bypassed some provocative questions including whether the Government had any "backup plans"

for meeting the MMRCA requirement. Social media analysts had a field day in analysing some of the statements : that there was no budget provision for the MMRCA in 2013-14 was always realised but sugarcoating the obvious harsh realities was an escape route.

Diminishing Options

In a startling development on the eve of Defexpo 2014, months after the organisers had accepted their monies and allocated large space, the Defence Ministry issued a missive asking Finmeccanica, parent company of AgustaWestland, to withdraw from this biennial exhibition.

The MoD has not officially blacklisted AgustaWestland or any of its group companies, stating that any such decision would be taken "after consulting the law ministry and CBI". According to some defence analysts, the MoD is trying "to send a message ahead of the general elections in early 2014 that the ruling government is taking action against corruption". Whether this be so or not, there will be tremors felt in the armed forces as this Group has several ongoing important projects including those on air surveillance radar, light weight torpedoes and a slew of helicopter programmes for the Indian Navy as also maritime reconnaissance aircraft.

Many defence observers are outspoken of the fact that with the MoD continuously 'blacklisting' several leading defence equipment manufacturers, modernisation plans of the Indian defence forces are being dramatically impacted. Such 'blacklisting', which began in the 1980s, first focused on manufacturers of the world's leading artillery guns which has virtually choked the Indian Army's desperate requirement for 155mm howitzers, now awaiting realisation for nearly three decades. There is also the need for ultra light howitzers to be deployed with the new Mountain Strike Corps but this requirement remains stuck in spite of several years of negotiation, after an alternative system was 'blacklisted' thus reducing the options.

Then, the Indian Army and Air Force have struggled to keep their veteran Chetak and Cheetah helicopters operational in some of the world's highest and most treacherous mountains, but the requirement for 197 new reconnaissance & surveillance helicopters (RSH), is still far from any selection let alone induction, owing to constant derailments following allegations of "misconduct."

A well known Defence analyst has quipped that the MoD blacklist reads like 'Who's Who' of global weapons suppliers, including corporations with good records of delivering weapon systems and equipment to India's armed forces. "Today, anyone who wants to block an important Indian arms purchase has only to level an allegation against the vendor", complains an Indian army officer furiously. "Anonymous letters, motivated charges, press reports, whatsoever … just kick-start an investigation and the MoD will kill the procurement. This is now routine business practice for rival arms dealers …".

According to a report in *The Times of India*, of 29 January 2014 MoD sources have stated that 27 firms, including 15 companies already on the 'de-barred' list and those under CBI scanner, have been refused participation at Defexpo 2014. Empty spaces in Hall 10 were testimony to the last minute debarring of Finmeccanica from the event which generally left a hollow feeling.

Less than a month after the event came the distressing news about Rolls Royce going under similar scrutiny. Bewildered, many well wishers of the Indian polity have opined that should this blue-chip company also fall foul of the mandarins, six different aircraft types with the Indian Air Force and Indian Navy will be directly affected.

"When are we going to stop scoring self goals," say exasperated senior officers!

No show! 'Freehold' in Hall 10 where Finmeccanica were earlier allotted space for their stand.

MKU: "Defexpo provided opportunity for reaching out to international clients"

MKU, manufacturer of ballistic protection equipment and night vision devices with over 25 years of domain experience, participated at the show and displayed some latest protection solutions which included ballistic jackets, armour inserts, helmets, advanced protection gear, platform protection for aircraft, naval vessels and land vehicles. Their personal protection products comply with stringent and new International Standards. Also on display were the new range of Night Vision Devices manufactured by MKU GmbH showcasing the Jaguar 7, Jaguar 14 and Night Eye weapon sight. "The latest range of night vision devices offer larger field of view, long range illuminators and high quality optics."

Subdued Atmosphere

The overall atmosphere at Pragati Maidan remained somewhat subdued but participating Companies kept a stiff upper lip to move on with the hope that requirements of the Indian armed forces would be met sooner – than later. The Defence Minister's address on the opening day of Defexpo 2014, candidly admitting that there was a 'stay' on Defence spending (at least till the next financial year which will also see the National elections being held), had naturally dampened spirits of participating companies but these were alleviated by the sight of visiting officers of the Indian Armed Forces looking purposeful : the Indian Army's uniform code for Fridays is for personnel to be in combat wear and so Defexpo was well served to that extent. The Army's camouflage uniforms intermingled with the Navy blues which contrasted with the black overalls of Special Forces and officers of the Air Force in their shade of blue.

Still, there was this sense of déjà vu amongst visitors and participants alike with everyone going about their routine affairs without much ado about anything!

The positive part

There was a surfeit of formal conferences and so the one by Mr Avinash Chander, Scientific Advisor to the Defence Minister was well attended. After reviewing highlights of 2013, the SA revealed that several launches of Indian ballistic missiles are planned for in 2014, beginning with that of the Agni-I which in fact marked the 75th such launch in the series. While the nuclear-submarine INS *Arihant* was to commence sea trials in February-March, the Arjun Mk. II main battle tank (on display at Pragati Maidan) was undergoing user trials with the Indian Army's Armoured Corps . The DRDO has offered UAVs to the CRPF in the Naxal affected areas, the force having a projected requirement for 16 Nishants.

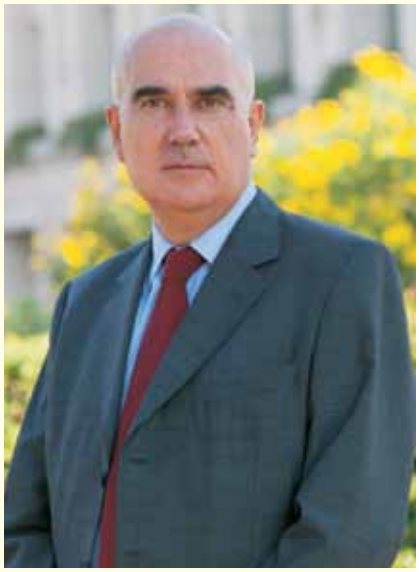
The Army's camouflage uniforms intermingled with the Navy blues which contrasted with the black overalls of Special Forces and officers of the Air Force in their shade of blue.

"India is a strategic resource hub for Airbus Group"

Taking off into 2014, EADS, one of the global leaders in aerospace, defence and related services has been rebranded as 'Airbus Group'. Uniting all its activities under a single and strong brand, Airbus Group has also renamed two of its three Divisions. The Group is now home to Airbus, Airbus Defence and Space, and Airbus Helicopters. Airbus, the Group's international flagship, is a leader in the commercial aircraft market. Airbus Helicopters (previously Eurocopter) comprises all commercial and military helicopter business. Airbus Defence and Space consolidates the defence and space activities from Cassidian, Airbus Military and Astrium.

India is an important market but it is also a strategic 'resource hub' for the Airbus Group. "India and our Group have much to offer to each other for mutual growth," said Yves Guillaume, President India, Airbus Group. "India is home to quality engineers whom we are tapping to make our products more competitive globally and develop tailor-made solutions for our customers here," he added.

Airbus Group operates two engineering centres – one focused on civil and the other on defence activities – and a research centre in India. Situated in Bengaluru, the Airbus Defence and Space Engineering Centre is India's first defence oriented engineering centre owned by a foreign company. It has developed two 'Made-in-India' products: a Reduced Vertical Separation Minimum (RVSM) compliant Altimetry System, which provides highly accurate altitude readings to aircraft systems and a structurally integrated antenna for aircraft. The Airbus Engineering Centre, also situated in Bengaluru specialises in high-tech aeronautical engineering and works closely with other Airbus Engineering Centres



around the world, as well as with the Indian aviation industry. The R&D centre belonging to Airbus Group Innovations is co-located at the Airbus Engineering Centre premises. Indian engineers are working there in areas such as aerothermics and cloud computing. In particular, Airbus Group Innovations and the Airbus Defence and Space Engineering Centre in Bengaluru are jointly leading a research project in the field of cognitive radars. This ongoing research project has led to publications in leading journals and the filing of a patent.

"Joint development programmes and consultancy agreements with Indian defence R&D agencies underline our commitment to support the process of defence indigenisation in India," outlines Yves Guillaume. Airbus Defence and Space and India's Defence Research and Development Organisation (DRDO) have jointly developed a missile approach warning sensor (MILDS), which has been certified as 'indigenous' by Indian authorities and is produced locally for the Indian Army's Cheetah and Chetak helicopter fleet.

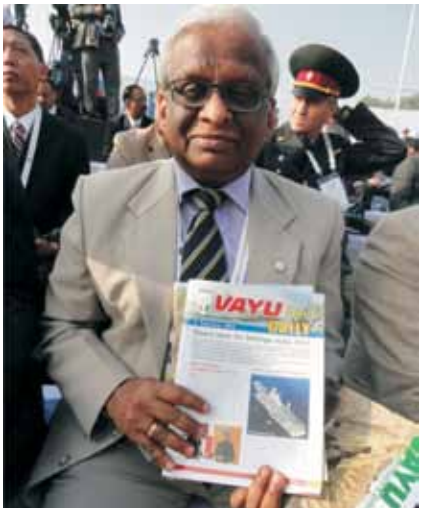
Israeli Defence Industry at Defexpo 2014

Senior executives from Israel at their pavilion

- **Accubeat Ltd.** – specialising in highly accurate tailor-made Rubidium and OCXO technology based frequency and timing solutions for the aerospace, defence and communications industries.
- **Beth El Industries** - a manufacturer and designer of CBRN Air Filtration Systems for vehicles, mobile shelters, ships, tents, and bomb shelters.
- **Camero-Tech** - a pioneer of radar-based Through Wall systems.
- **CONTROP** - specialising in the development and production of electro-optical and precision motion control systems, having unveiled new solutions for unmanned vehicles and border control.
- **DSIT Solutions Ltd** – specialising in sonar and acoustic solutions for the naval, HLS and commercial markets.
- **ESC-BAZ** - developing cost-effective Video Surveillance and Observation systems, and defence and security communication technologies for military, police, and law enforcement organizations.
- **IAI** - a globally recognised leader in development and production of commercial and military aerospace and defence systems. IAI showcased their solutions, in air, space, sea, land and the cyber realm.
- **IWI** – Israel Weapon Industries presented their family of assault rifles, sniper rifles and the legendary UZI SMG for military and security forces.

High-tech aspects of defence systems from Israel were displayed in model form.

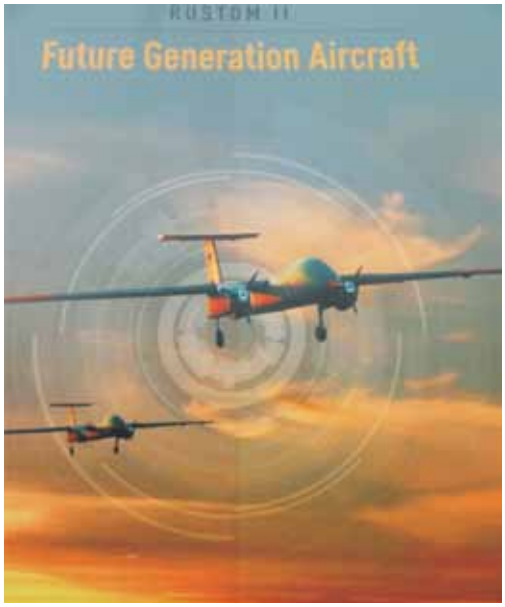
- **Meprolight** - presented its portfolio of thermal, night vision and electro-optical solutions.
- **Opgal Optronic Industries** - a provider of infrared imaging solutions, advanced vision and surveillance.
- **Persys Medical** – specialising in lifesaving and emergency medical devices for military, law enforcement, disaster preparedness and SAR.
- **Peryphon Development Ltd** - designing military and defence communication solutions for naval, aerial and ground forces.
- **Plasan** - supplier of innovative solutions presented their unique armour kit and a wide range of customised, passive survivability solutions for tactical wheeled vehicles, aircraft, naval platforms, civilian armored vehicles and personal protection.
- **Rafael Advanced Defense Systems Ltd.** - developing state-of-the-art armaments for the Israel Defence Forces (IDF) presented their range of EW, C4I and armour and precision-guided weapon systems.
- **SCD** – a leading developer and manufacturer of a full spectrum of cooled and uncooled infrared detectors and laser diodes.
- **Seraphim Optronics Ltd** - specialising in electro-optical systems for covert surveillance in defence, military, paramilitary and civilians markets.
- **TAR Ideal Concepts Ltd** - offering innovative solutions in the areas of critical infrastructure and border protection, urban management, cyber security, transportation, law enforcement, and natural disaster preparedness.
- **Techaya** - developing military rugged and "tailor-made" IP based communication solutions where extreme conditions and unique tactical requirements are met.



Dr K Tamilmani, Director General (Aeronautics) & Chief Executive (Airworthiness) with Vayu's Show Daily and the Special Issue.

Yoash Rubin, Director-India, Israel Aerospace Industries with model of the Heron UAS at the Israeli pavilion in Hall 11.

UAVs–the thrust area

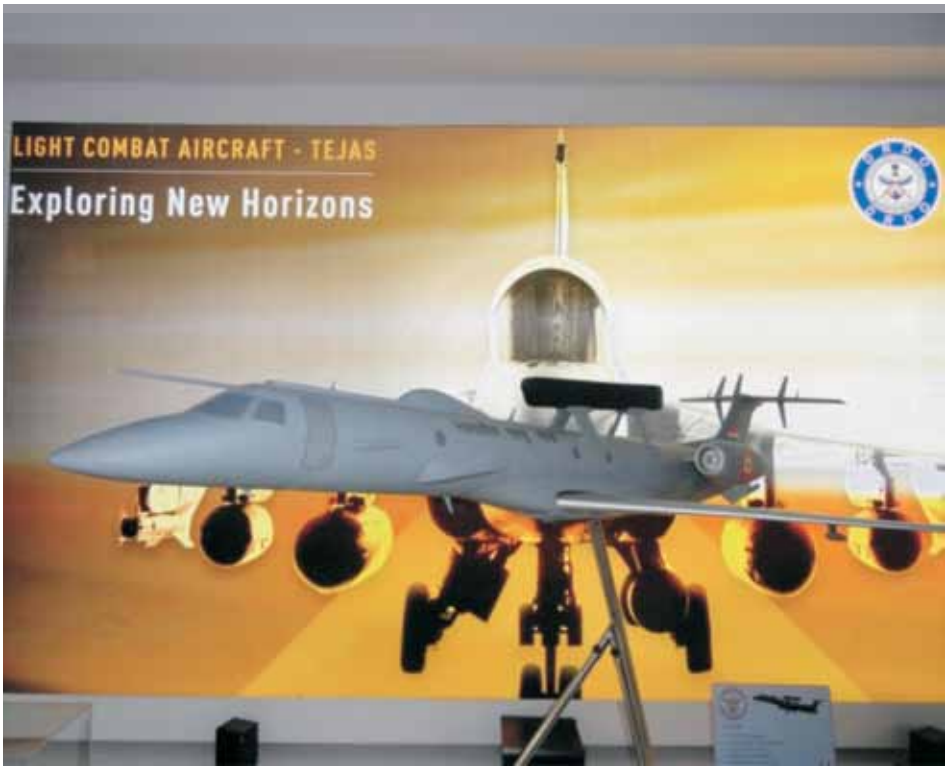


The future is nigh !

Defence Minister AK Antony with his SA Avinash Chander, and Dr K Tamilmani.

In an exclusive interaction with *Vayu* some days before the Defexpo, Scientific Adviser to RM Avinash Chander had stressed that UAVs are the thrust area for DRDO and amongst the various programmes underway, the most exciting one is the Rustom II. True to his projection that taxi trials were to commence at Kolar during Defexpo 2014, this was confirmed by Dr K Tamilmani, DG Aerospace at Pragati Maidan on 6 February. In fact, DRDO are projecting first flight of the Rustom II in June this year. *Vayu* was introduced to the Rustom II Programme Director, APVS Prasad and Mr P Srikumar Director of the Aeronautical Development Establishment, all exuding great confidence.

P Srikumar, Director ADE with APVS Prasad, Programme Director Rustom II



At the DRDO stand : model of AEW&C aircraft with head–on image of Tejas LCA in the background.

In fact, one of the two Rustom IIs built to date was at Pragati Maidan and this took pride of place at the open air DRDO exhibit site, with the twin Rotax-engines running. Defence Minister AK Antony was visibly pleased !

Boeing in India

Mission console of P-8 Poseidon

Pratyush Kumar and Ashmita Sethi of Boeing at their stand

In an interaction with *Vayu* at Boeing's stand in Hall 14, Pratyush Kumar, President Boeing India re-emphasised Boeing's commitments to meet Indian requirements and to play a significant role in the growth of India's "aerospace ecosystem." So as to capitalise on Indian competencies, a progressive partnership is fast developing between Boeing and Indian entities that encompasses manufacturing, infrastructure, engineering services, research and technology, training and skills development, supply chain activity and social initiatives. These collaborations include public sector companies like Hindustan Aeronautics Limited (HAL), Bharat Electronics Limited (BEL), as well as major private sector companies such as the Tata Group, Larsen & Toubro, Dynamatic Technologies, Wipro, Infosys, HCL Technologies, and Infotech Enterprises. Boeing has also undertaken to build aerospace infrastructure like Air India's MRO in Nagpur.

Meanwhile, the Indian Navy's Long Range Maritime Patrol / ASW capabilities are being considerably augmented with the induction of Boeing P-8Is with INAS 312 at Arakkonam while the Indian Air Force is building up strategic heavy lift prowess with the C-17 Globemaster IIIs with No.81 Squadron at Hindan. Additional aircraft are to be procured subject, of course to CCS clearance and appropriate funding. Awaiting formal contracts are more aircraft from Boeing : AH-64D Apache Block III attack helicopters and CH-47F Chinook heavy lift helicopters.

SAAB's range of new generation missiles

On display at Defexpo 2014, Saab presented its BAMSE missile on offer to meet the Indian Army's Short Range Surface to Air Missile (SRSAM) requirement. Saab and Ashok Leyland are teaming to meeting this with a solution that combines its BAMSE missile system with Ashok Leyland high-mobility vehicles.

The RBS 23, designated BAMSE, is a Swedish medium range, all-weather capable air defense system designed for protection of military facilities, ground forces and high value infrastructures. It is intended to operate against very small and fast targets such as attack missiles, anti-radiation missiles, UAVs and cruise missiles, and can also engage high altitude flying targets. The BAMSE system has formidable built-in ECCM capabilities both in the GIRAFFE AMB surveillance radar and the unique monopulse Fire Control Radar (FCR) Automatic Command to Line Of Sight (ACLOS) missile guidance function.

All sub-units within the BAMSE SRSAM are to be integrated with the Ashok Leyland Super Stallion 8x8, a high-mobility vehicle capable of operating in all types of terrain under all weather conditions. As Saab's Head of Market Area India Lars-Olof Lindgren expressed "the tie-up brings together two great engineering companies with front-end technologies that together could serve the Indian Army well".

The Saab RBS 70 NG was arguably the most 'popular' weapon system on display and Indian Army officers, ranging from generals to subalterns took their turn to 'engage' aerial targets. The RBS 70 is a Short-range Air Defence (SHORAD) laser guided missile system, in which the operator receives instructions on the position of the target from a local SLT (combat-control terminal) which is about the size of a laptop. The SLT in turn

Silouhettes of various naval craft, with their nemesis, the RBS-15

The Real Thing! RBS70NG VSHORAD in the field.

Indian Army officer tries out the RBS 70 NG

receives information through an encoded radio broadcast made by either a radar station or some other information gathering source. "If the missile is guided to within 30 meters of the target a kill is 95% assured".

The other weapon system displayed was Saab's RBS-15 (Robotsystem 15) which long-range fire-and-forget surface-to-surface and air-to-surface, anti-ship missile attracted much naval attention. The subsonic cruise type missile can be launched from a ship's deck as also land vehicles, has a range of more than 200 km. The GPS-supported high precision navigation system enables the missile to be used in naval land attack missions engaging stationary targets on land such as buildings, depots, hangars, air defence sites and others.

BAMSE on launch

RBS15 Mk.3 surface-to surface missile on launch from ship.

At Defexpo 2014, the *Vayu* team had detailed briefings on various artillery systems that were exhibited. From the French Nexter *Caesar* and *Trajan* systems to Kalyani Group's *Bharat-52* howitzers to the 'imminent' BAE Systems M777, there was much to inspect and speculate on the Indian Army's long pending 155mm howitzer requirement. A detailed analysis will follow in Vayu's forthcoming issue.

The BAMSE system has already been integrated with an Ashok Leyland Super Stallion, seen undergoing trials in this image (photo: Saab)

Ashok Leyland and Saab team up

In their endeavor to provide the Indian Army the best technological solutions, Ashok Leyland and SAAB have signed a partnership agreement to deliver High Mobility Vehicles for SAAB's BAMSE Short Range Surface to Air Missile (SRSAM) system. All sub-units within the BAMSE SRSAM will be integrated with the Super Stallion.

Ashok Leyland has also provided a mount for Nexter Systems' howitzer – the Caesar–to provide a Mounted Gun System to the Indian Army. The Caesar, a 155 mm / 52-calibre gun-howitzer, has been integrated onto the Super Stallion.

Saab and Kalyani Group into Partnership

RBS 70 NG & GBAD

Saab and the Kalyani Group have entered into a strategic alliance to partner and address key Indian Army air defence projects, including the VSHORAD and SRSAM requirements. The agreement was signed by Saab's CEO and President Håkan Buskhe with Baba Kalyani, Chairman of the Kalyani Group during Defexpo. The agreement will initially focus on the VSHORAD and SRSAM programmes for India. Saab is offering a system based on the RBS 70 NG missile system for VSHORAD, delivering a highly accurate, man-portable system with 24/7 all-target capability that is immune to countermeasures. For the SRSAM requirement Saab is offering a combination of its Giraffe AMB 3-D radar and the BAMSE advanced ground based air defence missile system.

BAMSE-SRSAM

Dauntless at Defexpo 2014

Personalities at the Show

General J Jayasuriya, Chief of Defence Staff Sri Lanka at the inauguration

Defence delegations included many from the Middle East

Inderjit Sial, President & Managing Director of Textron India

Clemens Linden, Managing Director of Eurojet Turbo, Germany

Air Vice Marshal Arvind Walia of Sikorsky India

Aloke Banerjee, Director (Marketing) of National Textile Corporation at Hall 18 which also had SympaTex-clad mannequins and other extreme climatic clothing on display.

Home Minister Sushil Kumar Shinde with Sanjay Bhandari of OIS-AT in Hall 12A

VAYU Interview with

Mr S K Sharma, Chairman & Managing Director, Bharat Electronics Limited (BEL)

VAYU : What are the products BEL showcased at Defexpo 2014?

SKS : A Defexpo 2014 BEL showcased its latest technologies through the Technology Module section and products in areas of C4I Systems, radars, communication equipment, electronic warfare systems and avionics, sonars, encryptors, simulators, electro-optics & fire control systems and EMP shelters.

BEL's stand at Central Hall–Lake showcased its R&D capabilities, displaying its latest range of products and systems, developed in-house. The main highlights of our display included :

Radar Systems including Bharani (Low Level Light Weight Radar), Weapon Locating Radar, Central Acquisition Radar, Battle Field Surveillance Radar-Extended Range and Ground Penetrating Radar, which have been developed in collaboration with DRDO labs.

Communication products like Software Defined Radio with different form factors, Radio Relay (Frequency Hopping Radio Relay & High Capacity Radio Relay), Point to Multi Point Radio, 100W HF Radio, Radio Trunking System, Data Link systems and Composite Communication Systems.

Key elements developed for use in various **Network Centric Systems** like computing elements in various forms, right from wrist-wearable computers, handheld computers, Tablet PC to rugged laptop and Military WiMAX System.

Network Centric Warfare solutions for the Indian Navy which include Combat Management System and Coastal Surveillance System, an all-weather 24x7 surveillance system developed for safeguarding the Nation's coastline by networking various sensors such as radars, day and night electro optical elements, automatic identification systems and meteorological equipment.

Electronic Warfare & Avionics products like Missile Approach Warning System, LRUs for Flight Control System and Radar Finger Printing System.

With several major defence purchases in the pipeline, we expect global OEMs and their vendors to identify Indian partners and expect this exhibition will provide a meeting ground for such business partners. Apart from this, it also provided BEL, the premier defence electronics company of the country, a platform to showcase its capabilities to the world as well as to the Indian Armed Forces. Similarly, it also provided BEL an opportunity to meet and assess several companies from all over the world, in its domain of business.

VAYU: Please inform us about some of BEL's successful orders and supplies in the last two years.

SKS: The major orders received are for Mobile Cellular Communication System (MCCS), SRE Radar AMC, Naval Radars and Sonar Export, Hull Mounted Sonar, Passive Night Vision Devices, Composite Communication System & Naval ESM Systems, Missile Warning System, Electronic Voting Machines and Combat Management System.

BEL has executed various projects in the last two years for Armed forces and non-Defence customers, which include MCCS, Mobile Ground Based Electronic Intelligence System, Passive Night Vision Devices, Battlefield Surveillance Radar–MR, Central Acquisition Radar, Fire Control Systems, Coastal Surveillance System, Akash Missile Systems for the Indian Air Force & Army, Missile Warning Systems and Biometrics for National Population Register.

VAYU : Could you elaborate upon some of your major programmes such as the Akash Weapon System, Radar and Fire Control Systems?

SKS : The Akash Weapon System is for air defence of Vulnerable Areas/Vulnerable Points against airborne threats penetrating from low, medium and high altitude. Air threats are from aircraft, helicopters, UAVs, remotely piloted vehicles (RPV) and cruise missiles.

As for radars, we have on order a wide range of 3D radars in mobile, static, ship-borne and light weight transportable configuration which are deployed for surveillance and air defence on land, sea and coastal zones. We also manufacture multifunction phased array radars as the major component of weapon systems for surveillance, tracking, missile guidance and fire control applications.

BEL's 3-D Central Acquisition Radar

There are various kinds of gun fire control systems comprising X band radar, laser range finders, thermal imagers, CCD sensors, servo systems and weapon control units for firing of medium and long range guns are being manufactured by BEL.

VAYU : Kindly give our readers an overview of BEL's tie-ups with foreign OEMs for products and technologies.

SKS : BEL is working in many strategic areas like next generation electronic warfare suites, air defence systems, elements for tactical communication systems, passive night vision devices and multi-sensor stabilisation systems. Many strategic alliances are made for addressing the emerging opportunities. These include stabilization system for electro optic payloads, electronic warfare suites, ELINT/COMINT ESM systems, aerostat surveillance and communications, mini/ micro unmanned aerial vehicles (UAVs), CDMA infrastructure, next generation night vision devices and various surface to air missile (SAM) systems.

VAYU : What have been BEL's successful export orders and supplies in the last two years ? How much of your turnover for 2012-13 and till December 2013, in the current fiscal, come from exports ?

SKS : During the last two years BEL has acquired export orders worth about US$110 million. The major orders are for naval radars and sonars, doppler weather radar, automatic identification system, radar finger printing system and contract manufacturing from various customers.

During 2012-13, the export turnover was US$ 32.78 Million and in the current FY, exports of US$ 15.53 million have been made.

VAYU : What new products does BEL intend to introduce in 2014-15 and beyond for the Indian armed forces and export customers ?

SKS : BEL is planning to introduce various new products / systems for the Indian Armed forces during 2014-15 which include weapon locating radar, L-70 gun upgrade, compact multi-purpose advanced stabilisation system for helicopters, L-band static tropo system, naval electronic warfare systems and SMART Encryption devices.

VAYU : What is BEL's strategy for offset programmes, based on Indian armed forces contracts in the next few years ?

SKS : We intend to deploy many initiatives for generating offset business, some of which are:

- Accelerating the absorption of new technologies through transfer of technology/joint ventures.
- Upgradation of facilities and infrastructure in line with global requirements.
- Tie up with foreign OEMs and vendors to manufacture their products on "Built to print" & "Built to Spec" basis.
- Frequent interaction with customers and OEMs to identify the possible opportunities.
- Upgrade/customise existing proven products to suit offset programme requirements.
- Open up for initial low volume business Association which can be increased to long-term relationship.
- Strengthening of the supply chain management team.
- Accreditation with latest aerospace standards and military standards which meets the global requirement (AS 9100C).

VAYU : Could you give an update on R&D initiatives at BEL?

SKS : Recent new initiatives undertaken by BEL in the areas of R&D and technology development (BEL spent 8.48% of its turnover on R&D during 2012-13) are :

- R&D Divisions across all the SBUs and Units of BEL, supported by the Central-D&E and two Central Research Laboratories located at Bangalore and Ghaziabad, have continued to contribute significantly to the generation of new business through the development of state-of-the-art products with cutting edge technologies.
- R&D Divisions of BEL continued to actively interact with the National Labs, namely, DRDO, ISRO, CSIR, C-DAC, C-DOT and leading academic institutions like IITs, NITs and IISc for the development of specialized indigenous technologies.
- Investment for a Centralised Product Development and Innovation Centre has been approved by the Board and plans are under formulation.
- A Core Group has been formed to address Homeland Security Business.
- R&D Committees have been formed in core business areas to chart out technology roadmaps & action plans for acquiring technology.
- Knowledge Management Portal created as part of ERP system has been implemented across the company to provide common platform for all R&D engineers.
- Around 60 technical papers were published by scientists and R&D engineers of BEL in various national and international journals / seminars / conferences.
- BEL filed for 12 patents during 2012-13 in the areas of image processing, Data Analytics, Target Recognition & tracking. ASICs, Avionics, Radar Signal processing , Optical sights, UHF Frequency generation, Rugged Laptop Motherboard and Laser resonators.
- R&D Engineers are motivated by suitably rewarding the individuals/ teams for excellence in in-house R&D efforts, technology development and innovative ideas.

Software Defined Radio

Spyder SAM system, showing both Python and Derby missiles in their launch canisters

India : "a strategic market for Rafael"

Rafael were at Defexpo 2014 after implementing a major restructuring process, in which the company transformed its product-focused organisational structure into a leaner, customer-oriented structure. Oron Oriol, the company's Executive Vice President Marketing told *Vayu* "the new formation enables Rafael to better align its offering to meet customer requirements, particularly with complex modern 'systems of systems'. It also garners closer focus our activities to best address customer requirements".

The new formation eliminated the old structure to create three new divisions, along with the establishment of cross-corporate support groups. These three include the Air Operations and Intelligence Division, Air Superiority Division and Land Systems Division. Several cross-organisational groups were also created, providing common engineering, manufacturing, and testing supporting the three divisions activities.


Oron Oriol, EVP marketing

"Missiles have always been the core of Rafael's activity, and at Defexpo we are highlighting a number of the missiles currently offered to India, along with other systems that are supporting those capabilities, from sensors and target acquisition systems to intelligence gathering, command, control and communications to cyber warfare systems and homeland defence."

After over a decade of continuous activity in the country, Rafael's sales in India span many programmes, with Oriol stating, "India is one of our most important international markets.It is a strategic market for Rafael."

Among the major programmes highlighted at Defexpo this year is the Spike family of missiles. "We offer our Spike MR anti-tank missile to the Indian Army and the extended range Spike ER missile to equip Army helicopters. We are focusing on these two variants as these are the more mature requirements." Rafael also has a number of other variants of the Spike, which is one

of the most widely used modern anti-tank missiles. According to Oriol, "the Indian customer is very thorough in preparation and sourcing procedures, therefore, these other systems should not be proposed prematurely. I am confident that when requirements for longer-range precision attack weapons are laid out, the Spike NLOS that we are also displaying here at Defexpo will come to the limelight."

The Spike NLOS can be employed from helicopters, vehicles or naval vessels and has been operational with a number of international forces, including the Israel Defence Forces. It is similar to the rest of the Spike family of electro-optically guided weapons in its ability to collect intelligence, obtain target updates throughout its flight and provide last-second impact confirmation, but Spike NLOS adds the ability to strike targets at ranges up to 25 km, far beyond the 8 km range of the Spike ER.

Oriol highlights another Rafael forte - its end-to-end integration of sensors and effectors using electro-optical sensor technology. "Rafael provides a variety of imaging sensors, capable of collecting intelligence and acquiring targets at extremely high definition. We also possess different precision-guided weapons that can locate and strike targets by their image. The image thus becomes a new 'common language' that interfaces between the sensors and shooters in real-time." Oriol explained that this new language alleviates the need for external mediation techniques such as geo-location or laser designation, which require translation, and processing are vulnerable to human error or enemy countermeasures. As a result, this 'electro-optical language' facilitates rapid attack cycles, enabling the engagement of targets that appear only for few seconds or minutes at most.

Typical systems supporting this electro-optical 'sensor to shooter' cycle include the Reccelite reconnaissance pod, the Recce-U system for unmanned aerial vehicles, and Litening and Toplite targeting pods on the sensor side, with weapons such as the Spice stand-off glidebomb, and Spike family of guided missiles on the munitions side.

The Air Superiority Division established last year reflects a profound shift in missile applications. "Moving from the air-to-air focused operation that characterised our past activities at the missile division, the new division addresses the modern air-defence focused market," Oriol said. "This trend that is going on for quite some time has intensified in recent years, as air forces cutting back on their combat aircraft fleets refocus on land-based assets to safeguard their airspace."

An Iron Dome launcher deployed near Ashkelon in Israel (photo: IDF)

Rafael was among the first to address this trend with the Spyder air defence system, employing the same missiles developed for fighter aircraft butfrom ground-based batteries. Rafael has already sold the Spyder to the Indian Air Force for an air defence programme, and the system is now competing in two additional programmes: the QR-SAM and SR-SAM, where Rafael feels the Spyder would be a strong contender.

According to Oriol, part of the answer to new asymmetric threats, dominated by stand-off attack by unguided, ballistic and guided weapons, is the capability to establish credible air defence through a multi-layered system that would be able to take out all forms of attack, from aircraft launching stand-off guided munitions to salvos of long and medium range ballistic missiles. At Defexpo 2014 Rafael is showing parts of such a multi-layered solution, comprising the Spyder and Iron Dome SAM systems and an air defence integration network called MIC4AD that would combine multiple assets into a comprehensive defence system.

Tamir Eshel

In conversation with

Bezhalel 'Butzi' Machlis, President & CEO Elbit Systems

"Aiming High in India's Defence Market"

"India is an important market for each of our divisions." Elbit Systems President and CEO Bezhalel Butzi Machlis told *Vayu*, "We have established here a number of joint ventures, with public and private sector units." To thrive in this market you have to believe in it play for the long run Machlis explains in an exclusive interview for Defense-Update.com and Vayu Aerospace.

The government requirement to limit foreign ownership of JVs to 26 percent is also a tough one, but sofar Machlis said Elbit has managed to cope. " These JVs enable us to merge our technologies and systems, tailoring the right operational solution to meet the customer's requirements. I hope that we'll be able to increase our share in the future, if new policy is implemented. It will enable us to bring more technology and know how, and bring even more capabilities to these JVs. " Machlis said.

An example for such a successful cooperation is in the field of artillery - one of the most promising areas for Elbit Systems in India, and one where Elbit Systems is bringing a unique value to the table.

"We see artillery far beyond the barrel and projectile, since artillery is perfectly weaved into Elbit Systems' core competencies. On one hand, these systems blend clear operational requirements, accurate ballistics, and measurable data and orderly procedures that can be transformed into effective and streamlined mechanised and computerized processes", Machlis noted.

"What we can offer is to take this transformation to the next level – through networking and integration with modern command and control, yielding dramatic operational benefit. In fact, a modern artillery gun is a highly sophisticated robot, operated that will be operated by a reduced crew. You take a great cannon, and enhance it with robotic system that replaces a crew of seven hands that perform manual processes with three operators that control a much faster and efficient robotic machine. Everything here is linked to advanced computing, hydraulics and communications, all are fields Elbit Systems has excelled in."

Winning the towed artillery tender is important in its own merit but, it will also provide an advantage for future opportunities, as the Indian Army moves forward with additional tenders for self propelled howitzers and other systems.

"What are your current JVs here in India?" *Vayu* asks. "We already have a great cooperation with Bahrat Forge, with which we established a Joint Venture (JV) for the future production of our artillery systems for the Indian Army," Machlis answered.

ATMOS self-propelled gun from Elbit

Another area where Elbit has excelled through the years is fire control systems for T-72 tanks and BMP-2 armoured fighting vehicles. "We have supplied these systems for several generations of tanks, and implemented them here through our diversified network of partnerships with public and private sector units in India." Machlis confirmed.

He continued : "Another JV we have with HAL is well positioned to sustain the army, navy and air force with various avionic solutions, including the latest aviator helmets, integrated with optronic and night vision systems. In recent years this activity has also expanded into sophisticated training systems."

Electro-optics is also a growing area for Elbit Systems in India. "It reflects long standing cooperation between Elbit Systems, its local industry partners and customers, particularly among our military and paramilitary markets. Through these cooperations we have established a number of operations with strategic importance to us, in which we supplied a wide range of products, including ground surveillance, aerial reconnaissance for helicopters and aircraft, etc. In this field, I feel we have a great potential looking forward", Machlis added.

At Defexpo 2014 Elbit expanded on this activity, introducing its growing family of unmanned aerial systems (UAS), with emphasis on two of the proven Hermes family UAS - the Hermes 450 and Hermes 900. The latter is a highly versatile multi-mission platform, carrying multiple payloads including radars, EO, and various SIGINT payloads. As part of its multi-mission approach, the drone has been optimised for maritime surveillance and paramilitary / homeland security missions, equipped with advanced means for persistent wide-area surveillance.

New applications for Elbit Systems' C5I 'know how' is now implemented in the field of homeland defence and cyber warfare, which are becoming major growth areas for defense and other government agencies.

"In the communications field we have a sound basis here in India, since the days our subsidiary Tadiran made the first sales of communications equipment here. Together we have developed and inducted a wide range of communications systems supplied to the military through the partnerships we established with local industries. Today, we are introducing the future generation based on Software Defined Radios, (SDR), the next level that will be integrating future military systems at all levels. These technologies are positioning our company and JV partners to reach new heights in the future," Machlis concludes.

Tamir Eshel, Editor Defense-Update

VAYU Interview with

Dr. R.K. Tyagi, Chairman, HAL

On the eve of Defexpo 2014, HAL Chairman, Dr. R.K. Tyagi, spoke with Commander M.Nirmal of *Vayu Aerospace & Defence Review*

Excerpts of the interview:

Dhruv ALH in Uttarakhand, 2013

On HAL's roadmap : Other than the usual production jobs on which our teams are working and committed to, my aim is to orient the company work-culture, systems and procedures that will enable HAL becoming amongst the top 20 global aerospace and aviation industries in the world in five years from now. I want HAL to be in the league of *Maharatna* companies in India. In the next five years, HAL will productionise the current indigenously designed and development projects such as the IJT, LCA, LCH, LUH and HTT-40. Our aim is also to manufacture the 10-12 ton category helicopter for Navy in the next five years. We are making efforts towards co-development projects such as FGFA and MTA so that they progress towards certification.

Another two areas in which HAL is planning to increase its presence are in the area of UAVs and civil aviation in the coming years. We have plans to pursue the development/production of UAVs through Transfer of Technology (ToT), through collaboration with international partners and also through Indigenous development. In addition, HAL would like to play a major role in the Civil aviation sector including MRO.

On indigenisation and self reliance: HAL has always been proud to be in the forefront contributing to India's defence preparedness and has contributed significantly towards indigenisation and self reliance. HAL has been growing steadily over the years and it is company's endeavour to achieve self reliance in Design and Development and promote indigenisation in all related fields of aerospace. We have developed a robust supply chain and aerospace ecosystem across country by providing requisite hand holding to more than 2400 suppliers across the country.

During the last decades, HAL has indigenously developed 15 types of aircraft and helicopters. Around 1250 of these indigenous aircraft have been produced. The major aircraft and helicopters produced from indigenous design include the Marut, Ajeet, Kiran Mk.I, Kiran Mk.II, HT-2, HPT-32, LCA, IJT and the Advanced Light Helicopter (ALH). The ALH is a 5.5 ton class multi-role helicopter with modern design features. ALH production commenced in 2002 and more than 140 helicopters have been produced for various customers so far. A new variant of ALH suitable for high altitude operations by IAF and Army have been developed with a higher powered Shakti engine and several mission systems. The armed variant with air-to-air missiles, rockets and turret gun was delivered to Indian Army during Aero India 2013.

HAL has also built extensive infrastructure to manufacture engines, accessories and avionics. Additionally, overhaul of aircraft, helicopters, engines and accessories are also carried out indigenously. The company is also involved in indigenous aircraft mid-life upgrades of the Jaguar, MiG-27M, Dornier 228, Avro 748 and Cheetah helicopters.

On role of HAL in recent Uttarakhand relief work : HAL-produced helicopters, comprising the Dhruv, Cheetah and Chetak played a leading role in the biggest ever helicopter-based rescue operations undertaken by the Indian armed forces in flood and rain-hit areas of Uttarakhand in 2013. These helicopters were deployed over flood and landslide affected areas in Uttarakhand and performed effectively in deploying paratroopers, evacuating stranded people and in supply of food and medicines. The helicopters made hundreds of sorties in the high-risk zone battling against strong winds, poor visibility and with virtually no space for landing in the high mountainous terrain. HAL teams were positioned at Dehra Dun and Delhi to ensure logistic support for the rescue operations. The Dhruv ALH which can carry 14 passengers was the star performer. On many occasions, owing to incessant rain, pilots could use only the Dhruv as it was considered unsafe for other types of helicopters to land. Dhruv helicopters flew 630 hours during the operation and Cheetah/Chetak flew 520 hours. The indigenously-produced helicopters pressed into service by the Army and the Air Force in flood-hit areas have proved their mettle in carrying out rescue and relief operations in highly inaccessible areas. We are indeed proud of these helicopters.

On export potential of Dhruv: HAL is keenly following the leads to expand the footprints of the Dhruv helicopter in the global market. HAL so far has exported Dhruv helicopters to Ecuador, Nepal and Mauritius. In addition, one ALH is in operation in Maldives. Quite a few Latin American countries, including Chile, Brazil, Columbia etc have evinced keen interest in Dhruv helicopters.

The LCH performs at Aero India

HAL HJT-36 Sitara : delays to affect induction?

On R&D strategy: R&D is one of our prime focus areas. In last one year alone, HAL filed 225 patents and established Chairs at Indian Institutes of Technology at Kanpur, Roorkee and Chennai. Being a strategic defence organisation, the company intends to file more patents to protect its intellectual property developed with large investments. As an important strategic move we have brought 10 R&D Centres of the Company under the ambit of Committee of Institutional Network (COIN). HAL Board also has decided to create an R&D corpus fund by earmarking 1/10th of the annual profits of the Company for taking up advanced and applied research in aerospace domain.

On the IJT: The Intermediate Jet Trainer is at the advanced stage of flight testing. The only major task remaining for operationalising the IJT is to define the stall characteristics and to carry out the spin trials. Our designers and flight test crews are working hard to complete these by the middle of 2014.

On the MMRCA: HAL has created a dedicated full time MMRCA Project Group in May 2012 and it is operational since then. Action groups have been created at all HAL divisions taking part in the MMRCA programme. All groups are working in a coordinated manner to interact with OEMs. The plan for MMRCA is within the ambit of MoD at the moment, and the Contract related discussions are in progress. Dassault is interacting with various HAL divisions on work packages related to MMRCA. As part of the Technology transfer, Dassault is recommending the production capability required. By carrying out gap analysis, HAL would be planning upgradation of facilities as per norms.

HAL's Areas of Focus: HAL will be diversifying into Civil Aviation in the coming year as the Government has mandated the company to lead Civil Aircraft Development in the country. Further in line with HAL's diversification strategy, plans for Special Purpose Vehicle (SPV) for Civil Aircraft, MRO, starting Airport Operations at Nasik and Bangalore, Civil Helicopters and UAVs have been developed and these plans will be taken forward. We believe that these will be very important revenue streams in times to come and hence we have dedicated the year 2014 as the year of ICQ (Integrity, Customer Focus & Quality). HAL aims to achieve business excellence while pursuing its mandate of nation building. It has plans to add capacity to handle the future programmes like Medium Multi-Role Combat Aircraft (MMRCA), Fifth Generation Fighter Aircraft (FGFA), Multi-role Transport Aircraft (MTA), Light Combat Helicopter (LCH) and Light Utility Helicopter (LUH), civil aviation aircraft and Naval Multi Role Helicopter (NMRH). The LUH has gone past the design phase with successful realisation of the Ground Test Vehicle, MTA has entered the conceptual design phase and the FGFA will be entering the detail design stage, all encouraging signs for the future of aerospace in India.

On modernisation plans at HAL: HAL has embarked on modernisation and expansion plan for its ongoing and new projects. For example we are planning to slightly over Rs. 1500 crores on production lines of the Tejas LCA. Overall, new production units are planned with enhanced rate of production, reduced production cycle-times by incorporating several advanced defence aerospace technologies. We have drawn up very ambitious plans to revamp our capabilities and capacity. Key technologies like stealth, advanced sensors, highly integrated avionics suite, enhanced situational awareness, internal carriage of weapons, operation data link application etc will be developed with the new co-development/co-production projects. The plan also includes bringing in critical and modern technologies in the areas of design, manufacture, maintenance and training by collaborating with leading technology suppliers across the globe through Joint Ventures.

The Dhruv ALH remains HAL's 'flagship' programme

VAYU Interview with Nik Khanna,

Director & Senior Executive India, Raytheon Company

VAYU : What products is Raytheon showcasing at Defexpo 2014?

NK : While we have decades of relationships to build upon, Raytheon believes that even greater collaboration with our many customers in India and around the Asia-Pacific region remains of paramount importance. By continuing to work closely together we can more effectively develop and deliver advanced technology solutions that address the security challenges India and our other customers face.

As we look forward, Raytheon is committed to enhancing its technology collaboration in India to share in the development and delivery of the latest technologies, systems and industrial base. And, Raytheon is dedicated to helping strengthen India's economy and local industries as well as its defense and technology capabilities.

Which leads us towards this year's Defexpo where we will be highlighting a number of capabilities and technology solutions including; precision warfare, advanced air traffic management solutions, sonar and seapower demos as well as a show casing a full complement of key weapon systems including Javelin, Stinger, Talon and Excalibur.

VAYU: What is the latest status on the GAGAN air traffic management programme here in India?

NK : We are thrilled that the advanced GPS-Aided Geosynchronous Augmented Navigation (GAGAN) System, is now certified and ready to enter service which will help increase efficiency and capacity in India's air space. GAGAN will provide satellite-based navigation for civil aviation over Indian airspace and adjoining areas in South and East Asia, and continues to be a successes story for both Raytheon and the Indian government.

This programme has been a true partnership with Raytheon building the ground stations for the GAGAN System, and the Indian Space Research Organization (ISRO) and Airports Authority of India (AAI) providing the space segment, additional ground equipment, as well as participating in the integration and operating the system. Doing business in India continues to be important to Raytheon and as we move into the future we look forward to celebrating additional successes and partnerships.

Nik Khanna, Director & Senior Executive India, Raytheon Company at Defexpo 2014.

VAYU: What are the highlights for Raytheon at this year's show?

NK: We continue to focus on helping India meet its emerging and evolving defence modernisation needs - with a strong focus on Integrated Air and Missile Defence, Land Combat Systems, Naval Warfare Systems and Undersea Capabilities, and Air Warfare Systems. All this closely aligns with the government of India's priorities. This cannot be done alone. Raytheon's way forward is predicated on the belief that in order to fully understand and serve our customers in India, it is important we do so with long term partners, integrated across our enterprise.

From a national security standpoint, a great example is our capability in protecting coastlines, shores and borders around the world. We have demonstrated our integrated strategic infrastructure protection solution to state-owned companies, the private sector and the government of India. Raytheon provides a number of tailored solutions that can and do protect military installations and high value units (like aircraft carriers), nuclear energy facilities, natural resources and government capital regions.

All countries have assets upon which their economies and population depend. Many of these strategic infrastructure assets are vulnerable to damaging attacks, from simple theft to coordinated terrorist attacks to nation state engagements.

We are also highlighting our successful Excalibur programme along with several others. Raytheon welcomes the Indian Army's interest in the Excalibur weapon system. We encourage them to discuss this option with the US Government, since the projectile is sold on a Foreign Military Sales basis.

With nearly 700 projectiles fired in theatre to date, Excalibur is the revolutionary precision projectile for the US Army and Marines, and would be a great fit for Indian Army artillery. Excalibur is a 155mm precision-guided, extended-range projectile that uses GPS guidance to provide accurate, first-round effects capability in any environment. By using Excalibur's level of precision, there is a major reduction in the time, cost and logistical burden associated with using other artillery munitions. Analyses have shown it can take 10 to 50 conventional munitions to accomplish what one Excalibur can.

VAYU: What type of maritime domain capabilities can Raytheon offer to India?

NK : Some may think of Raytheon as the 'radar' company or the 'missiles' company, but we are also a world leader in maritime and naval warfare solutions. Our seapower capability systems, part of Raytheon Integrated Defense Systems (IDS), boasts some of the finest capabilities in naval systems - from naval radars, integrated ship systems, combat management, undersea sensors, and torpedoes.

Raytheon has a very long history with undersea sensors and hull mounted sonars. Our MS3 sonar is totally scalable and is unique as it can be installed in ships of the size of the new 850 ton Indian Navy Coastal ASW ship. Our Airborne Low Frequency Sonar is a highly capable anti-submarine warfare solution, deployed from the MH-60R multimillion helicopter to detect enemy submarines. Highly integrated with the MK54 lightweight torpedo, we offer the full detect-to-engage ASW capability.

Our MK54 Lightweight Torpedo, co-developed by Raytheon and the US Navy, is the next generation anti-submarine warfare weapon deployed from a surface ship, helicopter or fixed wing aircraft to track, classify, and attack underwater targets.

The US Navy has successfully launched the first MK54 lightweight torpedo from the P-8A Poseidon aircraft. The torpedo adds a critical capability to these long-range anti-submarine warfare (ASW), anti-surface warfare (ASuW), intelligence, surveillance and reconnaissance (ISR) aircraft which will be capable of broad-area, maritime and littoral operations.

ShinMaywa at Defexpo

India's Defence Minister and the Ambassador of Japan at the ShinMaywa stand

Cmde Sujeet Samaddar, Director and CEO, ShinMawya Industries India with model of US-2i.

ShinMaywa showcased the US-2i amphibian at its stand at Defexpo 2014, aiming to increase awareness about the aircraft and its numerous roles and missions : its varied operational envelope makes the aircraft a force multiplier and game changer in the Indian Ocean Region (IOR). Uniquely, the US-2i is the only aircraft that operates in sea state 5 conditions as well as on rivers and lakes, carries a sizeable payload of personnel (30 personnel) and stores (3 tonnes of load) and has the longest endurance with the shortest take-off and landing distance in its class (only 300m). The aircraft is presently the only amphibious aircraft fitted with the state of the art 'Boundary Layer Control System' for lift augmentation, which allows the aircraft to operate at very low speeds and consequently reduces the take-off / landing run of the aircraft and allows for safe afloat operations during rough sea conditions. "This aircraft is an ideal platform to carry out long range logistics support roles for the Indian Navy, island support operations, casualty evacuation, humanitarian assistance and disaster relief, long range SAR and EEZ surveillance for the Indian Coast Guard and the Navy." Significantly, based on the recommendations of the Summit Meeting held in Tokyo on 29 May 2013 between the Prime Ministers of Japan and India, a Joint Working Group (JWG) has been instituted. The JWG has already commenced discussions to explore modality for the cooperation on the US-2 amphibian aircraft.

ShinMaywa attracted much attention from officials and general public during Defexpo. Apart from senior officials of the three Services and the Coast Guard, many important dignitaries including the Indian Defence Minister AK Antony, the Japanese Ambassador to India, Chief of the Naval Staff of Sri Lanka, Chief of the Army Staff of Maldives, Secretary (Defence Production), Deputy NSA, VCAS, VCNS, DCNS, DGCG CISC, Chief of Material (Indian Navy), C-in-C (Strategic Forces Command), PCDA and Joint Secretary of DIPP (Member JWG). In addition, important visitors from Embassy of Japan, JCCII, JETRO and JICA were also at the show.

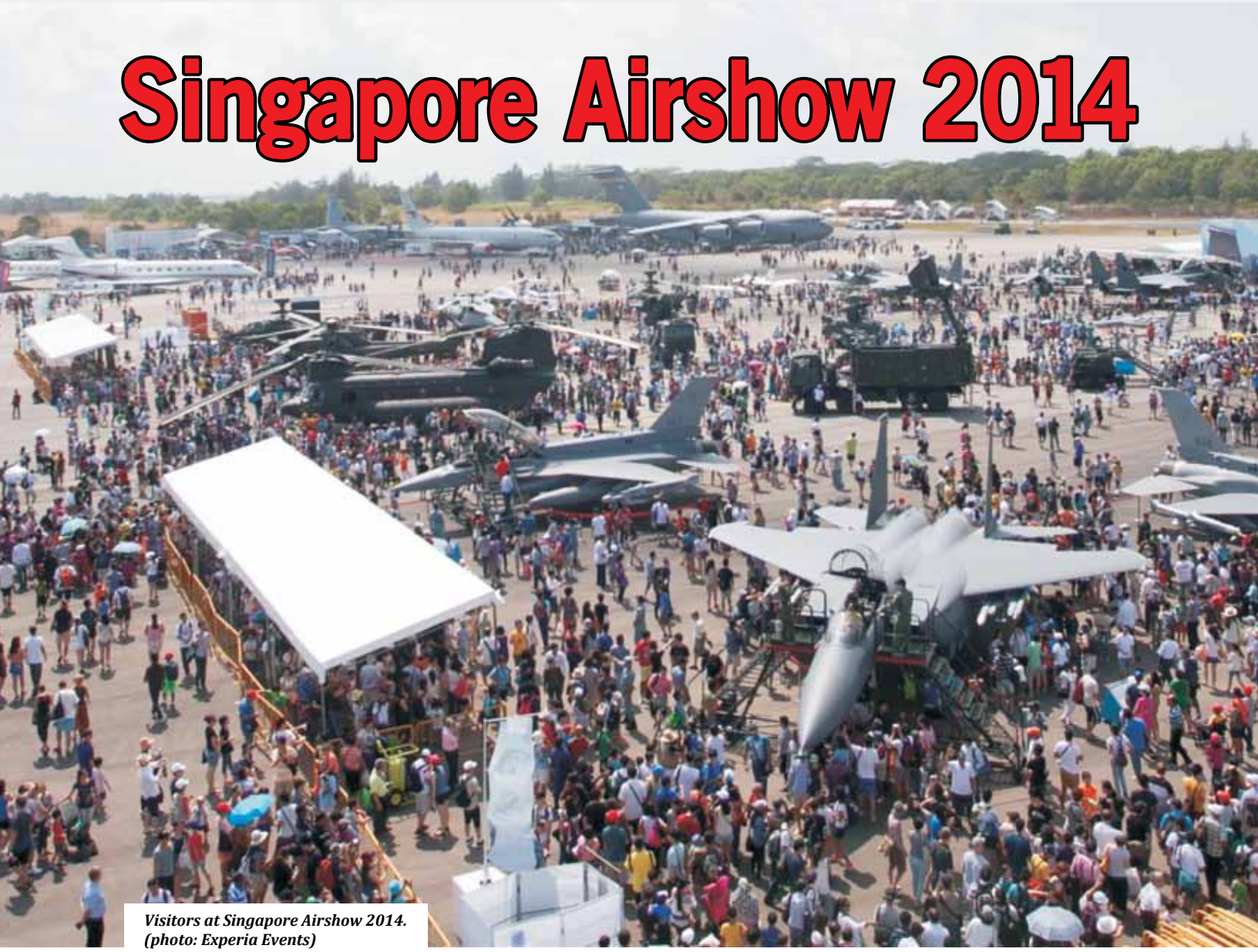
Tata Motors reveal new frontline combat vehicles

Tata Motors revealed two new combat vehicles at Defexpo 2014. The Kestrel is a wheeled armoured amphibious platform, designed and developed indigenously with DRDO, for "optimised survivability, all-terrain performance and increased lethality." The driver in combat mode has visibility through 3 periscopes and a display catching vision through front and rear view cameras, with day and night vision. The back to back seating layout allows firing through 3 gun ports on each side, with 12 troops accomodated.

The LAMV is indigenously developed with technical inputs from Supacat of the UK, for reconnaissance mobility, protection and firepower. A light patrol vehicle, the LAMV combines an integrated blast and ballistic protection system, including a protected all composite detachable crew pod and V-shaped hull, providing all-round protection. Carrying a complement of six (two+four) and using the latest composite and ceramic armour systems, the crew pod is constructed as a separate module, sealed off from potential secondary projectiles. All seats are mine-blast protected.

Tata Motors showcased their wheeled armoured vehicles, including the Kestrel, optimised for all-terrain performance and increased lethality.

Singapore Airshow 2014



Visitors at Singapore Airshow 2014. (photo: Experia Events)

Deals worth US$32 billion announced!

Singapore Airshow 2014 wrapped up trade segment of the six-day event with deals announced worth US$32 billion, surpassing the value of deals announced in 2012. Major announcements included contracts for Airbus, Embraer, Boeing, CFM, ATR and Rolls-Royce.

The show played host to over 1,000 exhibitors from 47 countries and 279 delegations from 72 countries. In all, over 40,000 trade visitors from 125 countries visited the show during the first three trade days, compared to some 38,000 in 2012. Of these, 33% were from overseas. 72% of exhibitors from this year's Airshow have already reaffirmed their plans to exhibit at the next Airshow in 2016, "underscoring the relevance of Singapore Airshow as an

IAI reveals its Super Heron - Heavy Fuel UAS

Mr. Weiss, IAI's President and CEO, near the new "Super Heron", at the Singapore Airshow.

Israel Aerospace Industries' (IAI) revealed its new Super Heron heavy fuel Unmanned Aerial System (UAS) during a special ceremony held at the IAI chalet at the Singapore Air Show. Mr. Joseph Weiss, IAI's president and CEO said: "We are proud to introduce the new generation of IAI's leading UAS. Based on IAI's Heron UAS, the Super Heron introduces the latest technology and re-defines Medium-Altitude Long-Endurance (MALE) UAS."

The fabulous Changi Airport stand at the show.

high level U.S. officials had numerous productive bilateral meetings with our counterparts throughout the region. Last but not least, U.S. military and commercial aircraft provided for the show, including the V-22 Osprey, C-17, P-8, Boeing 787, Gulfstream 650 and many others received enormous interest from Airshow visitors."

Sean Lee, Airbus spokesman in Asia said: "We were very pleased with this year's show. In addition to presenting the A350 XWB for the first time, we announced orders valued at almost US$ 15 billion, as well as the establishment of a new joint venture training centre with Singapore Airlines. We were also pleased with the quality of visitors to the show, which included senior airline management representatives from across the region. This year's event has demonstrated once again that Singapore remains the premier air show in this region, attracting an international visitor profile."

"We are delighted that the US$32 billion of deals announced at Singapore Airshow 2014 represents an increase in the value of deals from 2012. We have also recorded strong visitor figures from an even larger number of countries, underscoring Singapore Airshow's standing as the preferred platform for high-level government delegations and industry leaders to come together, network, address challenges facing the aerospace industry and do business, all in one convenient location," said Mr Jimmy Lau, Managing Director of Experia Events.

Singapore Airshow 2014 attracted close to 100,000 visitors over the public day weekend on 15 and 16 February.

essential platform to network and seize opportunities in key markets in the Asia-Pacific and beyond".

The US was the feature country at Singapore Airshow 2014, marking its largest presence at the show with 163 US companies, including 111 in the US Pavilion. US Ambassador to Singapore, Kirk Wagar, said: "The US was delighted to be Feature Country, the first-ever such designation, at the Singapore Airshow. We would like to thank the Government of Singapore and all of those involved in the Feature Country effort. The largest number of U.S. companies exhibited this year, 163, and they are reporting a very successful Airshow. A large delegation of


Spyder-SR system of the Singapore Armed Forces on the static display

ST Engineering displays group-wide engineering capabilities

The perpetually busy stand!

ST Engineering, one of Asia's leading defence and engineering group, showcased an extensive range of innovative products and solutions, including new concepts. As the largest exhibitor occupying over 2,000 sqm in the main exhibition hall, it presented its capabilities incorporating latest technologies in three clusters: Aviation, Combat and Environmental solutions. The exhibits were a concrete demonstration of the Group's response to the "needs and requirements of modern military and paramilitary forces". Apart from products that are already operational and fielded such as the Bronco and a range of 40mm ammunition, the new USTAR series of unmanned aerial vehicles and Singapore's first commercial Earth observation satellite, TeLEOS-1 also debuted at the show. The Group also showed off novel concepts such as the STK 5.56 Bullpup Multirole Combat Rifle, a new family of rifles with multi-role capabilities; and the BRACES (Bionic Regenerative Active Energy System) which converts the mechanical energy generated by the soldier from moving during missions, into electric energy to power soldier systems or other low power electronic devices.

Meanwhile, ST Aerospace and Alenia Aermacchi said that they would deliver the last of the 12 M-346 new generation advanced trainers to the RSAF in April 2014, following the contract that was signed in late 2010. Currently, a total of 10 aircraft have been delivered along with the delivery of the relevant ground based training system and the associated M-346 initial logistics support package. In February 2013, the RSAF commenced the pilot training in its Advanced Training School at the Cazaux Air Base in France, while in March 2013 the first training flight for a pilot trainee in the M-346 was successfully conducted. This event marked the beginning of the full spectrum 3rd Generation Integrated Pilot Training System for the RSAF and it was also an important milestone for the M-346 programme.

2014 off to a great start for CFM

2014 is off to a great start for CFM International with the company booking orders for 614 CFM56 and LEAP engines to date. Overall, CFM has received orders for 352 CFM56 engines (including spares) from several customers, including FlyDubai, Air Algerie, GECAS, who ordered 20 CFM56-7B-powered Boeing Next-Generation 737s, and VietJetAir, who announced that it had selected the CFM56-5B to power 21 Airbus A320ceo aircraft. Singapore-based Lion Air recently finalised an order for 60 A320ceo aircraft powered by CFM56-5B engines. The company has also logged orders for 262 LEAP engines and this includes Flydubai for 75 LEAP-1B-powered 737 MAX aircraft and GECAS for 20 LEAP-1B-powered Boeing 737 MAX aircraft. To date, CFM has received total orders for nearly 6,000 LEAP engines across all three models, while total CFM56 engine orders stand at more than 30,640 engines. "This is a great way to come off a record orders year," said Jean-Paul Ebanga, President and CEO of CFM International. "Having more than 700 engines already on the books - and it is only February - is just incredible. We take it as a true testament to the faith our customers have in our products and in our ability to execute on our promises".

Black Knights over the Island

Six F-16Cs of the RSAF aerobatics team (*Black Knights*) were greatly applauded during their daily performance at the Singapore Air Show 2014. The team's six F-16C Fighting Falcons are painted in flashes of red and white, the national colours of the Singapore, with the Black Knights insignia emblazoned on the vertical tail.

Formed in 1973 as the *Osprey Red*, the team was renamed *Black Knights* the following year. They started off on the majestic Hawker Hunter, much like the IAF's *Thunderbolts*, before progressing to the F-5E Tiger II and A-4SU Super Skyhawk until the year 2000, after which they took to flying the F-16C.

In addition to the 80,000 public day tickets that were completely sold out, the Airshow also welcomed guests for the Republic of Singapore Air Force's 45th anniversary celebrations at Singapore Airshow, exhibiting personnel, student groups and concession ticket holders over the two days. Visitors to the Airshow were treated to an impressive line-up of public day activities, including the highly-anticipated flying display, featuring the largest number of aerobatic teams in the history of Singapore Airshow. The line-up included awe-inspiring team aerobatics performances by the Republic of Singapore Air Force (RSAF) Black Knights, the Republic of Korea Air Force (ROKAF) Black Eagles and the Indonesian Air Force (TNI-AU) The Jupiters. There were also solo aerobatic performances by the US Air Force, the US Marine Corps and the Royal Australian Air Force (RAAF). The RSAF pavilion, part of the RSAF's efforts to celebrate its 45th anniversary with the public at Singapore Airshow 2014, was also a major highlight of the public days.

Boeing's AH-64D Apache

Mahindra Aerospace GA8 Airvan at the static display

Over the six-day show from 11-16 February, Singapore Airshow 2014 welcomed some 146,000 visitors in total. Visitorship over the four trade days from 11-14 February stood at almost 46,000 visitors from 129 countries/regions, with 31% coming from overseas. Singapore Airshow 2014 also played host to 279 delegations from 72 countries.

Airbus at Singapore Air Show

The Airbus group displayed a wide range of its products and technologies at the static display area, the highlight of which was a full display of Airbus' new A350 XWB aircraft. "The Singapore Air Show presents an excellent opportunity for the global aerospace and defence community to converge and address the needs of the industry in this pivotal region for our sector," said Tom Enders, CEO of Airbus Group. "As one of the top players in this highly competitive market, Airbus Group seeks to strengthen its partnerships with governments and commercial customers in Asia, and across the globe."

The show saw the first flight display of the all-new A350 XWB aircraft (MSN-3), while guests were able to discover Airbus' cabin comfort standards in a dedicated Comfort Tent at the Airbus static display. Also displayed was a full-scale model of the A350 XWB cockpit as well as an interactive A350 XWB interactive model. Airbus Defence and Space displayed the C295 tactical airlifter in a Maritime Patrol Configuration at the static display, while the A330MRTT and A400M aircraft, UAVs and Pleiades and TerraSAR-X satellites were put on show at the Airbus stall.

An EC130T2, an AS350B3e and an EC135T2e were on display as part of Airbus Helicopters exhibit, while models of the recently certified EC175, EC135 and EC275 were at the Airbus Stand. The Group also presented its Flight Path Optimisation technology that aims to optimise E-FAN energy consumption as well as its Smart Non-Destructive Testing (NDT) tools.

VietJetAir order 100-plus Airbus

On opening day of the Singapore Air Show 2014, Vietnam's VietJetAir placed a major order that includes 42 Airbus A320neos, 14 A320ceos and seven A321ceos, plus 30 options. VietJetAir will also lease eight A320-family aircraft from third-party lessors. In the photograph are (left) Fabrice Brégier, President and CEO of Airbus, with Nguyen Thi Phuong Thao, Vice Chairwoman and CEO of VietJetAir.

Amedeo firms up A380 Deal

Airbus scored its first major order for the A380 this year, after Amedeo firmed up a memorandum of understanding signed at last year's Paris Air Show. Amedeo, formerly a part of Doric Lease Corp., made a commitment for 20 aircraft bringing Airbus more than half-way to its target of reaching at least 30 additional orders for the aircraft in 2014. The deal was announced at the Singapore Airshow. Amedeo plans to take delivery of the aircraft from 2016 to 2020 at a pace of around five to six units per year. The company's CEO, Mark Lapidus, said no engine choice had been made yet, but will be announced in due course. The Amedeo order takes total commitments for the A380 to 324. It follows an order for 50 A380s placed by Emirates at the Dubai Airshow.

A350 XWB makes its Singapore debut

The A350 XWB flight test aircraft (MSN3) arrived at Singapore Changi Airport for the Singapore Airshow where it performed its first ever airshow flying display. On its way to Singapore, MSN3 passed the milestone of the first 1000 flight test hours for the A350 XWB programme since the first flight with MSN1 on 14 June 2013. Overall the five A350 flight test aircraft will fly 2,500 fight test hours in just over 12 months. Currently two A350 XWB flight test aircraft are flying, MSN1 and MSN3. Both aircraft are fitted with heavy test instrumentation and are successfully carrying out performance and systems evaluations in extreme environmental conditions and are starting Certification testing. MSN2 and MSN5 will be fitted with cabins, and will carry out the Early Long Flights and Route Proving Flights later this year. MSN4 will be fitted with light flight test instrumentation and will perform external noise and lightning tests, avionics development and certification testing. This aircraft will also be used to start the training for first customer pilots and maintenance teams.

ATR notches 48 orders

ATR announced that it had boosted its order book with 48 aircraft, including 28 firm orders. These contracts amounted to nearly $1.2 billion and comes on the back of a particularly successful year for ATR which saw the manufacturer sell 195 aircraft (89 firm orders and 106 options). These orders included a contract for 40 ATR 72- 600s (including 20 firm orders) from the UAE leasing company Dubai Aerospace Enterprise, and a contract with the Spanish company Binter Canarias for the confirmed purchase of six ATR 72-600s. The order placed by the UAE lesser DAE allows ATR to welcome a new client to its portfolio, while Binter Canarias has previously operated ATR aircraft for over two decades, since 1989. Binter Canarias currently operates 18 ATR aircraft. The announcement also saw the formalising of the purchaser of eight ATR 72-600 aircraft (including 6 firm orders) which had been undisclosed at the presentation of annual results for 2013 as Bangkok Airways.

AgustaWestland signs new contracts worth €130 million

AgustaWestland was awarded new contracts worth a total of about €130 million by different customers in North and Southeast Asia for the supply of 13 helicopters for both government and commercial roles. These contracts were announced during the Singapore Air Show 2014. In particular, Weststar Aviation Services of Malaysia signed a contract for ten AW139 helicopters for offshore missions, bringing the total number of AW139s that will be operated by this customer to 34. AgustaWestland also delivered two AW139 twin-engine helicopters to the Royal Thai Army. Ordered at the end of 2012, these aircraft will perform transport and utility missions across the nation. The contract, which also includes a comprehensive maintenance and training package, marks the entrance of the AW139 into Thailand's military helicopter market.

AW149 at the AgustaWestland stand

Russian Helicopters at Changi

Russian Helicopters displayed its military helicopters at the Singapore Airshow 2014 aerospace and defence exhibition during a conference for military helicopter operators entitled *Russian military helicopters and new technological developments: Ka-52 Alligator, Mi-35M and Mi-8/17,* held jointly with Rosoboronexport. "Russian Helicopters offers a wide range of military helicopters, which are praised world over for their reliability, effectiveness, and high combat resilience," Russian Helicopters CEO Alexander Mikheev said. "It was at Singapore Air Show 2014, that we held our first conference on military helicopters for international customers, and showed our partners the latest developments in this area." At the conference, operators had the chance to learn more about military helicopters in the Mi-8/17 series (Mi-17V-5 and Mi-171Sh) and the Mi-35M. Mi-8/17M helicopters are used extensively across the world by the armed forces of dozens of countries, and are operated in diverse climatic conditions.

Kamov Ka-52

Nepal's Shree Airlines expands Airbus Helicopters fleet

Airbus Helicopters formally presented the first of five AS350 B3e rotorcrafts to Shree Airlines at the Singapore Air Show, where the helicopter was on display at the Changi Exhibition Centre. Shree Airlines currently has one AS350 B3e in its inventory, and will use the expanded Airbus Helicopters fleet for services that include search and rescue, aerial work and disaster relief missions in Nepal. It also plans to expand passenger transport and utility mission operations into the neighbouring countries of Bangladesh, Bhutan and Myanmar in the future. When deliveries of all five new AS350 B3e rotorcraft are completed, Shree Airlines will be the largest operator of this model in Nepal.

Sikorsky begins flight tests on prototype CH-53K

Sikorsky Aircraft Corporation powered up the engines and spun the rotor head on the first prototype CH-53K heavy lift helicopter, designated the Ground Test Vehicle (GTV). The event continued the "Bare Head Light Off" phase of testing — so named because it was conducted without rotor blades — that began under auxiliary power in December 2013 with safety-of-flight test pilots at the aircraft's controls. Four additional test aircraft are being prepared for flight test, commencing in late 2014. During the three-year flight test program, Sikorsky will continue to evaluate the GTV for long-term endurance of the engines and dynamic components, survivability, and maintenance practices.

Helicopter types depicted at the Sikorsky stand

Bombardier's successful week

Bombardier concluded its participation with firm orders and commitments for up to 17 aircraft valued at up to $852 million. The Challenger 605 and Global 6000 aircraft on display attracted many visitors, highlighting the region's increasing appetite for "aircraft that meet the needs of a discerning business clientele". Guests were able to view Bombardier's Q400 NextGen turboprop airliner, which was on static display, as well as the full-scale passenger cabin and cockpit demonstrators of the company's CSeries aircraft. Bombardier also welcomed Dhaka-based US-Bangla Airlines Ltd. and Lilongwe-based Malawian Airlines to its family of Q400 aircraft operators, as well as lessor Falko Regional Aircraft Limited to the CRJ900 aircraft family, following Falko's addition of a CRJ900 regional jet to its portfolio.

V-22 debuts at the show

With foreign interest in the unique V-22 Osprey rapidly gathering pace, the US decided to show off the type's capabilities at Changi in Singapore. Two of the Bell-Boeing tiltrotors were deployed from their home base in Japan to take part in the show's flying and static display. The two Ospreys are from US Marine Corps squadron VMM-262, known as the 'Flying Tigers', one of the units that recently deployed in support of relief efforts after Typhoon *Haiyan* in the Philippines. Crews went into action within 24 hours of arriving in-country, flying hundreds of sorties to areas cut off by the storm.

Saab at Singapore Air Show

The Saab 340MSA at Changi

Saab exhibited its range of technologies across the aerospace domain, covering defence, surveillance, and air traffic management at the Singapore Airshow. The company showcased an array of products in the air domain ranging from the Skeldar to Air Traffic Management, RBS70 NG, the Giraffe Radar Systems, ESTL, - a unique countermeasure systems for fighters, the Saab 340 MSA, Barracuda signature management and 9Air Compact. Singapore's armed forces have over the years acquired from Saab a range of different systems and technology including radar systems, the RBS 70 and advanced underwater technology.

Vayu at India Aviation 2014

The magic of biryani and big jets at Hyderabad!

Welcome to Begumpet! The Emirates A380 is suitably greeted on arrival (photo: Angad Singh)

India Aviation, the five-day civil aviation show held over 12-16 March, took place at its now traditional site, Begumpet airport. The highlight, as widely reported was the deal signed between SpiceJet and Boeing for 42 Boeing 737 MAX aircraft: at $4.4 billion or Rs. 26,000 crore, the biggest ever signed at such an event in the country.

Inaugurating the *4th International Exhibition & Conference on Civil Aviation-India Aviation 2014*, Civil Aviation Minister Ajit Singh, said that "the rapidly expanding air transport network and opening of the airport infrastructure to private sector participation had fuelled the growth of air traffic in India." Currently the world's 9th largest aviation market, handling 121 million domestic and 41 million international passengers with more than 85 international airlines operating to India and 5 Indian carriers connecting over 40 countries, the Indian civil aviation industry

Civil Aviation Minister Ajit Singh, inaugurating the five-day India Aviation 2014 event at Hyderabad.

is poised to handle 336 million domestic and 85 million international passengers by 2020, making India the third largest aviation market. The commercial fleet size is expected to grow from the 400 today to 1000 aircraft by 2020.

Mr. Ajit Singh elaborated : "49% FDI by foreign airlines in Indian carriers has emerged as the biggest game changer, resulting in two new scheduled airlines, Air Asia and Tata–SIA in the process of starting their operations. A number of global players have entered Indian aerospace manufacturing, ground handling, training and capacity building, cargo and MRO industry. To address the forthcoming challenges the government has decided to set up a separate Civil Aviation University to produce world-class manpower in the aviation sector. Considering growth prospects of air traffic, potential for large-scale acquisition of aircraft by the airlines and substantial investment options Indian civil aviation market offers tremendous opportunities for foreign investors to invest in India. This show shall build on the results of previous shows with the goal of increasing international collaboration in the civil aviation."

Sidharth Birla, President FICCI, in bringing out the anomalies of a tough tax regime said, "state surcharges on aviation turbine fuel vary widely from 4% to 30% making cost of ATF in India 60% higher than international levels. Though the solutions are obvious, service tax on air tickets and discriminatory tax policies for India MRO players must be addressed." For enhancing regional connectivity and financial viability of airports in Tier-2 and Tier-3 cities, he called upon the authorities to look at an 'Essential Air Services Fund' as a support mechanism. He pointed out that significant opportunities existed for promoting aircraft and related manufacturing in the country, and that this could be encouraged through tax incentives to the aerospace industry and speedy time bound licensing procedures. He further called for the government to bring a bill to constitute an independent Civil Aviation Authority that will have autonomy in administering aviation safety and have oversight over air transport operators, airport operators and related issues.

The chief guest, Governor of Andhra Pradesh, ES Lakshmi Narasimhan, assured the gathering that "should you choose to tap into the aviation potential of Andhra Pradesh you would be our guest and partners in development". Talking about India's *First Aerospace Special Economic Zone* (SEZ) situated 15 km from *Rajiv Gandhi International Airport* at Hyderabad, he said that the SEZ offers a wide range of services to meet the needs of aerospace, nuclear space and defence sectors. He stated that "the civil aviation policy of AP focuses on the development of non-hub

Line up of aircraft on static display at Begumpet, flanked by the gargantuan Airbus A380 at one end and the luxurious Dassault Falcon 7X at the other.

Union Minister of Civil Aviation Ajit Singh being briefed by Palash Roy Chowdhury, Country Head - Pratt & Whitney (third from left) on the Geared Turbofan (GTF) engine technology at the India Aviation Show in Hyderabad. The GTF engine design makes the engine 'ultra-efficient', and reduces fuel burn by up to 16%, nitrogen oxide emissions by half and noise footprint by 75%. In India, IndiGo and GoAir's new A320neo aircraft and Air Costa's Embraer aircraft will be powered by Pratt & Whitney's Geared Turbofan engines. Shown in the image is a working scale model of the GTF engine. Also in the picture is Air Vice Marshal (retd.) Arvind Walia, Regional Executive, India & South Asia, Sikorsky (on extreme left).

The UTC stand at the show (photo: Angad Singh)

airports across the province by cashing on the huge infrastructure base built over the years, to make them new magnets of investment for development and to give a fillip to tourism."

Ashok Lavasa, Secretary Ministry of Civil Aviation, in his opening remarks said that "Civil aviation Industry in India is experiencing a new era of expansion driven by factors such as Low Cost Carriers (LCC), modern airports, FDI in domestic airlines, cutting edge information technology interventions, growing emphasis on regional connectivity, increasing involvement of private participation under PPP and the policy of developing green field airports. This surge has fuelled the demand for support services. In addition to the Greenfield airports at Navi Mumbai, Goa, Kannur and Kushinagar, the Airports Authority of India has identified six airports for private management under the PPP route following the successful implementation of such models in Delhi, Mumbai, Bangalore and Hyderabad and Cochin. "The India Aviation Show is an essential part of our vision for India's aviation industry and would provide significant business opportunities for the participants in the world's fastest growing aviation market. I am confident that this Show as a showcase of latest technologies, innovative ideas, best practices and partnership strategies would enable the participants to glean the opportunities in the aviation sector", he concluded.

Other highlights at the show included a display of aerobatics by *Mark Jefferies Air Shows* and *Display Aerobatics* of the UK. Some 18 aircraft, including business jets and motor gliders, were at the static display area which included an Emirates Airbus 380 and an Air India Boeing 787 Dreamliner. Approximately 250 exhibitors participated in the show, where *Vayu* were present, in Hall C, bringing out a Special Supplement to mark the event.

Forecasting a good future for Indian carriers

According to Airbus' latest market forecast, Indian carriers will require 1,290 new passenger aircraft valued at $190 billion between now and 2032 to satisfy surging annual demand. Indian annual passenger traffic growth rates of 8.6 per cent are well above the regional Asia Pacific average

growth rate of 6.1 per cent and the world average 4.7 per cent. Of the requirement for 1,290 new aircraft, some 73 per cent will be for growth and 27 per cent for replacement. The new passenger aircraft include 913 single aisles tyes such as the A320 and A320neo Family, 322 twin-aisles including the A350 XWB and A330, and 56 very large aircraft such as the A380. By 2032, the present fleet of 343 aircraft will have more than tripled to some 1,233 aircraft.

By 2032, Airbus forecasts that 36 per cent of India's fleet will be wide-bodies, more than doubling today's level. This is a result of increased capacity of international as well domestic routes with larger aircraft such as the A330 and A350s. In passenger traffic terms, domestic traffic in India will grow at the fastest rates, increasing at almost 10 per cent per year to 2032. "By 2032, the number Indian cities with more than a million passengers each month will have grown to thirteen from today's two. This exponential growth will continue to drive the need for larger aircraft like the A380 to operate in the country," observed Dr. Kiran Rao, Airbus EVP Strategy and Marketing. "As the people of India fly more and the number of first time flyers increases, demand for the latest generation of aircraft will also increase making India one of the largest and most dynamic markets in the world."

An Emirates Airbus A380 as well as models of its full civil aircraft product range were the focus of Airbus' presence at the fourth India Aviation 2014 air show in Hyderabad. The Emirates A380 was on static display for the first three days of the air show to demonstrate the readiness of Indian airports like Hyderabad International for A380 operations. Four major Indian international airports (New Delhi, Mumbai, Hyderabad and Bangalore) are now 'cleared' to commence A380 operations.

The Emirates A380 does a low level flypast over the event (photo: Angad Singh)

Boeing highlights Innovation

At India Aviation 2014, Boeing highlighted its family of commercial airplanes in both the single and twin-aisle market segments, accompanied by a strong display of its latest product technologies. "Boeing is delighted to support this air show. For the past seven decades, we have been a steadfast partner in the development of aviation in India and the air show offers another opportunity to demonstrate our commitment," said Pratyush Kumar, President, Boeing India. "In addition to serving our customers, we are sharpening our focus on building an entire ecosystem for aerospace - maintenance, repair, engineering, front line skill-building and component manufacturing." The Boeing exhibit at the biennial show featured models of the latest range of commercial airplanes including the 737-8 MAX, the new 777-9X, the 777-300ER (Extended Range) and the 787-8. There was an Air India 787-8 Dreamliner on static display.

Dr. Dinesh Keskar, Senior Vice President - Sales (Asia Pacific & India), Boeing Commercial Airplanes with Mr. Pratyush Kumar, President, Boeing India

UK pilots' flying manoeuvres on display

An Extra 330SC on the tarmac at Begumpet (photo: Angad Singh)

Two ace air display pilots put on breathtaking aerial aerobatic displays over Begumpet airport during India Aviation 2014. The UK-based pilots, Mark Jefferies and Tom Cassells, flew Extra 330 SC and Extra300L aerobatic aircraft during their daily demonstration, the first time they used synchronised smoke systems of the two aircraft.

Fenced in : Air India's Boeing 787-8 Dreamliner (photo: Angad Singh)

Dassault Aviation bullish on future of Indian Bizjet market

Dassault Aviation presented its Falcon fleet of large cabin, long range business jets at *India Aviation* and featured its 5,950 nm /11,000 km range Falcon 7X trijet, the first business jet certified with a fully-digital flight control system. Dassault is the Indian market leader for large cabin, long-range aircraft, with 22 aircraft currently in service and several more on order. The Falcon 2000 twinjet is also popular among Indian customers. Two newly introduced versions, the 3,350 nm/6,200 km 2000S and the 4,000 nm/7,000 km 2000LXS, will offer takeoff and landing performance unparalleled among wide body jets - comparable to much smaller midsize and super midsize models.

Dassault anticipates a warm reception in India for its brand new 5,200 nm / 9,630 km Falcon 5X and is expected to make its first flight in the first quarter of next year with certification planned at the end of 2016.

Global Aviation US, LLC to open India office

Global Aviation US, LLC., an Indiana-registered business aviation company specialising in aircraft transactions, ferry services, spares and aircraft evaluations, plan to open an office in India. "The Company already has an Independent Representative in India, but now we feel that there is a need for us to open an office. This will give us the right framework that would act as a platform to explore the Indian market in a much better way. This shall involve prioritisation of various aspects that play a crucial role in closing an aircraft transaction successfully especially for our Asia Pacific clients by giving them the comfort of local presence," said their President, Karan Sidhu. He also confirmed that his plans included strategic tie-ups with all major maintenance companies in India for their pre-buy and formal aircraft inspections. "It's a win-win situation for both. We need 100% confidence in the technical evaluation of the third party maintenance company and in return we plan to give them regular business and encourage them for future international expansions" stated Karan.

President of Global Aviation US, LLC, Karan Sidhu

Dassault's Falcon 7X trijet (photo: Angad Singh)

Bombardier's Mobility Solutions

Attesting the increasingly important role the Indian market holds within the greater Asia-Pacific region, and with demand for business and commercial aircraft

Interior of the Challenger 605 (photo: Angad Singh)

projected to continue to grow in the area, Bombardier Aerospace was at India Aviation 2014 showcasing its aircraft and after-market services solutions. Guests had the opportunity to experience first-hand the luxury of the wide body Challenger 605 business jet and to learn more about Bombardier's range of commercial aircraft.

Rolls-Royce's Trent technology

Rolls-Royce showcased its Trent engine and the underlying technology at India Aviation 2014 with a Trent 1000 scale model at its exhibition area. Kishore Jayaraman, President, Rolls-Royce India, said: "India Aviation offers a great platform for Rolls-Royce to showcase its technology for the growing civil aviation market in India. With passenger numbers forecast to triple in the near future, wide-body aircraft could be a key solution to increase efficiency in passenger load and air traffic and we are the

The Rolls-Royce stand at India Aviation (photo: Angad Singh)

engine provider of choice in that market." Capable of providing up to 78,000lb of thrust, the Trent 1000 engine is designed to power all members of the Boeing 787 Dreamliner family (787-8, 787-9 and 787-10 aircraft variants). The Trent family's three-shaft design makes every Trent engine able to retain its performance advantage for longer, the equivalent of an additional fuel burn benefit of 1% through life. To date, over 450 Trent 1000 powered Boeing 787 Dreamliner aircraft have been ordered by 25 airlines.

Latest developments from Russian Helicopters

Russian Helicopters, a subsidiary of Oboronprom, showcased their current and forthcoming helicopter models to operators from South and South-East Asia at India Aviation 2014. Model of their new multirole Ka-62 took pride of place at their stand in the exhibition hall. This new helicopter, developed with close international cooperation, incorporates the "latest technologies in aircraft building and the finest achievements in Russian helicopter construction." The helicopter is built to a single-rotor design with a multi-blade anti-torque rotor ducted into the tail fin, offering enhanced security for passengers and crew during take-off and landing. The Ka-62 is designed for passenger transport, offshore operations, transporting cargo internally or via an external sling, search-and-rescue

Mi-171A2

Spicejet places LEAP-1B engine order

Spicejet also announced that CFM International's LEAP-1B engines would power the 42 Boeing 737 MAX aircraft it had recently ordered. The engine order is valued at $1.1 billion at list prices. "We are pleased that Spicejet has continued to place its trust in CFM," said Gaël Meheust, vice president Sales for CFM International. "We have built a great relationship with this airline over the years and really look forward to introducing the LEAP engine into their fleet." Spicejet, a long-time CFM customer, currently operates a fleet of more than 40 CFM56-7B-powered Boeing Next-Generation 737-800 and 737-900ER aircraft. The first full LEAP engine began ground testing in September 2013, two days ahead of schedule, logging a total of 310 hours and more than 400 cycles during approximately five weeks of testing. This engine was launched with the most extensive ground and flight test certification programme in the company's history, encompass 60 engine builds over the next three years and will accumulate approximately 40,000 cycles before entry into service.

LEAP engine at the CFM stand (photo: Angad Singh)

Gulfstream G650 flies into India - and record books

Gulfstream's ultra long range and ultra large cabin G650 business jet flew into the country for the first time during India Aviation 2014 and in the process created a record of sorts, getting to Mumbai non-stop from New York in 13 hours and 49 minutes.

The hi-tech cockpit of the Gulfstream G650 (photo: Angad Singh)

operations, and evacuation missions. It can operate in a wide range of climatic conditions, over land or sea, day or night, in any weather.

Russian Helicopters officials held a series of meetings over the course of the air show where they discussed advantages of the Mi-171A2 helicopter, an advanced medium multirole helicopter based on the Mi-8/17 series, incorporating the latest technology and kitted out with modern equipment that expands its operational range. 'Operators' experience from operating Mi-8/17 family helicopters across the world were taken into account in designing and manufacturing this model.

Russian-built helicopters have continued to be in great demand in India, for now almost 50 years. Rosoboronexport is currently supplying the Indian Air Force with the latest Mi-17V-5 military transport model made by Russian Helicopters under a 2012 contract.

OIS-Aerospace in strategic relationship with Magnaghi Aeronautica

OIS AeroSpace (OIS-AS) announced a strategic relationship with Magnaghi Aeronautica of Italy for the Sky Arrow platform and other aviation products. Commenting on the new ties, Sanjay Bhandari, Chairman and Managing Director of OIS AeroSpace said "We are honoured that Magnaghi Aeronautica of Italy has chosen to enter into a relationship with OIS AeroSpace whereby we will market, supply and maintain Sky Arrow aircraft platforms for the Indian market, with special focus on Homeland Security".

Spicejet order 42 B–737 MAX 8s

A computer-generated image of the 737 MAX 8 in Spicejet livery.

Boeing and Spicejet have concluded a deal for 42 737 MAX 8s. The order was previously listed as "unidentified" on the *Boeing Orders and Deliveries website*, and is valued at $4.4 billion (at list prices.) "Spicejet greatly values the ties we have built over the years with Boeing. The Boeing Next-Generation 737 aircraft, the mainstay of the fleet ever since Spicejet started operations, have vindicated our choice with their endurance, reliability and cost effectiveness," said SL Narayanan, Group CFO for The Sun Group. "The induction of Boeing 737 MAX will further modernise our fleet, improve customer experience, and ensure that we operate the most efficient fleet well into the future." With this announcement, Spicejet has ordered 90 aircraft directly from Boeing, which includes the 737-800, 737-900ER and now the 737 MAX.

Spicejet's CEO Sanjeev Kapoor with Spicejet air hostesses in their striking uniforms.

"We are extremely pleased and optimistic about our relationship with OIS-AS to advance our technology franchise across various sectors in India. We believe that given OIS-AS's team and technology capabilities, we have forged a win-win cooperation that would efficiently service the growing Indian market including defence offsets," said Vincenzo Damiano, Strategic Marketing Sales & Procurement Director, Magnaghi Aeronautica, Italy.

Sky Arrow is an Italian-designed and manufactured, all-composite, high-wing aircraft with tandem seating and pushing configuration. It was first introduced in 1992; several hundred Sky Arrows are currently operated worldwide in different categories: LSA, certified USFAR-23 and EASA CS-VLA and Experimental.

Why *Vayu* likes the Hyderabad show!

- Superbly managed !
- Media and exhibition documentation fasttracked !
- Clean and accessible washrooms !
- High quality food counters !
- Event venue located in the heart of the city!
- Media/conference/chalets/halls/static displays all well located !
- Weather is always great !
- Polite and helpful FICCI officials/ team!
- ContraAds for Hall Space actually works!
- The insidious 'royalty system' inflicted on media at Defexpo is absent!
- Finally, the best biryani in India in downtown Hyderabad !

What a contrast to the chaotic and virtually hostile attitudes of the organisers at Aero India (Bangalore) and Defexpo (New Delhi.)

Releasing the Indian Aviation report by FICCI-KPMG

"Indian aviation sector has the potential to be number one globally" !

India has the potential to become the third largest aviation market by 2020 and the largest by 2030. A report released by FICCI-KPMG at the civil aviation exposition in Hyderabad, 'India Aviation 2014', indicated that there is large untapped potential for growth in the country, primarily owed to the fact that access to aviation is still a dream for nearly 99.5 per cent of its population. According to the report, the Indian civil aviation industry is on a high growth trajectory, albeit with minor hiccups.

The industry has ushered in a new wave of expansion driven by Low Cost Carriers (LCC), modern airports, Foreign Direct Investments (FDI) in domestic airlines, cutting edge Information Technology (IT) interventions and a growing emphasis on No-Frills Airports (NFA) and regional connectivity. The Indian civil aviation industry is amongst the top 10 in the world with a size of around USD 16 billion, but is a fraction of what it can actually achieve.

The report notes that regional airports will trigger off the next generation of aviation growth in India. At present, there are around 450 used/unused/abandoned airports and airstrips spread all over the country. Many Indian states, especially in Eastern India, have started taking pro-active measures to promote air connectivity. These initiatives include reduction in sales tax on ATF, development of no-frills airports, promotion of aviation academies and supportive policies for airlines and tourism. West Bengal deserves special mention, being the first large state in the country to declare zero per cent sales tax on ATF at its regional airports and 15 per cent sales tax on ATF used by additional flights started at its metro airport in Kolkata.

Amber Dubey, Partner and Head of Aviation at KPMG India, speaking at the Conference on 'Enhancing Air Connectivity' (photo: Angad Singh)

Much more needs to be done, the report states, as several Tier-2 and Tier-3 cities are still unconnected or underserved. These involve relaxation on regulations, revising the security requirements, allowing domestic code sharing, providing free or discounted utilities and connecting infrastructure. The proposed Essential Air Services Fund (EASF) by Ministry of Civil Aviation (MoCA) needs to be set up immediately. All this will have a multiplier effect in terms of higher growth of local economic activities, tourism and employment.

The report highlights significant growth in the Indian aviation sector over the last decade. As per data from the Airports Authority of India (AAI), passenger traffic grew to 159 million (FY 13) and cargo throughput to 2.19 million metric tonnes (FY 13), registering an impressive growth rate of 13 per cent and 10 per cent CAGR respectively over the period FY 2003-2013.

The most significant development in the Indian domestic aviation market is the growing dominance of the low-cost carrier model, which in FY 2013 accounted for almost 70 percent of the domestic capacity. LCCs have driven the growth in aviation and tourism through low fares, introduction of regional routes and periodic discount offers. Full service carriers plan to shift more seats to their low cost offerings in line with market trends. Indian carriers plan to double their fleet size by 2020 to around 800 aircraft.

The FICCI-KPMG 'Indian Aviation 2014' report points out that development of air transportation services and socio-economic development are highly correlated. According to the International Civil Aviation Organisation (ICAO), every additional dollar invested in air transport leads to a benefit of around three dollars to the local economy. Moreover, every additional job created in the air transport results in creation of over six new jobs.

The growth in Indian aviation has created significant employment opportunities. With passengers and aircraft fleets likely to double by 2020, the need to strengthen the human resource development infrastructure is immediate. As per KPMG estimates, the total manpower requirement of airlines is estimated to rise from 62,000 in FY-2011 to 117,000 by FY-2017. It is estimated that the sector, overall, will need about 350,000 new employees to facilitate growth in the next decade. Shortfalls in skilled labour could create safety issues and may see staff salaries rise, hurting India's cost competitiveness.

It is a well-known fact that the Indian aviation industry is overtaxed and this is being reflected in the industry's lack of competitiveness at the global level. It is important for India to acknowledge the devastating impact of high taxes. Some of the avoidable taxes/charges that need immediate attention are central and state taxes on ATF and MRO, Service Tax on air tickets, high airport charges etc.

India's current MRO market size is estimated to be around USD 700 million. By 2020, the total Indian fleet would double in number, making it critical to have a strong domestic MRO industry. According to industry sources, merely 5-10% of the MRO work for domestic scheduled carriers is carried out in India, while most of the maintenance activities are outsourced to third-party service providers outside the country. This is a classic case of scoring self-goals. An inter-ministerial task force on MRO needs to be formed immediately by the government to check the outflow of MRO revenue, foreign exchange and jobs.

Extracted from the FICCI-KPMG report

Au Revoir !

Farewell to the Dassault Mirage F1

The last operational Dassault Mirage F1 fighters of the French Air Force (*Armée de l'Air*) exercised their bombing skills for the very last time at the shooting range in the third week of November 2013. Bombing exercises are known in France as *'Champ de Tir'* and this last such of the Mirage F1s was conducted at the French air base Cazaux (*Base Aérienne 120 de Cazaux*) in southern France. The exercise included a media day during which the Mirage F1 aircraft conducting the exercise were equipped with Mk82 unguided bombs and GBU-12 laser-guided bombs, dropping these live weapons at practice targets on the Captieux Range located about 100km from Cazaux.

Cazaux is chosen for these armament exercises because the large range nearby is suitable for such training missions with live ordnance. All squadrons of the French Air Force participate annually at this air base to qualify their bombing skills.

After an operational life of nearly 40 years, the Dassault Mirage F1 is now at the end of its career, in service with the last squadron, *Escadron de Reconnaissance* 2/33 (ER02.033), nicknamed 'Savoie,' and commanded by Lieutenant Colonel Benjamin Souberbielle.

These 20 remaining Mirage F1s are of the F1CR variant, used for reconnaissance and attack missions. Pilots of this squadron will remain in operational service until mid-2014, following which most of them will convert on other types of aircraft in the French Air Force.

The standard unguided bombs used are the Mk82 (500 lb), the MK83 (1000 lb) and the Mk84 (2000 lb). Their laser-guided counterparts are simply fitted with fins mounted on the rear of the bomb to control direction of the bomb during its descent.

Fresh French Air Force pilots need to achieve their bombardment qualification by dropping live bombs, both guided and unguided, twice a year. Pilots already qualified for bombardment need only drop one live bomb a year (guided or unguided) to maintain their qualification.

The last Mirage F1s will be phased out of service in July 2014, and flown to Châteaudun where they will be put into storage. It is not yet clear if any aircraft will be sold to other countries after their retirement in France or whether they will be dismantled and eventually scrapped. The last flight of the Mirage F1 is scheduled during the Bastille Day parade in Paris on 14 July, where the Mirage F1s will lead the parade as a handsome tribute to this type.

Text and photos: Joris van Boven and Alex van Noye

Mirage F1 and its LGBs at BA 120, Cazaux in South France

UAE orders additional F-16s

The United Arab Emirates has increased the size and scope of a potential follow-on order for the Lockheed Martin F-16, to also include a new 'Block 61' designation. The number of fighters involved has increased from 25 to 30, according to a US Defence Security Cooperation Agency notice to Congress, posted on 24 January 2014. "The United Arab Emirates has requested a possible sale of equipment in support of its commercial purchase of 30 F-16 Block 61 aircraft, and to support the upgrade of its existing F-16 Block 60 aircraft," valuing the Foreign Military Sales element of an order at a potential $270 million.

Lockheed has declined to comment on how the Block 61 variant would differ from the 80 F-16E/Fs purchased by the UAE more than a decade ago. The in-service Block 60 variant uses a General Electric F110-132 engine, Northrop Grumman APG-80 radar and a Northrop electronic warfare system. A likely decision to increase the F-16 inventory follows the UAE's previous interest in the Dassault Rafale and then Eurofighter Typhoon as potential replacements for its fleet of upgraded Dassault Mirage 2000-9s.

PAF acquires thirteen F-16A/Bs from Jordan

F-16A and F-16B of the Royal Jordanian Air Force

Authoritative sources have reported that the Pakistan Air Force will acquire thirteen F-16A/B Block 15 fighters from Jordan, with the new arrivals due to be received in March 2014 itself. Twelve of the ex-Royal Jordanian Air Force aircraft are single-seat F-16As, and one is a twin-seat F-16B. These aircraft had undergone mid-life upgrades (MLUs) while in Jordanian service, and are expected to have approximately 3,000 remaining flight hours each. The Block 15 F-16 is an earlier production variant that is suited primarily to air defence and interception roles. Most current PAF F-16s are early generation A/B models, acquired from the USA and upgraded through MLUs.

The purchase brings the Pakistan Air Force's total F-16 count to 76. The Royal Jordanian Air Force's F-16 MLUs (Mid-Life Update) were bought from Belgium and the Netherlands. Those sold to Pakistan are from a separate set of F-16s in use by the Jordanian Air Force. "This set being sold is from the 33-plane Peace Falcon I/II purchases of F-16 ADFs in 1997 and 2003", according to news reports. The ADF variant is more suited for dogfighting, air superiority, and interception.

Pakistan's "well-placed defence sources" have confirmed that the purchased aircraft were in good condition and could serve for up to another 20 years, with about 3,000 flying hours available to them. The deal was set up between Pakistan and Jordan a year ago when Pakistan's Chief of the Air Staff (CAS) Tahir Rafiq Butt visited Jordan to pursue the deal. The total amount Pakistan paid for the aircraft is not known at this point, but speculations indicate that Jordan likely made a profit on sale of the aircraft. The Jordanian F-16 purchase is the latest step in the Pakistan Air Force's ongoing efforts to bulk up its fleet. Another example of this is Pakistan and China's joint development of the JF-17 Thunder aircraft, which is being inducted into the Pakistan Air Force.

Overall, the F-16 is one of the most important components of the Pakistan Air Force, originally introduced to the *Fiza'ya* in the 1980s. The United States provided Pakistan with an initial batch of F-16s before nuclear sanctions came into force as a result of the Pressler amendment. In the 1990s, a series of F-16 aircraft were embargoed despite Pakistan having paid for them. Currently, the U.S. and Pakistan are discussing additional upgrades and weapons purchases for Pakistan's existing F-16 force. The Pakistani government has shown interest in advanced medium range air-to-air missiles, short range air-to-air missiles, joint direct attack munition, and bunker-buster bombs.

Referendum on Swiss Gripen acquisition

The potential sale of 22 Saab Gripen E fighters to Switzerland will face a public vote on 18 May, as confirmed by the nation's Federal Council. Despite having been approved by Swiss parliamentarians in late 2013, the *Gripen Fund Law* will now be the subject of a referendum, after almost 65,400 citizens signed a petition opposing the proposed acquisition. Some 50,000 signatures had been required to trigger the step. Planned to be delivered after 2018, the Swiss Air Force's new aircraft would serve as replacements for the country's current Northrop F-5 fighters.

Qatar considers NH90, Tiger acquisitions

Qatar has emerged as a potential operator of the NH Industries (NHI) NH90, with its armed forces also interested in potentially acquiring Airbus Helicopters' Tiger. A 22-aircraft order for a mixture of both the TTH troop transport and NFH naval variants of the NH90 could emerge, along with 20 attack helicopters, according to Dominique Maudet, Airbus Helicopters' executive vice-president.

Guillaume Faury, chief executive of NHI consortium majority stakeholder Airbus Helicopters, said the NH90 "has now overcome the difficulties at beginning of the programme" and entered the "industrialisation and fast delivery phase." The eventual target is to produce 60 of the aircraft per year, including those manufactured by partner company AgustaWestland, rising from nearly 50 in 2013. Although Spain will take delivery of its first NH90 TTH this year, it has yet to finalise a proposal to trim its contract from 45 aircraft to 22, but with the addition of a logistics support package of similar value.

Apaches for Iraq?

Iraq's military transformation could be fast tracked through a potential $4.8 billion deal for 24 Boeing AH-64E Apache helicopters. Announcing details in a notification to Congess on 27 January, the US Defence Security Cooperation Agency says an Apache sale would provide Iraq with "a critical capability to protect itself from threats and reinforce Iraqi sovereignty".

Twelve Northrop Grumman APG-78 Longbow fire control radars and 480 Lockheed Martin AGM-114R Hellfire air-to-surface missiles would be among the equipment supplied under the deal, along with personnel training and logistics support.

New Zealand orders T-6Cs

New Zealand is to acquire 11 Beechcraft T-6Cs to meet its pilot training requirements, the order also including simulators, additional ground instruction equipment, maintenance support and spare parts. New Zealand had been searching for an intermediate trainer that will enable it to take students from the Pacific Aerospace CT-4E Airtrainer to the Lockheed Martin P-3K2 Orion maritime patrol aircraft, Boeing 757 and upgraded Lockheed C-130H transports, plus the AgustaWestland AW109, NH Industries NH 90 and future Kaman SH-2G(I) Seasprite helicopters.

New Zealand's T-6Cs will be operated by the air force's No. 14 Squadron from Ohakea air base, the same unit which earlier flew the Alenia Aermacchi MB-339CB in the advanced training and light attack roles, until the disbandment of New Zealand's air combat force in 2001. The same aircraft will also be used by the air force's aerobatic display team.

Typhoon for RAF's II(AC) Squadron

One of the oldest units in the Royal Air Force, No. II(AC) Squadron, is to be re-equipped with the Eurofighter Typhoon, after earlier flying Tornado GR4s in Afghanistan. The move is part of transformation of the RAF's combat air capability that will have the Panavia Tornado GR4 replaced by Typhoon and Lockheed Martin F-35B Lightning II fighters. Minister of State for the Armed Forces Mark Francois said it was part of the RAF's Tornado Force, under which all GR4s will be phased out from service by 2019. The newly re-formed II(AC) Squadron will become the fifth front-line RAF Typhoon squadron.

Rafale F3R development contract

A contract has been awarded to Dassault for development of the F3R standard Rafale, by France's defence procurement agency, the *Direction Générale de l'Armement (DGA)*. The F3R is a further evolution of the Rafale F3 standard and will enable Dassault to integrate the European Meteor long-range air-to-air missile produced by MBDA, the Thales PDL-NG new-generation laser designator pod and HAMMER (Highly Agile Modular Munition Extended Range), the laser homing version of the Sagem AASM (*Armement Air-Sol Modulaire* or Modular Air-to-Ground Weapon) that was partially integrated as an urgent operational requirement for France's Operation *Serval* in Mali. The DGA plans to buy 20 PDL-NG pods, of which 16 will be delivered between 2018 and 2019. The F3R will also include upgrades to Rafale's sensors and systems. Validation of the F3R standard is scheduled for 2018.

Dassault have stated that the Rafale has successfully completed its first test flights in this new heavily-armed configuration, comprising six air-to-ground precision AASM Hammer missiles, four MICA medium and long range air-to-air missiles, two Meteor missiles, as well as three 440 gallon (2,000 litre) fuel tanks. By increasing the capabilities of its 14 hard points, including eight under the wings, the Rafale is capable of carrying one-and-a-half times its own weight and Dassault states that "two Rafales have the same potential as six Mirage 2000-class aircraft."

Neither Typhoon nor Rafale for UAE ?

The United Arab Emirates (UAE) has decided against purchasing the Eurofighter Typhoon, even though BAE Systems and the UK Government had been in high-level discussions with the Government of the UAE regarding a range of defence and security capabilities, including Typhoon. According to BAE Systems, "the UAE has advised that it has elected not to proceed at this time. All parties have invested significant effort in drawing up Typhoon proposals for the UAE and, recognising the risk, scale and complexity of such a transaction, the Group had not built this prospect into its planning assumptions. BAE Systems stands ready to work with the UAE to address any future requirements."

The Typhoon had been competing with the Dassault Rafale for the prospective UAE Air Force and Air Defence (UAEAF&AD) order for 60 new fighter aircraft worth an estimated $6billion. The UAEAF&AD has been examining its options to replace the current Mirage 2000-9 fleet for some years, but eventually the competition had come down to a choice between the Rafale and Typhoon. Previously, the Rafale had been selected as the preferred type, but lengthy negotiations failed to achieve any agreement on a deal.

Six more F-35As for Norway

Norway is to order a further six Lockheed Martin F-35A Lightning II Joint Strike Fighters following approval by the Norwegian parliament's Foreign Affairs and Defence Committee. Purchase of these additional aircraft for the Royal Norwegian Air Force (RNoAF) will cost approximately 4 billion Norwegian krona ($654 million) and are scheduled for delivery to the RNoAF in 2018. Under a revised procurement plan, the RNoAF will receive six aircraft each year from 2017 through to 2024, giving an eventual total of 52 aircraft.

RAF Airbridge to Afghanistan

The RAF's Airbus Military A330 Voyager multi-role tanker transport (MRTT) aircraft are in regular flights to Camp Bastion, Helmland province in Afghanistan, an operational airbridge that transports all personnel to and from there. The Voyager carries 300 passengers over a 6,000mile (9,700km) range with 111 tonnes of fuel, some of which is used for air-to-air refueling. Six aircraft are in service with the RAF of the nine aircraft on order. Fourteen Voyagers will be delivered by September 2016 as part of the contract with AirTanker.

Poland orders Alenia Aermacchi M-346

Alenia Aermacchi has confirmed Polish defence ministry plans to order the M-346 trainer aircraft for the Polish Air Force. The contract for eight M-346 aircraft plus support is worth €280 million and includes an option for Poland to buy four more aircraft and training devices. Final contract signature is expected in early 2014. Delivery of the eight M-346 aircraft to the Polish Air Force will take place in 2016-2017 to be based at Deblin-Irena, where its 41 *Baza Lotnicza Szkolnego* (air base school) currently undertakes jet training with the TS-11 Iskra.

EC135T2+s for Spanish Army

The purchase of eight new Eurocopter EC135T2+ helicopters for the Spanish Army Aviation (*Fuerza Aeromoviles del Ejercito de Tierra* – FAMET) was approved at the beginning of December 2013. To be delivered to the Spanish Army Aviation Training Centre (*Centro de Enseñanza de las FAMET*) at Colmenar Viejo, Madrid, these will augment four of the type there. Under the €49 million contract, the first two helicopters were due to be handed over by Eurocopter España by the end of 2013 and the remaining six delivered between 2014 and 2015.

US Army Special Ops

US Army Special Operations Command have activated the 160th Special Operations Aviation Regiment to operate the General Atomics MQ-1C Gray Eagle unmanned air system (UAS), the fifth to do so and the first for special operations. Currently, each Special Forces group has a UAS platoon operating the RQ-7 Shadow, designed to provide UAS support at brigade level. The MQ-1C

Gray Eagle brings enhanced capability and is able to support troops at the Theatre Special Operations Command level.

The Gray Eagle can carry multiple payloads, including radars, signals intelligence, Hellfire missiles and a camera which provides very high quality HD resolution. The new company will eventually have 12 Gray Eagles on strength.

Peru order for Mi-171Sh

Peru will purchase 24 Ulan Ude-built Mi-171Sh helicopters from Russia for its armed forces. The contract includes supply of a flight simulator to train pilots in-country. The first helicopters are expected to arrive in the second half of 2014, the remainder to follow in 2015. The Russian company will establish a regional helicopter maintenance and repair centre in Peru, due to open in the first quarter of 2016 and by 2018, will have expanded to include a major overhaul capability for all Latin American countries. The agreement includes provision for co-production in Peru, due to open in the first quarter of 2016 and by 2018, will have expanded to include a major overhaul capability for all Latin American countries. The agreement includes provision for co-production in Peru of various components for the Mi-171.

The new Mi-17Sh helicopters will be operated by the FAP's Grupo Aéro No3, Peru's Army Aviation Brigade (*Primera Brigada de Aviación del Ejército Peruana*) and the Naval Aviation Command (*Comandancia de la Aviación Naval*), all of which are based at Lima-Callao. Six previously delivered examples are already in Peruvian service, three being with the FAP and three with the Army.

Long-Term Support Contract for SAAF Gripens

Saab has been awarded a four-year support contract for the South African Air Force (SAAF) JAS 39 Gripen fleet. Operations of the SAAF Gripens have previously been supported by Saab through short-term interim support contracts and the last of these had lapsed in April 2013. The SAAF has a fleet of 26 Gripens, but a reduced defence budget has led to "problems." General John Bayne, director of combat systems for the SAAF has stated that 12 Gripens had initially been placed in storage but after discussions with Saab, it was determined that a far less costly option was to fly all of the Gripens occasionally to maintain their airworthiness in a rotational preventive maintenance programme.

Final Su-34s delivered

The final batch of Sukhoi Su-34 bombers, ordered under a 2008 state contract for 32 aircraft for the Russian Air Force was handed over on 16 December. The aircraft then flew to unspecified deployment bases. Sukhoi is now producing Su-34 aircraft under the 2012 state contract announced on 1 March 2012, which covers 92 additional aircraft.

Mi-28N enters service

Russian Helicopters have announced that the Mi-28N Night Hunter combat helicopter officially entered service with the Russian Defence Ministry on 27 December. The helicopter has been operated by the Russian Armed Forces for several years, with a dozen delivered since 2005, but has been under acceptance testing until now. As Alexander Mikheev, CEO at Russian Helicopters stated, "The fact that the defence ministry has officially accepted the Mi-28N testifies that the Night Hunter meets the requirements for a combat helicopter and is ready to enter into service with the Russian Air Force." Some potential export customers have shown interest in the Mi-28N and an international version (the Mi-28NE) is being offered by the company.

USMC F-35Bs demonstrated for Singapore

US Marine Corps Lockheed Martin F-35B Lightnings have been demonstrated to senior Singaporean defence officials at Luke Air Force Base, Arizona. They were then put on static display while the type's capabilities were explained to the Singapore delegation, which was visiting to observe 'Exercise Forging Sabre', a Singapore Armed Forces exercise taking place at the base and on the nearby training range. Singapore has been considering purchasing the F-35 for some years and the demonstration of the F-35B variant appears to confirm reports earlier this year that it is Singapore's preferred option. As per Defence Minister Dr Ng Eng Hen, who was with the delegation, "Singapore is seriously looking at the F-35s to replace our F-16s. We're in no particular hurry, because our F-16s are still very operational and due for upgrades. And during my visit here to Luke Air Base, the US Marines were kind enough to demonstrate the F-35B and it's quite an engineering marvel." It is likely that the initial purchase will be around 12 aircraft, but a total of around 75 may eventually be acquired.

Philippine Air Force for more UH-1Hs

The Philippine Department of National Defence (DND) has ordered 21 Bell UH-1H Iroquois helicopters to boost the depleted Philippine Air Force fleet. According to a spokesman, a joint venture between US company Rice Aircraft Services and Canada's Eagle Copters has been awarded a 1.3 billion pesos ($29 million) contract.

Japanese 5-Year Defence Plan

Japan's cabinet has approved a 5-year defence plan with provision for acquisition of 17 Bell Boeing MV-22B Ospreys, three surveillance UAVs and 28 Lockheed Martin F-35A Lightning II Joint Strike Fighters. The plan, covering the years 2014 to 2019, also involves purchase of three new transport/aerial refueling aircraft and four airborne early warning aircraft, plus other weapon systems. The new posture is aimed at strengthening protection of Japan's more

remote islands from possible attack and increasing defences against ballistic missiles. The Ospreys would form part of a US Marines-style amphibious quick reaction force that could be deployed to repel any invasion of its outer islands.

Production J-10B identified

Initial production examples of the Chengdu J-10B have been seen late in 2013, with aircraft 101 to 106 noted on 13 December. The improved version of the J-10 has been undergoing development for five years, and several factors are understood to have contributed to delays, including time needed for active electronically-scanned array and a complete set of new generation avionics. Chinese sources have reported that the WS-10B Taihang engine originally intended for the aircraft was unavailable, which led to continued reliance on the Russian AL-31FN. The Institute No. 611 at Chengdu were also devoting most of their resources to the J-20 project while developing the J-10B.

Following additional pre-production aircraft, featuring modified electronic-countermeasures antennas installed ahead of the canards, as well as the prototypes updated to the final configuration, an initial batch of eight aircraft were assigned to an operational trials unit within the FTTC. Chinese reports state the new aircraft will enter service within the 44th Division in the first quarter of 2014. There are also reports of a further upgraded multi-role variant, the J-10C, with even more enhanced avionics and a more powerful engine is under development.

Turkish BTAs ordered

Contracts for 15 Turkish Aerospace Industries (TAI) Hürkuş-B turboprop advanced trainers were finalised on 26 December 2013. The prototype Hürkuş has flown on 29 August 2013 and had accumulated 800 flight test hours by the end of the year with series production to start in 2017. Alongside the trainer, TAI is also developing a light attack version of the aircraft that will put it into competition with the Beechcraft T-6C/AT-6 and the Embraer Super Tucano.

JH-7B revealed

First images of the Xi'an JH-7B prototype appeared on a Chinese internet site in December 2013. While development of the aircraft has been underway by Institute No.603/Xian Aircraft Industry Corporation since at least mid-2000 and reportedly first flew in late 2012, recent pictures are the first to have been released. Currently two prototypes (821 and 822) are being tested at the China Flight Test Establishment at Xi'an-Yanliang.

The JH-7B was originally expected to be a completely new design featuring a stealth optimised diamond-shaped fuselage and diverterless supersonic inlets, but this was a limited upgrade of the JH-7A with mostly avionics-related improvements, featuring a new fire-control radar and mission computer, a new full-authority digital fly-by-wire system, and a greater percentage of composite materials to further reduce weight. Since the JH-7B might face competition from the Shenyang J-16 being developed for the People's Liberation Army Air Force, the primary user is thought to be the People's Liberation Army Navy, with which the new version could replace the earlier batches of naval JH-7.

Z-20 helicopter flown

The Harbin/Changhe Z-20 medium-lift utility helicopter made its maiden flight on 23 December at Harbin and is externally similar to the Sikorsky S-70 Black Hawk. China is familiar with the Black Hawk, having procured 24 S-70C-2s in the 1980s. Such a 10-

ton medium-lift machine will supplement its Mil Mi-17/171 fleet and serve as the basis for a new anti-submarine warfare helicopter. Development of what became the Z-20 was first revealed in November 2006, when a model was displayed. Progress was delayed by work on the Z-10 gunship, which was originally being designed under the Chinese Medium Helicopter project.

UK contracts for Apaches and Merlins

Two new contracts were awarded on 29 January providing an additional £330 million for 25 RAF Merlin HC3/3A helicopters to be upgraded for the Royal Navy's Commando Helicopter Force (as Merlin HC4/4As) under the Merlin Life Sustainment Programme (MLSP). Seven interim 'Phase I' aircraft will be delivered to the Royal Navy in 2015 and 2016, with all 25 'Phase 2' standard aircraft delivered between 2017 and 2020. These will provide the Royal Navy with an interim capability between the withdrawal of the Sea King HC4 in early 2016 and introduction of the full MLSP-configured aircraft in mid-2018. The 25 Phase 2 aircraft will be optimised for ship operations and include automatic main rotor blade folding and tail fold.

The second major contract, valued at £430 million, will provide maintenance support for the Army Air Corps' (AAC) Apache AH1 attack helicopter for the next five years. Under this contract, Apache IOS prime contractor AgustaWestland will continue to be supported by its industrial partners Boeing, Lockheed Martin, Longbow International and Selex ES to deliver complete spares provisioning, engineering, depth maintenance, repair and overhaul and technical support services. AgustaWestland will continue to be responsible for supporting Apache aircraft on the flight line at the School of Army Aviation, delivering the required number of flight hours to match the army's training requirements, from the Army Aviation Centre Middle Wallop in Hampshire. The UK Apache AH1 fleet is approaching the 150,000 flying hour milestone and recently more than 40% of annual flying hours have been performed on operations in Afghanistan.

RAF's F-35B IOC in 2018

It is confirmed that the RAF's F-35B Lightning II programme is overall making steady progress. It was stated in the House of Commons that "the UK programme remains on track to deliver initial operating capability (IOC) in December 2018". Also, "the UK F-35 programme is scheduled to seek financial approval for its fifth and final Main Gate in 2017." Main Gate 5 will approve the main production batch of F-35Bs for the UK, the exact number being subject to decisions to be made in the 2015 Strategic Defence and Security Review. Earlier, it was indicated that an initial production order under Main Gate 4 is expected to be for around 14 F-35Bs and should be signed shortly. To date, the UK has taken delivery of three test and evaluation F-35Bs at Eglin Air Force Base, Florida.

Third Operational USN P-8A Squadron

The Boeing P-8A Poseidon has been delivered to a third USN squadron, Squadron 45 (VP-45) 'Pelicans' at Naval Air Station Jacksonville, Florida. VP-45 will join two other operational P-8A squadrons at Jacksonville, the first of these being VP-16 'War Eagles' which achieved such status in January 2013 and undertook the type's first operational deployment in December to Kadena Air Base, Japan. The second is VP-5 'Mad Foxes' which achieved similar status at the beginning of August 2013 and is now proceeding through the inter-deployment readiness cycle prior to leaving for theatre.

Full-Rate production approval for P-8A Poseidon

Approval has been given for full-rate production of the US Navy's Boeing P-8A Poseidon. Earlier reports on "major deficiencies" identified in combat testing between September 2012 and March 2013 imply the aircraft "is not effective for the intelligence, surveillance, and reconnaissance (ISR) mission and is not effective for wide area anti-submarine search." Most of this referred to the P-8's radar, identified as having "operational limitations for some targets", together with deficiencies with on-board electronics to detect enemy anti-aircraft radar "seriously degrading capabilities and aircraft survivability across all major missions."

However, the US Navy states that the P-8A was "ready, was needed in-theatre and continues to more than meet fleet commanders' expectations." The programme's current objective is for 117 aircraft to the US Navy, and of these, 13 of the 37 Low Rate Initial Production aircraft ordered have already been delivered to

fleet squadrons, with all deliveries on or ahead of schedule. The next significant milestone is initial operational capability for Increment 2, scheduled for 2016.

Mi-35Ms for Azerbaijan

The last of 24 Mil Mi-35M Hind-E attack helicopters have been delivered to Azerbaijan. A contract was signed for these in September 2010 and the first two were air freighted to Baku on 12 December 2011. A further four arrived in April 2012, followed by four more that August, but dates for the remaining 14 helicopters were unconfirmed. It is believed the Mi-35Ms are operated by both the Azerbaijan Air Force and the State Border Service.

C295M for Philippine Air Force

The Philippine Air Force (PAF) requirement for three new medium-lift transport aircraft will be met by the C295M. Three were offered at the cost of 5.288 billion Philippine pesos, within the approved Department of National Defence (DND) budget of 5.3 billion. The DND undersecretary and chairman of the Bids and Awards Committee, Fernando Manalo said that first delivery was anticipated 18 months after the contract is signed.

All Indonesian T-50i Golden Eagles delivered

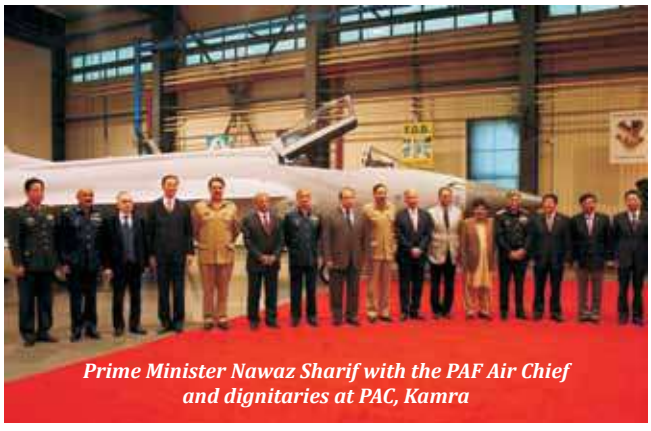
The last of 16 KAI T-50i Golden Eagles ordered by the Indonesian Air Force (*Tentara Nasional Indonesia – Angkatan Udara* – TNI-AU) has been delivered. The two jets were flown in by Korean pilots, routing from the factory in Sacheon, South Korea, via Kaohsiung, Taiwan; Cebu, Philippines; and Balikpapan, East Kalimantan, Borneo. The latest aircraft were both in the camouflage scheme worn by the previous six deliveries, while the first eight carried the blue and yellow colours of the TNI-AU's *Elang Biru* display team. All are joining *Skadron Udara* 15 at Iswahjudi, where they are replacing the squadron's Hawk Mk 53s.

Bangladesh orders 24 Yak-130s

The Bangladesh Air Force has signed a contract for 24 Yakovlev Yak-130 *Mitten* combat training aircraft. The deal, worth approximately $800 million, was concluded with Russian state arms export agency Rosoboronexport in the fourth quarter of 2013 and first deliveries are anticipated by early 2015. Bangladesh will use $1 billion in credit pledged to the country during the Bangladesh Prime Minister's visit to Moscow in January 2013 to assist with financing the deal.

The 50th JF-17 Thunder Block 1

As reported in *Vayu* Issue I/2014, Pakistan Aeronautical Complex (PAC) handed over the 50th Block 1 JF-17 'Thunder', serial 13-150, to the Pakistan Air Force in presence of Prime Minister Muhammad Nawaz Sharif on 18 December also marking the official launch of Block 2 production of the JF-17. The first 50 JF-17s have equipped the Nos. 16 and 26 Squadrons. The type will continue to be produced in blocks of 50, where every succeeding block will be an upgraded version. Block 2 JF-17s will not have any airframe changes, but an aerial refueling probe will be fitted together with improved avionics and electronic warfare sub-systems, additional weapons-carriage capability (including nuclear) and optimised maintenance requirements.



Prime Minister Nawaz Sharif with the PAF Air Chief and dignitaries at PAC, Kamra

The first Block 2 is expected to be ready by June 2014, the facility at Kamra having capacity to produce 16 to 25 aircraft per year. The first Block 3 will be produced in 2016 and will

reportedly bring a substantially altered airframe and possibly a different engine. Weapons integration is under the full control of PAC engineers as the PAF has all the necessary source codes from China. This follows the bilateral understanding with Chinese partner CATIC, which explicitly covers future export possibilities of JF-17 as a joint undertaking. Several countries in Central Asia, South America and Africa have shown interest in the fighter, with Argentina, Azerbaijan, Bangladesh, the Congo, Egypt, Indonesia, Iran, Nigeria, the Philippines, Serbia, Sri Lanka, Sudan, Turkey, Venezuela and Zimbabwe specifically named. Advertised as $20-24 million per unit, the JF-17 is almost three times cheaper than the most reasonably priced Western-made aircraft.

Philippines Navy to acquire additional AW109s

The Philippines Navy have ordered an additional two AW109 Power maritime helicopters, which brings to five the total number of AW109 Powers ordered. The order further expands the success achieved by this model in the Philippines for military applications following the contract for eight units signed by the Philippine Air Force in 2013. The two additional helicopters will be delivered in the second half of 2014 and will operate from both shore bases and from ships.

DCNS' multimission frigate for Royal Moroccan Navy

DCNS has handed over the multimission frigate *Mohammed VI* to the Royal Moroccan Navy "on time, on budget and with performance as promised". This is the second vessel of this type designed and built by DCNS in a production run of 12 ships for the French and Moroccan Navies. The *Mohammed VI* benefits from the same technological and production innovations as the FREMM frigates for the French Navy. The Royal Moroccan Navy will acquire the ship's weapon systems and munitions directly from its own selected suppliers. FREMM frigates are designed to deal

with all types of air, surface, subsurface and land-based threats, and are amongst the most technologically advanced and competitively priced on the world market.

C-17 Globemaster III for Kuwait Air Force

On 13 February 2014, Boeing delivered Kuwait's first C-17 Globemaster III airlifter. A custom paint design distinguishes the Kuwait C-17 from the 259 others that have been delivered to customers around the world. "When this C-17 arrives to deliver humanitarian aid or disaster relief anywhere in the world, people in need will know that the aid came from Kuwait," said Col. Abdullah.

Boeing has delivered 260 C-17s, including 223 to the US Air Force, and a total of 37 to Kuwait, Australia, Canada, India, Qatar, the United Arab Emirates, the United Kingdom and the 12-member Strategic Airlift Capability initiative of NATO and Partnership for Peace nations.

Additional Fire Scouts for US Navy

The US Navy has ordered six additional Northrop Grumman Corporation Fire Scout unmanned helicopters. The Fire Scout endurance upgrade, designated the MQ-8C and based on Bell

Helicopter's 407, will provide ship commanders with increased range, endurance and payload capacity over the current MQ-8B variant. The Navy plans to purchase a total of 30 aircraft under a rapid development effort. Northrop Grumman is currently under contract to produce 14 Fire Scouts that are scheduled to begin deploying in 2014.

A330 MRTTs for Singapore

Airbus Defence and Space will deliver six A330 MRTT new generation air-to-air refuelling aircraft for the Republic of Singapore Air Force (RSAF). Singapore's choice of the A330 MRTT makes it the sixth nation to select the type following Australia, Saudi Arabia, the United Arab Emirates, and the United Kingdom which have ordered a total of 28 aircraft, while India is reportedly at the final stages of contractual negotiations for six aircraft. A total of 17 aircraft are currently in service with the first four nations.

The A330 MRTT is derived from the highly successful A330 commercial airliner and proven in-service as a tanker/transport with multi-role capability.

Turkey orders Sikorsky Black Hawks

Sikorsky has signed agreements with the Turkish government and key Turkish aerospace contractors that license Turkey's aerospace industry to manufacture 109 T-70 helicopters (Turkish variants of Sikorsky's S-70i International Black Hawk helicopter)

for operation by the Turkish Government, and to assemble 109 S-70i helicopters for Sikorsky. The agreements license the transfer of certain manufacturing technology to Turkish industry, and provide for the potential to produce up to a total of 600 aircraft, including both T-70 units for Turkish indigenous use and S-70i aircraft for export over the next 30 years. The agreements are subject to requisite export approvals.

Under the Turkish Utility Helicopter Programme, Sikorsky has signed agreements with the *Turkish Undersecretariat for Defence Industries* (SSM) and two Turkish defence contractors, Turkish Aerospace Industries, Inc. (TAI) and Aselsan A.S. TAI is the prime contractor for T-70 licensed production and assembly in Turkey for multi-mission use by the Turkish government. The aircraft will be assembled in Turkey by TAI and will include components supplied by Sikorsky and other American and Turkish companies. Aselsan will develop a new cockpit avionics system that will be featured in the T-70 aircraft.

Carl-Gustaf selected for US Army

Saab's man-portable weapon system Carl-Gustaf (M3 MAAWS in the US) has been chosen by the US Army to be a *Programme of Record*, which will hence become standard issue to the Army's Light Infantry units providing the US Army with a capability that units using disposable shoulder fired munitions currently lack. This system has been a key component of the US Special Operations Forces for over twenty years. "The Carl-Gustaf has repeatedly proven itself in the world's most demanding environments as a versatile, powerful tool for the infantry soldier", said Jonas Hjelm, President of Saab North America.

As a true multi-role, man-portable shoulder-fired weapon, the Carl-Gustaf weapon system is currently in use in more than 40 countries worldwide and is standard weapon with Indian Army's infantry battalions. A new, lighter weight, version of the Carl-Gustaf is currently under development and advances are also being made to the Carl-Gustaf ammunition family with the recent release of the new 655 CS (Confined Space) High explosive anti-tank (HEAT) round.

Korea's Chungnam FFD orders AW139

The Republic of Korea's Public Procurement Service and Chungnam Fire Fighting Department have ordered an AW139 twin engine helicopter for public utility services, to be delivered

in the second half of 2015, for fire fighting, search and rescue, Emergency Medical Services (EMS) and utility mission in support of the Chungnam community. Chungnam Province's AW139 will be fitted with a wide range of role equipment including a four axis auto pilot, Bambi bucket, search light, dedicated EMS suite, fast roping fittings, rescue hoist. The AW139 has proven extremely successful in Northeast Asia performing a number of roles including search and rescue, maritime patrol, law enforcement, fire fighting, disaster relief, VIP/corporate transport and electronic news gathering. In the Republic of Korea the AW139 is operated by the Korea Coast Guard, Gangwon Fire Fighting Department, Gyeonggi Fire Fighting Department, and Incheon Fire Fighting Department.

Lion Group selects CFM56-5B for A320ceo fleet

The Indonesian Lion Group has selected CFM International's CFM56-5B engine to power 60 Airbus A320ceo (current engine option) aircraft on order. Jakarta-based Lion Group been a CFM customer since the year 2000 and recently took delivery of its 100th CFM56-7B-powered Boeing 737 aircraft.

All of Lion Group's new engines will be the CFM56-5B Performance Improvement Package (PIP) configuration. The PIP became the new production configuration for the CFM56-5B in 2011. The improvements, which is providing a 0.5% improvement in fuel burn, include hardware changes to the core, including new high-pressure turbine blade, as well as manufacturing changes the fan and compressor blades and vanes to improve performance retention.

Rolls-Royce and LM for future C-130Js

Rolls-Royce has completed a long-term agreement with Lockheed Martin to deliver approximately 600 engines to power future C-130J Super Hercules aircraft. The agreement secures the Rolls-Royce AE 2100 as the engine of choice for all variants of the C-130J to 2025. The engine agreement will service US Government and International contract requirements between 2014 and 2018.

The AE 2100 powers all C-130Js, while the Rolls-Royce T56 engines power the legacy C-130 fleet. The global C-130J fleet has surpassed 1 million flight hours, and Lockheed Martin recently announced its intent to obtain certification from the Federal Aviation Administration for a new civil variant: the LM-100J.

The agreement will ensure the continued success of the C-130J military transport aircraft and its powerful, reliable and fuel-efficient turboprop engines. More than 300 of the four-engine transports have been delivered to customers in 16 countries, across 16 different mission types. Rolls-Royce has already delivered more than 1,500 AE 2100 engines to Lockheed Martin's Marietta, Ga., facility. AE 2100 engines are manufactured, assembled and tested in Indianapolis, USA.

78 bookings for Airbus Helicopters

A total of 78 bookings were announced by Airbus Helicopters at Heli-Expo industry convention which "underscore the competitiveness of its product line", with acquisitions covering

EC135 at the static display

rotorcraft that range from the EC225 and the AS350 B2 and B3e, to the next-generation EC175, along with the new EC145 T2 and the evolved EC225e and AS332 C1e versions.

The new EC175, which was certified in January for deliveries beginning later in 2014 has received 14 orders with announcements at Heli-Expo. Noordzee Helicopters Vlaanderen (NHV), a launch customer is adding six to its previous order for 10 of the mid-sized, twin-engine helicopters; Lease Corporation International (LCI), a new Airbus Helicopters customer, is acquiring up to six EC175s; and CHI Aviation purchased two of the rotorcraft. The EC145 T2, which is another new Airbus Helicopters rotorcraft to enter service in 2014, expanded its order book by a 25-rotorcraft booking from Waypoint Leasing. For the workhorse EC225 and the new EC225e, orders were announced for 27 helicopters. Rounding off were orders for seven AS350 B3e aircraft and three AS350 B2s from a total of five customers in the United States.

MA Group acquire eight Sikorsky S-92s

Milestone Aviation Group has increased its Sikorsky S-92 order book by eight units, making it one of the world's largest S-92 owners, increasing firm and option S-92 orders to 37 aircraft. The forward orders are scheduled to deliver over the next five years with 15 scheduled for completed delivery in 2014 and 2015, more than half of which are already on lease or under letter of intent.

Milestone already has 73 Sikorsky aircraft in its fleet, including 45 S-92s and 28 S-76 family aircraft with four of the brand new S-76D aircraft. These aircraft are on lease to operators in Asia, Australia, Europe, North America and South America serving the offshore oil and gas, search and rescue and emergency medical service industries. The new aircraft will enter into service globally in support of Milestone's lessees serving offshore oil and gas transportation services, helicopter-based emergency medical service (HEMS), search and rescue (SAR), para-public and other utility missions.

Safran and GE mark 40-year partnership

On 12 February 2014, a special ceremony at the US Chamber of Commerce, Safran and General Electric Company (GE) marked signing of the historic partnership agreement that formed CFM International in 1974. The event launches a nearly year-long celebration that will culminate on 24 September 2014, 40th anniversary of "the world's most successful international joint venture". In 2008, the companies renewed the partnership agreement to the year 2040.

The original framework agreement was signed in 1974, creating CFM International as a 50/50 joint venture between the two aircraft engine manufacturers. It was a decision that would redefine international cooperation and help change the course of commercial aviation. The two companies had been involved in a co-production agreement on GE's CF6 engine family since 1968 and, thus, had already worked very successfully together.

The first CFM-powered aircraft, a DC-8 Super 70, entered commercial service on 24 April 1982 with Delta Air Lines. Today, CFM is the preferred supplier of commercial aircraft engines with a product line that serves as the industry benchmark for "efficiency, reliability, and low overall cost of ownership." More than 26,000 CFM56 engines powering 30 different aircraft applications have been delivered to date to more than 530 operators around the globe. The CFM56 fleet in service has logged 700 million flight hours in service powering more than 11,000 commercial and military aircraft worldwide as the most reliable engines in the air.

The advanced new LEAP engine, currently undergoing certification testing, has achieved broad-based market acceptance, with 6,000 engines ordered to date. The engine is delivering on the aggressive goals CFM set for it when the programme was launched in 2008: a 15 percent improvement in fuel efficiency; double-digit improvements in noise and emissions; and "the lowest overall cost of ownership in the industry." CFM is on track for engine certification for the US FAA and European EASA in 2016 and entry into airline service in 2016.

196 new Bell Helicopters ordered

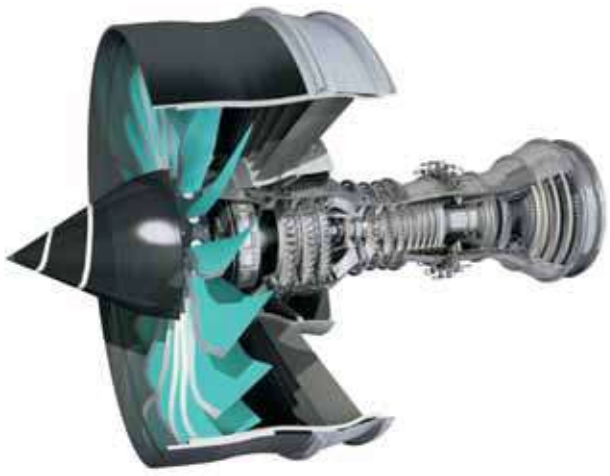
Bell 505 Jet Ranger X

Bell Helicopter has secured customer commitments of purchase 196 new helicopters. The company has also revealed its highly anticipated new Bell 505 Jet Ranger X as an updated full-size mock up of the Bell 525 Relentless in a search-and-rescue configuration. According to John Garrison, president of Bell Helicopter, "Customers have been clamouring to get a first look at our new Bell 505 and it was thrilling to reveal not one but three mock ups of this beautiful new rotorcraft to a chorus of cheers and applause. I am pleased to report the excitement did not stop there as customers from around the world were eager to sign commitments to purchase more than 170 of the aircraft."

Rolls-Royce unveils Next Generation engine designs

Rolls-Royce has shared details of its next generation of engine designs, which could be ready within ten years, featuring technology innovation designed to transform performance. The company has built a technology leadership position with its Trent family of engines, the latest of which, the Trent XWB, is the world's most efficient engine flying today. Trent engines will continue in service for decades to come with 2,500 in service and more than 2,500 on order.

Rolls-Royce is continually innovating and, as part of that ongoing process, is looking to build on the success of the Trent family of engines with two new generation engine designs. The first design, 'Advance', will offer at least 20 per cent better fuel burn and carbon dioxide emissions than the first generation of Trent engine and could be ready from the end of this decade. The second, UltraFan, a geared design with a variable pitch fan system, is based on technology that could be ready for service from 2025 and will offer at least 25 per cent improvement in fuel burn and emissions against the same baseline.



The next generation UltraFan design

"Over" 150 Russian-made helicopters involved in UN peacekeeping operations

Over 150 Russian-origin helicopters are currently involved in UN humanitarian and peacekeeping operations around the world. Speaking at the *Russian Hour* conference at Heli-Expo 2014 in Anaheim, California, United States on 27 February 2014, Russian Helicopters CEO Alexander Mikheev said that "The extensive use of Russian-made helicopters in UN missions is further testimony to the unique capabilities of our technology. Russian helicopters are unmatched on humanitarian and peacekeeping missions. I am confident that the new technologies we are currently working to develop will also become effective instruments for UN missions."

A wide range of Russian-made helicopters are currently carrying out UN missions and include those in the Mi-8/17 family, the world's heaviest-lifting Mi-26(T), and multirole Ka-32 type helicopters, taking part in UN missions in a range of climates and

Mi-171

environments across the world, from Afghanistan, South Sudan, Somalia, East Timor and countries across Africa. During the conference, Russian Helicopters also unveiled new developments that incorporate modern technologies and build on experience using helicopters on UN missions. *Russian Hour* participants had the opportunity to hear about new helicopters, such as the medium multirole Mi-171A2 and transport and the new Russian Mi-38 multirole helicopter can be used to carry cargo and passengers, as a flying hospital, and for a range of other operational needs. Its competitive advantages include a high cruising speed of 295 km/hour and range of 1,200km.

Brazilian Army orders Saab RBS 70

Saab has signed a contract with Brazil for the RBS 70 VSHORAD (very short range air defence system). The order has a value of approximately MSEK 80 and comprises deliveries of man-portable launchers, missiles and associated equipment. First deliveries are scheduled during 2014.

The deal comprises an undisclosed number of RBS 70 man-portable launchers, Mk II type missiles, simulators, night vision equipment, a test set, maintenance tools, spares, associated equipment, and training for the weapon's operators and maintainers. The systems are among others intended to protect Brazil's strategic infrastructure, and would be employed in protection of major incoming events, including the 2014 FIFA World Cup and the 2016 Summer Olympics in Rio de JaneiroThe Saab portfolio of short-range ground based air defence missile systems comprise of the RBS 70 and the further enhanced RBS 70 NG. With the RBS 70 family, Saab offers state-of-the art systems for demanding customers investing in the future. The RBS 70 system has an impressive track-record on the market. 19 countries have procured more than 1,600 RBS 70 systems, including more than 17,000 missiles.

Sagem SIGMA 30s for CAESAR Nexter Systems

Sagem (Safran) has been contracted by Nexter Systems to supply 37 SIGMA 30 navigation and pointing systems for CAESAR guns, to be delivered to "an Asian customer". Sagem's SIGMA 30 system gives long-range artillery system immediate, high-precision firing capability, since they do not need GPS.

Sagem Sigma 30 on Caesar (photo: Wodka-Gallien, Sagem)

Drawing on Sagem's proven expertise in navigation systems and inertial sensors, the SIGMA 30 features large digital ring laser gyro technology. Enabling deployment in distributed configurations, the Sigma 30 system enhances the mobility and protection of support forces, mounted on the cannon, and offering totally independent operation, protected from enemy countermeasures.

In addition to CAESAR guns, Sagem's SIGMA 30 system outfits 40 other artillery systems, including PzH2000 (Krauss Maffei Wegmann), MLRS M270 (Airbus Defence), Nora (SDPR), Archer (BAE), and the 2R2M mobile mortar (Thales).

Airbus' Orlik MPT trainer

Airbus Defence and Space have revealed the PZL 130 Orlik MPT (Multi Purpose Trainer), a new version of the twin-seat aircraft with glass cockpit, a development of the Orlik TC II Garmin

already in service in the Polish Air Force. The Orlik MPT offers the flight parameters and systems essential for military pilot training in the 21st century at "a significantly lower cost compared with other aircraft of this class". The upgrade, focused on an integrated glass cockpit and additional systems, greatly increases the scope of applications in military pilot training, including basic tactical training and lead-in to combat training. The aircraft's efficiency, low flight-hour cost and range of training capabilities "will position the Orlik for the international market".

Airbus A400M in first airdrop trials

The A400M new generation airlifter has successfully completed one of the most important elements of its continuing military flight-test programme: the first phase of airdrop trials. Flying over the Fonsorbes drop zone near Toulouse, an A400M development aircraft dropped a range of different loads by parachute during

11 flights over a two-week period. It dropped 26 platforms and containers weighing from 255kg to 4 tonnes using the ramp aerial-delivery system (RAS-wedge), and 11 bundles weighing from 15kg to 320kg using the paratrooper doors.

PAF C-130 fleet upgrade programme

The Defence Security Cooperation Agency of the USA has notified Congress of a possible Foreign Military Sale to Pakistan for a C-130 Fleet Upgrade Programme and associated

equipment, parts, training and logistical support for an estimated cost of $100 million.

"The Government of Pakistan has requested a possible sale of C-130B/E avionics upgrades, engine management and mechanical upgrades, cargo delivery system installation, and replacement of outer wing sets on six aircraft. Also included are spare and repair parts, support equipment, publications and technical documentation, personnel training and training equipment, US Government and contractor technical and logistics support services, and other related elements of logistics support at an estimated cost of $100 million". The proposed sale will facilitate the continued operation of the Pakistan's Air Force C-130 fleet (five C-130B and eleven C-130E models). The fleet is facing airworthiness and obsolescence issues, and will require upgrades and repairs for continued operation and effectiveness. The proposed modernisation of the C-130 fleet should ensure continued viability for an additional 10-15 years.

Textron AirLand Scorpion in maiden flight

Maiden flight of the Textron AirLand Scorpion light attack aircraft prototype took place on 12 December at Wichita Kansas. Designed as a low-cost strike/intelligence, surveillance and reconnaissance (ISR) aircraft, the aircraft was airborne for

approximately 1.4 hours, the crew conducting a range of handling manoeuvres during the sortie. The prototype was built "under wraps" by Cessna Aircraft in Wichita and is designated the Cessna Model E350 by the company, progressing from initial design to first flight in less than 24 months.

Scorpion's first flight was piloted by Dan Hinson, an engineering test pilot with co-pilot David Sitz. Scorpion's development was undertaken in secrecy and its existence not announced until 16 September. Intended as a demonstration aircraft, and powered by twin turbofan engines generating 8,000lbs (35.5Kn) of thrust, the Scorpion will transition easily between low speed and high-subsonic

speed as needed for diverse missions such as irregular warfare, border patrol, maritime surveillance, emergency relief, counter-narcotics and air-defence operations.

Raytheon to upgrade F-16 AESA radar

The Raytheon Company has signed a contract with BAE Systems in support of upgrading the Republic of Korea's fleet of more than 130 KF-16C/D Block 52 aircraft. As a key subcontractor to BAE Systems, the company will provide an integrated solution that includes the Raytheon Advanced Combat Radar (RACR), ALR-69A all-digital radar warning receiver, advanced mission computing technology and weapon systems integration.

This contract, booked in the fourth quarter 2013, adds the F-16 Fighting Falcon to the roster of fighters retrofitted with Raytheon AESA radars (F-15C, F-15E, F/A-18E/F and the EA-18G Growler). Since 2000, Raytheon has been the industry leader in AESA technology development. Raytheon's F-16 avionics heritage spans more than 25 years with deliveries of mission critical avionics systems including mission computers, electronic warfare systems, Anti-Jam GPS receivers and various weapons.

Textron takes over Beechcraft

It has been announced that Textron Inc has purchased Beech Holdings, with its range of piston and turboprop aircraft, for around $1.4 billion, after Beechcraft emerged from bankruptcy in February 2013. It had ceased production of its jet business aircraft, the rights to which were then offered for sale. The purchase by Textron, which already owns Cessna, Bell Helicopter and Lycoming Engines, is expected to be finalised in the first half of 2014. Cessna has not built any twin turboprop aircraft since production of the Conquest ended in the mid-1980s.

Corporate results for 2013

2013 was a good year for Eurocopter, with the company delivering 497 helicopters over the course of the previous 12 months. Renamed and rebranded as Airbus Helicopters in January 2014, the company started the new year with the certification of its new EC175 helicopter and the implementation of an ambitious customer-driven transformation plan.

"We enter 2014 with a transformation plan that is being applied across the company and responds to customers' evolving expectations," explained Airbus Helicopters President Guillaume Faury. "In parallel, the Airbus Helicopters rebranding provides a reference for greater ambition, inspired by the Airbus Group's values and excellence." A key focus of the transformation plan will be on ensuring product maturity, while continuing to deliver the highest level of mission capabilities and offer reliable and efficient support and services. Faury also reaffirmed the stress that Airbus Helicopters places on safety. As part of initiatives in this area, the company will begin deliveries of the EC130 T2 in 2014 with the Vision 1000 data monitoring and cockpit imaging system, following its pioneering use on the Ecureuil family of helicopters. The company's transformation plan is expected to capitalise on the 'favourite mission configuration' concept for Airbus Helicopters' products. This would reduce lead-times and improve cost effectiveness, thereby contributing to Airbus Helicopters' development and growth.

Airbus Helicopters' highlights for the coming months include start of deliveries of the new EC175, which has successfully completed the certification process. The EC175 marks the first time that Airbus Helicopters has integrated its state-of-the-art Helionix avionics, which enhances safety and operability, on a platform. Also to be certified in 2014 is Airbus Helicopters' new EC145 T2, also incorporating Helionix avionics, while increased production rates

Airbus Helicopters' EC-175

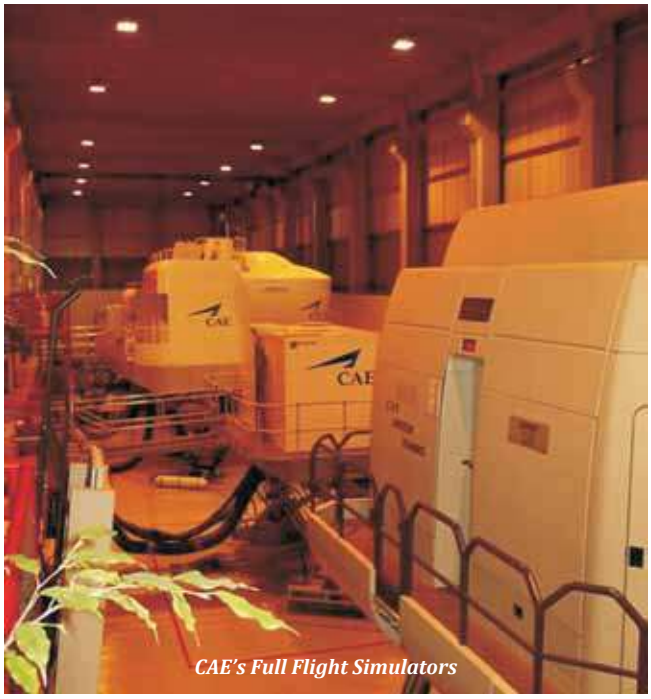
will be implemented for the military NH90, Tiger and EC725 helicopters during the year. For the next-generation of Airbus Helicopters now in development, the company will be applying new levels of crew-machine interface, automation and system integration thereby further enhancing flight safety.

BOMBARDIER Bombardier Aerospace delivered 238 aircraft during 2013, an improvement compared to the 233 aircraft delivered in the calendar year ending December 2012. The company also stated that it had received orders for 388 aircraft, net of cancellations, compared to 481 orders, net of cancellations, for the previous year. "The global economy has remained persistently sluggish, and with its recovery taking longer than originally anticipated, 2013 continued to be a challenging year for aviation," said Guy Hachey, President and Chief Operating Officer, Bombardier Aerospace. "Despite this difficult environment, we put in a solid performance overall. We had a successful order intake that included firm orders from a broad base of customers located in both traditional and emerging markets. A few of these included Flexjet LLC, VistaJet, American Airlines, the Ilyushin Finance Co. (IFC) of Russia and Iraqi Airways."

The number of business jets delivered by Bombardier remained almost the same, with 180 being delivered as compared to 179 in 2012. Bombardier delivered 10 fewer business aircraft in 2013 compared to guidance, mainly due to the transition from the Learjet 40 XR and Learjet 45 XR aircraft to the Learjet 70 and Learjet 75 aircraft, which entered into service in the fourth quarter of 2013. During this same period, the company received 305 net orders for business jets, compared to 343 for 2012.

In 2013, Bombardier delivered 55 commercial aircraft, compared to 50 for the previous calendar year ended 31 December 2012. The 2013 deliveries were in line with guidance. During this same period, the company received 81 net orders for commercial aircraft, compared to 138 for the previous year.

CAE Canada's CAE has set a new record for the sale of full-flight simulators (FFS), with 43 FFS already sold to date in fiscal 2014. The latest contracts include the sale of five full-flight simulators including one B787 simulator to Air Canada, one B737NG simulator to "an undisclosed customer" in North America as well as two A320 simulators and one B737NG simulator



CAE's Full Flight Simulators

to "an undisclosed customer" in Asia. The contracts are worth more than C$70 million, and bring the total number of FFS sales announced to date for fiscal year 2014 to 43. List prices include the value of OEM aircraft-specific data, parts and equipment (DP&E), normally procured by CAE in the manufacture of its simulators. In the case of these contracts, some customers are providing part of the OEM content. Two of the five simulators sold were recorded in CAE's third quarter and three in its fourth quarter.

"We are seeing unprecedented demand for simulation equipment, including from Asia's high growth market, and we are proud to maintain our leadership position in this robust market. We are pleased to have already exceeded our record in the sale of full-flight simulators with the year not yet complete," said Nick Leontidis, CAE Group President, Civil Simulation Products, Training and Services. "CAE has been a partner with Air Canada for over 20 years and we are proud to continue to support its training needs as it embarks upon its fleet renewal and growth strategy."

AIRBUS Airbus exceeded commercial targets in 2013, achieving a new record of 626 aircraft deliveries (493 A320 Family aircraft, 108 A330, 25 A380) to 93 customers, of which 15 were first-time customers. The company also received a massive 1619 gross orders (377 A320ceo, 876 A320neo, 77 A330, 239 A350 XWB, 50 A380), a new industry record, beating the previous record in 2011 by 11 aircraft. The year was also Airbus' most valuable gross order intake (list price $ 240.5 billion). By the end of the year, the backlog had climbed to an industry wide record of 5,559 aircraft, valued at $ 809 billion at list prices, or eight years production. Aircraft deliveries in 2013 were also up for the 12th year in a row, beating the initial target and surpassing the previous record set in 2012 (588) by an additional 38 aircraft.

Airbus A350 XWB taking off from Changi Airport during the Singapore Air Show 2014.

"2013 was an important and eventful year for the Group, not least because of the far-reaching make-over of our governance, shareholder structure and strategy. On the business and operational side we again increased revenues and profits, achieved record aircraft deliveries, the A350 XWB's first flight and initial A400M deliveries," said Airbus Group CEO Tom Enders. "Order intake was particularly strong for our Airbus commercial aircraft and provides a solid platform for the future growth of our Group. Strong demand allows us now to increase the single-aisle production rate. The restructuring and transformation efforts of Airbus Defence and Space as well as Airbus Helicopters are progressing well and will enhance the competitiveness and profitability of these businesses. We remain strongly focused on programme execution across the whole company." In 2013, revenues increased five percent to € 59.3 billion (FY 2012: € 56.5 billion), mainly reflecting higher commercial aircraft deliveries and the A400M ramp-up. Defence revenues were stable and reflected the portfolio mix of development and long-term defence contracts.

Capping off an extraordinary year was the A320neo, for which over 2600 orders have been placed. Strong sales of the A320ceo also continued, with over a 1000 sold since the introduction of the A320neo. The year also saw a significant commercial breakthrough for the A350 XWB, with first orders coming through from Japan. Demand for the A380 in the Very Large Aircraft market stayed strong, with over 50 new orders.

Signalling Airbus' successful transformation to a more agile company, 2013 was also notable for the A350 XWB first flight. Test flights are in progress with two aircraft having accomplished over 800 flight hours. The company hopes for certification to be completed by the third quarter of the year, and entry into the market is slated for the fourth quarter of 2014. 2013 saw the A330 new longer range and regional variants launched, and A330 production reached a new record high of 10 per month, although the single aisle production rate remained stable at 42.

On the military front, Airbus Military delivered 31 aircraft including seven A330 MRTT and two A400M for the French Air Force, confirming the programme is well back on track. "I thank the Airbus teams for these great achievements. The transformation of our company into a simpler, more agile and faster one is clearly taking shape. We are producing aircraft at all-time-highs and selling our market leading products at record levels," said Fabrice Bregier, Airbus President and CEO. "These benchmark results are feeding nicely into our profitability targets, and I am proud to report that the trajectory is showing strongly upwards. To expand our leadership in single aisles and widebodies, 2014 will be significant with the first flight of the A320neo and the Entry Into Service of the A350 XWB."

BOEING

Boeing set a company record in 2013 for the most commercial aircraft delivered in a single year, with 648 aircraft delivered in all. The company's backlog of commercial orders stood at 5,080 at the end of the year making this also a new Boeing record. Boeing also booked 1,531 gross commercial orders in 2013, another new company record and 1,355 net commercial orders in 2013, the second-largest number in company history.

Lufthansa became launch customer for the new 777X programme in 2013 (photo: Boeing)

In 2013, three programmes set records for deliveries in single year: the 737 programme delivered 440 Next-Generation 737s, the 777 programme delivered 98 aircraft, while the 787 programme delivered 65 Dreamliners. With higher production rates achieved in 2013, all three Boeing Commercial Airplanes production sites in Everett and Renton, Washington and North Charleston, South Carolina also delivered a record number of aircraft. Boeing's strong position in the twin-aisle market continued in 2013 with the launch of two new airliner programmes. The 777X was launched in November 2013 at the Dubai Air Show with 259 orders and commitments worth more than $95 billion at list prices. Boeing also launched the 787-10 Dreamliner, touted as "the most fuel-efficient airliner in history," at the Paris Air Show in June.

"With solid execution on our numerous production rate increases, the Boeing team performed extremely well in 2013," said Boeing Commercial Airplanes President and CEO Ray Conner. "We delivered more advanced, fuel-efficient airplanes to our customers than ever before, and it's a great example of what our team can accomplish. The year ahead will be exciting as we prepare to deliver the first 787-9, continue the design work on our newest programmes, the 737 MAX, 787-10 and 777X, while increasing our production rates on the 737. We'll remain focused on meeting our customer commitments by delivering the best products and services."

ATR ended 2013 breaking new annual records. The manufacturer increased its turnover to $ 1.63 billion, an increase of 13% compared to the previous year's $ 1.44 billion. Meanwhile, the firm continued to increase the pace of its deliveries, allowing it to achieve a new record with 74 aircraft delivered to customers during the year; an increase of 16% compared with 2012 deliveries (64) and 37% compared with 2011 deliveries (54).

A Lufthansa Regional ATR-72 (photo: Björn Strey)

Alongside these results were sales orders for a total of 195 aircraft (89 firm orders and 106 options), giving ATR a backlog of 221 firm aircraft orders as of 31 December 2013. The 89 firm orders represent an increase of 20% compared to orders from the previous year and the value of the 221 aircraft backlog is estimated at $5.3 billion. This backlog represents nearly three years of production and allows ATR to continue to increase its planned delivery rate for the forthcoming years.

The record deliveries made in 2013 also highlight the dramatic increase in the rate of deliveries, responding to the strong demand for ATRs worldwide. To date, over 130 ATRs from the -600 series are already in operation. Since the programme began in 1981, ATR has received net orders for 1,328 aircraft (443 ATR 42s and 885 ATR 72s). As of year-end 2013, ATR has delivered 1,107 aircraft (429 ATR 42s and 678 ATR 72s).

2013 proved to be another record year for CFM International with the company logging orders for a total of 2,723 engines, including 1,330 CFM56 engines (commercial, military and spares) and 1,393 LEAP engines (including spares). These orders, which were the highest level in the company's 40-year history, are valued at more than $31 billion at list price. In comparison, CFM booked a total of 1,998 CFM56 and LEAP engine orders in 2012 at a value of $23.5 billion at list price.

As the company logs record commitments, CFM is also achieving historic production rates for the CFM56 product line. The company delivered 1,502 CFM56 engines in 2013, compared to approximately 1,420 in 2012. Current plans are to reach more than 1,700 engines per year by 2019 as the company transitions from CFM56 to LEAP engine production. CFM has the highest production rate in the industry and has consistently built more than 1,000 engines per year since 2006.

"2013 was a big year for us in so many ways," said Jean-Paul Ebanga, president and CEO of CFM International. "The LEAP engine has seen the highest order ramp up in commercial aviation history and we are still more than two years away from entry into service. At the same time, the level of CFM56 engine orders is incredible as they nearly matched our LEAP orders for the year," he continued. "We actually sold nearly 500 more CFM56 engines last year than we did in 2012. That puts 2013 on par with some of the strongest order years in the programme's history. For us, this indicates that our customers have a very high level of confidence in the long-term residual value of their CFM56 fleets and tells us that we have made the right technology investments."

The CFM56 and LEAP engines are products of CFM International, a 50/50 joint company between Snecma (Safran) and GE. CFM is the world's leading supplier of commercial aircraft engines, with approximately 26,000 delivered to 530 operators around the globe. The company CFM officially launched the LEAP engine, which is its first all-new centreline engine in nearly 40 years, in 2008.

The LEAP engine promises to bring double-digit improvements in fuel efficiency, emissions and noise, while the legendary reliability and low cost of ownership of its predecessor, the ubiquitous maintaining CFM56 engine family. The LEAP-1A is an engine as an option on the A320neo family; and the LEAP-1C engine is the sole Western powerplant for the COMAC C919; and the LEAP-1B is the sole powerplant for Boeing's new 737 MAX.

DCNS's order intake in 2013 amounted to €2.3 billion, compared with €2.5 billion in 2012. The biggest order booked in 2013 was for the maintenance and modernisation of the frigates built under Saudi Arabia's *Sawari* I programme. At end-2013, the DCNS order book was worth €13.22 billion, compared with €14.46 billion a year earlier, and represented four years of revenue.

Revenue for 2013 amounted to €3.36 billion (compared with €2.93 billion in 2012) as work progressed on industrial programmes for France (FREMM frigates, Barracuda submarines, and through-life support for French Navy's front-line ships) and international customers (notably Brazil, India, Malaysia and Morocco). Revenue


FREMM of the Moroccan Navy

growth was boosted by progress made ahead of planning on the construction of two BPC-type projection and command vessels for Russia.

In 2013, operating profit before impact of purchase price allocation amounted to €166 million, or 5.0% of revenue, compared with €209 million, or 7.1% of revenue, in 2012. These numbers are explained by the operational difficulties encountered by industrial programmes in civil nuclear energy. Organisational and industrial measures have been taken to increase profitability in this area from 2014. At the same time, DCNS is maintaining the increase of its R&D expenditures to meet the needs of client navies and confirm the company's technological leadership.

Thales New Generation Laser Designation Pod

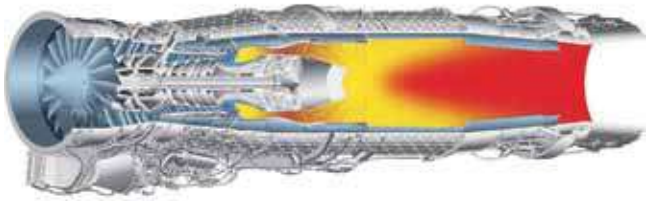
The French defence procurement agency DGA has awarded Thales with the contract to develop the New Generation Laser Designation Pod (PDL NG). This latest milestone is a follow on from the risk reduction phase led throughout 2013 and series production is expected to begin in 2018.

Thales will develop the PDL NG that will provide the French air forces with new day/night imaging and engagement capabilities in complex theatres of operations. The PDL NG will be designed to integrate with both the Rafale and Mirage 2000D fighter aircraft.

The risk-reduction phase, the first step in the development of any programme, confirmed the system's architecture, its high level of functional integration, reliability and the development schedule. The awarding of this development contract confirms the importance of optronics in future air combat systems and acknowledges the technical and operational expertise that Thales has acquired on laser reconnaissance and designation systems over the past 40 years.

Powering the future : Eurojet's EJ 200

The Eurojet GmbH consortium is responsible for the management of development, support and export of the EJ200 engine system. Eurojet shareholders comprise Avio (Italy), ITP (Spain), MTU (Germany) and Rolls-Royce (UK). Eurojet's primary customer is Eurofighter GmbH, the multinational company that co-ordinates the design, production and upgrade of the Eurofighter Typhoon. Since entry-into-service of the Eurofighter Typhoon in 2004, more than 1,000 EJ200 engines have been supplied around the world. There are 20 Eurofighter Operating Units all over the world, and the EJ200 engine fleet has achieved over 390,000 engine flying hours. The engine is 'deceptively powerful' given its small, light and simple design.



The twin-spool engine incorporates a tremendous amount of technology, and despite having similar dimensions to the Turbo-Union RB199 (the previous pan-European engine, used in the Panavia Tornado), manages to produce almost 50 per cent more dry thrust and 25 per cent more wet thrust than its predecessor. Not only does it vastly improve on the performance of the RB199, it uses some 35 per cent fewer parts (ca. 1800 against ca. 2800) !

Much of these improvements can be credited to simplified internals and more advanced materials engineering. Integrated blade-and-disk (blisk) rotors are used in both the high and low-pressure compressor sections, and it has only one high-pressure turbine (HPT) and one low-pressure turbine (LPT) stage. Not only do reduced parts counts make engines lighter and more reliable for a given performance level, they also make maintenance more streamlined.

The EJ200 is one of the candidates for India's Advanced Medium Combat Aircraft (AMCA) programme and given that the EJ200 is the baseline engine of a new generation design, there is a high potential for further growth, in terms of both efficiency and performance. In fact, Eurojet has already studied a second variant, dubbed 'EJ2x0,' which would offer a 20 per cent boost to dry and wet thrust. While company official stress that these "are only studies" for the moment, they are confident that, given the requirement, there is "no doubt" that they could deliver these improvements.

LEAP engine testing on schedule

CFM International's LEAP engine certification programme is proceeding on schedule, with 20 total engines to be on test by the year end. "This is the most extensive development and certification programme in our history," said Chaker Chahrour, executive vice president of CFM. "The tests we are performing are designed to push the limits of this engine, in addition to certifying it for commercial service."

The first full LEAP engine began ground testing in September, two days ahead of schedule, logging a total of 310 hours and more than 400 cycles during approximately five weeks of testing. This engine launched the most extensive ground and flight test certification programme in the company's history and will encompass 60 engine builds over the next three years and will accumulate approximately 40,000 cycles before entry into service. The engine recently successfully completed a series of early icing tests, one year ahead of required certification testing. "The engine behaved very well in extremely harsh conditions, validating pre-test predictions and reinforcing the company's confidence that the engine will certify on time and meet the performance and reliability promises made to its customers."

Over the next few months, CFM will complete early endurance testing and is on track to begin flight testing both the LEAP-1A and LEAP-1C configurations at GE facilities in California. The next big milestone will come in June when the first full LEAP-1B engine will begin ground testing at Snecma facilities in Villaroche, France.

"We are in the engine build-up phase right now," said Cédric Goubet, CFM executive vice president. "Like the LEAP-1A, this engine will have extensive instrumentation and will track more than 1,500 instinct engine parameters. The hardware is coming together smoothly and we look forward to putting the engine through its paces beginning in mid-June. We still have a lot of testing ahead of us, and problems may turn up in future engines," added Chahrour. "However, the point of these tests is to push the engine as hard as we can. We continue to get great data that is giving us real insight into this engine, and we are right where we want to be."

The foundation of the LEAP engine is heavily rooted in advanced aerodynamics, environmental, and materials technology development programmes. It will provide 15 percent better fuel consumption and an equivalent reduction in CO_2 emissions compared to today's best CFM engine, along with dramatic reductions in engine noise and emissions.

Ancient Aviator Anecdotes

A RAO IN TEXAS

In 1965 as a squadron leader in our air force, I was selected to attend a course of specialised flying training in the USA. Since it was a short duration course, there was no sanction for the family to accompany me. I found myself alone, air hopping from Delhi via Cairo, London, New York and Kansas to arrive at San Antonio in the southern state of Texas on my first visit to America.

I was escorted to the Language School at the Lackland Air Force Base as it was a USAF requirement that all foreign students must understand basic English before undergoing any training. It took only a few minutes for the school staff to learn that Indians were already fluent in the language. I was therefore required to just attend a few language workshops to familiarise myself with American aviation terminology. Consequently I was left with plenty of free time to adjust to the new environment. The service quarters on base were well equipped and comfortable; the only problem was that I could not cook. Breakfast and dinner were easily available at the cafetaria and club but at lunch time I sorely missed my *daal–chawal* and *subzi–roti*. The Indian diaspora was still in the far future hence there were no Indian restaurants then and no Indian families that I knew of.

In the San Antonio telephone directory, I was rather surprised to come across a 'Rao' listed and made a note of the number. I called the number and was happy to hear an unmistakably Indian voice. I introduced myself and found Mr Rao to be quite friendly. He explained that he was from Andhra Pradesh, had done a course in Agriculture and was now an academic at a university. When I mentioned that my wife too was from Andhra Pradesh, we immediately bonded. He observed that I sounded very homesick and, invited me over. I was of course delighted to accept and fantasised about an Indian meal at long last!

Mr Rao turned out to be about my own age and welcomed me warmly while we waited for Mrs Rao to join us. As she parked her car and walked in my spirits sank when I realised that she was American. Kathy was a very friendly and perceptive person who subsequently teased me a lot for the disappointment on my face when I saw that she was not Indian! They were most hospitable and invited me again a week later when I was surprised to be treated to a simple but delicious Indian meal.

I had meanwhile relocated to Randolph Air Force Base and was kept very busy at the Instrument Pilot Instructor School flying the twin jet T–39 aircraft and mastering new aviation academics, technologies and teaching methods. One weekend our Officers Club on base announced that the Hollywood celebrity duo of Dean Martin and Sammy Davis Jr would be performing live during dinner. I booked a table and invited the Raos who thoroughly enjoyed their show as much as I did. They thanked me profusely for the evening but it was I who was really indebted for my only *chakh le* India repast, to a Rao in Texas.

VAYU ♥ Valentine

It is a truth universally acknowledged that many married men tend to forget their wedding anniversaries. Some canny young ladies therefore choose to marry on 14 February, trusting that it's association with Valentines Day will help counter this annual male amnesia. On 14 February 1956 (a date selected by my bride–to-be), as a young 23 year old fighter pilot in our Vayu Sena, I married a young Mulkhi school teacher of Secunderabad whom I had been courting for five years. The marriage was performed in an old church situated at the isolated end of what was then known as Alexander Road. It is now a 200 year old Heritage building that overlooks a busy traffic junction on the renamed Sardar Patel Road terminus. The wedding reception was held in the Raj era 'Percys Hotel' which then oversaw vast spaces of open ground including a compete race course. It is today replaced by a multi storied commercial edifice that abuts an equally busy flyover on the same road. Our honeymoon was spent at a desert air base In Jodhpur where I was then posted.

In the next 30 years, Valentine's Day found us at IAF airfields or defence establishments at Ambala, Palam, Delhi, Wellington. Jamnagar, Hindan, Pathankot, Bangalore, Hakimpet, Adampur, London, Hyderabad and Udhampur. Retirement from the air force brought us back to Secunderabad to our home in the green environment of Vayupuri. One of the great benefits of the several transfers a service officer undergoes, is the growing number of new friends that are made in each posting. These friendships taught our family a great deal in our interaction with the numerous diversities that make up one nation. Valentines Day in each new place found our home filled with new friends (uniformed or otherwise) from all over India whose presence enriched our wedding anniversary.

Our post retirement activities involved regular travel and Valentines Day found us in various places in the country and abroad. Perhaps the most memorable was our Golden Jubilee anniversary. Being posted abroad, our two children were unable to be with us on our 50th wedding anniversary but had generously gifted us an all-expense paid holiday visit to the Holy Land. Valentines Day in 2006 found us in Mumbai embarking on a flight to Tel Aviv. As we boarded the aircraft, a surprise gift was awaiting my wife; she was presented with a bouquet of 50 roses and a chocolate cake by the airline staff who also assured us that both items had been security cleared! After we were airborne, at our request, the cabin crew cut and distributed the cake to our co-passengers many of whom came and congratulated us in several languages.

Valentine's Day 2014 marked our 58th wedding anniversary. Among our guests in our home on 14 February, were friends from Bengal, Kerala, Punjab, Andhra and the USA thus continuing to reflect the gift of friendship to this Vayu Valentine couple. As the astute reader will no doubt have observed, for all these years this writer has never been allowed to forget his wedding anniversary even once.

Air Vice Marshal (retd.) Cecil Parker

25 Years Back

From Vayu Aerospace Review Issue II/1989

'Agni' set for launch

DRDO's long-range technology demonstrator missile, informally known as the 'Agni', is set for launch in mid-April from the Interim Test Range (ITR), at Chandipur-on-Sea in Orissa. The missile is being assembled by scientists and once the launch is successful the country will boast of being self-sufficient to a great extent from the strategic defence point of view.

Dr VS Arunachalam, Scientific Adviser to the Defence Minister, has stated that parts for the missile were being prepared and manufactured indigenously in different laboratories in the country. Denying that the missile was named 'Agni', he said it was only after successful launches that it would be given a name. He said the missile was only a technology demonstrator and it was difficult to release the details.

30 leased 737s for IA

The Civil Aviation Minister Shivraj V Patil has stated that Indian Airlines was acquiring 30 Boeing 737 aircraft on lease along with some others to augment the fleet position.

He admitted that recent accidents to Indian Airlines aircraft had led to loss of capacity, some loss of confidence in the employees and adverse publicity, all of which affected the working of the airlines, punctuality of flights and revenue earned by them.

IA to withdraw Avro 748 services

Indian Airlines are to withdraw all Avro 748 services with effect from 15 April and pilots operating these aircraft are to undergo training on Boeing 737s.

Three stations (Tirupati, Vijayawada and Belgaum) will be delinked from the Airlines network and are likely to be taken over by Vayudoot. Nasik will be linked with a Boeing 737 from Ojhar, instead of the present Avro 748. This will enable the Airline to train its 35 turbo-prop pilots for Boeing 737s, some of whom have already an endorsement for the twin jet, in view of the induction of the Airbus A.320, the first of which are expected to join the fleet from June.

French offers on LCA

GIFAS, the association of French aircraft and space industries, has offered to supply India with "a package of advanced military hardware and technology", for its Light Combat Aircraft (LCA) project. An official has said that the package includes the latest long range air-to-air missile (the Matra Super 530D) and a short-range combat missile. The sale of navigation equipment was also a possibility, but he did not specify what India's response to the offer had been or when an agreement on the sale could be expected.

Meanwhile, Avions Marcel Dassault-Breguet Aviation has been providing design assistance to the Aeronautical Development Agency (ADA) on the LCA and has concluded a definition study on the project last September. France is also, alongwith several other European countries, negotiating to supply aerial tankers to the Indian Air Force, but New Delhi has yet to respond to that offer.

Karwar naval base

The Government of India have assigned consultancy to Nadeco (Netherlands Development Corporation) and Radecon of Australia for drawing up a master plan for the Karwar naval base codenamed 'Seabird', work on which has started by the end of March 1989. Vice Admiral Ravi P Sawhney, Flag Officer Command-in-Chief Southern Naval Command, said that 105 companies had bid for the tender. He stated that work on the actual construction of the preliminary phase of the base, for which Rs 350 crore ($230 million) had already been sectioned, would begin by March next year and the project would go well beyond the year 2000.

Review of the Fleet

The President of India Mr Venkataraman, reviewed the Indian naval armada at Bombay on 15 February 1989. Billed as the largest ever assembly of the Navy's ships, submarines and aircraft, the 'Review 89' was significant in view of the country's efforts to achieve a 'blue water' capability, to expand and modernize the fleet as also the Coast Guard and merchant marine. Some 70 ships and 40 aircraft took part in the Review, the fifth such to take place since India's independence. On display for the first time was INS *Chakra*, the N-powered submarine, as also the aircraft carriers INS *Viraat* and INS *Vikrant*, the latter with its newly installed ski-ramp for fixed wing V/STOL operations. The *Kashin*-class missile destroyers INS *Rajput*, *Ranvir*, *Ranvijay* and *Ranjit* represented the Western, Eastern, and Southern Naval Commands. The impressive flypast was led by helicopters : *Chetks* of INAS 321, followed by Ka-25s of INAS 333 and Sea Kings of INAS 330. The Naval Air Arm's fixed wing element comprised Islanders, Alizes, Kirans, Il-38s, Tu-142Ms and Sea Harriers of INAS 550, 310, 551, 315, 312 and 300 respectively. Bringing up the rear were four Chetaks, three Dornier 228s and two F-27s of the Coast Guard Air Squadrons 800, 750 and 700 respectively.

French help on third aircraft carrier

A contract has been signed with the French Government-owned design bureau to carry out project studies on development and construction of the third aircraft carrier for the Indian Navy. The carrier, when built, will be the first to be constructed in an Indian ship-building yard, the first two being British in origin and procured as second hand.

Expected to weigh between 30,000 to 35,000 tonnes, the third aircraft carrier would need between six and seven years to build after the detailed design.

Tale Spin

That magic '272'

As the country goes into hyper mode for the forthcoming national elections, political parties are striving to reach that magic figure of 272 seats in the Lok Sabha which gives them majority and, therefore, the invitation to form India's national Government. Watch this space !

Earlier, over the years, the Government of India had ordered Sukhoi Su-30MKI heavy fighters from Russia, in several batches which total = 272 ! Coincidence ? !

Tiger, Tiger burning bright

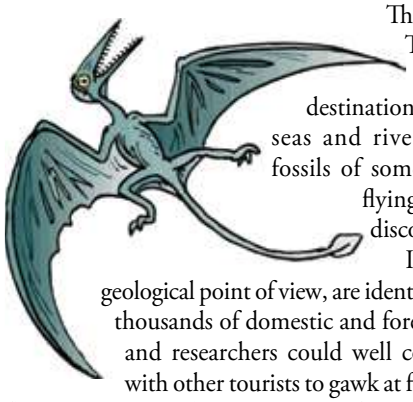
Tyger Tyger, burning bright,
In the forests of the night;
What immortal hand or eye,
Could frame thy fearful symmetry?

The English poet William Blake romanced the Tyger (Tiger) in his classic poem : the magnificent beast has fascinated mankind for aeons even though, now near extinction, frantic efforts are being made to ensure its survival after man relentlessly hunted it for centuries.

Tigers are among the most popular of the world's charismatic megafauna, featuring prominently in ancient mythology and folklore, and continue to be depicted in modern films and literature. Tigers appear on many flags, coats of arms, and as mascots for sporting teams.

The Tiger logo was adopted by the American Volunteer Group (AVG), the legendary 'Flying Tigers' in 1941, so too with the Indian Air Force whose No.1 Squadron has the Tiger on its crest (as does the Indian Navy's No.300 Squadron, albeit as a 'White Tiger'). The former celebrated its 80th anniversary in 2014, although it was raised in 1933 but older Tiger anniversaries are those of the famous Tiger Balm, around since 1914, Tiger Beer since 1932 and the controversial LTTE, which came into being in 1976.

Flying Dinosaurs of Jaisalmer



This Golden City in India's Thar desert could soon become a new tourist destination after discovery of deep seas and rivers evident along with fossils of some 180 million year-old flying dinosaurs which were discovered in the sands.

If these spots, from a geological point of view, are identified and conserved, then thousands of domestic and foreign geological scientists and researchers could well come to Jaisalmer along with other tourists to gawk at fossils of these prehistoric flying creatures in the vicinity, apart from contemporary aeroplanes practicing at the nearby Pokhran ranges.

How low can you go ?

If you can ....

Contributed by Lalit Mehra

.... so can I ! (Sukhoi Su-30 flashes by over the runway, just like the Blackburn Buccaneer above).

Afterburner

Irkut

Shinmaywa