

VAYU

IV/2011

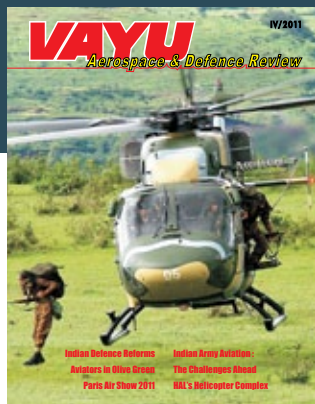
Aerospace & Defence Review



**Indian Defence Reforms
Aviators in Olive Green
Paris Air Show 2011**

**Indian Army Aviation :
The Challenges Ahead
HAL's Helicopter Complex**

CFM



Cover : HAL Dhruv Advanced Light Helicopter of the Indian Army in exercises (photo from Army Aviation Directorate)

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Defence Reforms

26 Brigadier Gurmeet S Kanwal, Director CLAWS writes on the challenges to National Security, 10 years after the Kargil Review Committee had tabled its report in Parliament. Many lacunae still remain in the management of national security and the Government has now appointed a Task Force on National Security and given them six months to submit its report.

Interview with

Maj Gen PK Bharali

29 Vision for the next 25 years



Aviators in Olive Green

33 The Indian Army Aviation Corps marks its Silver Jubilee in 2001. This article records its evolution from August 1947 till the independent Directorate came into being in November 1986, when Chetak and Cheetah helicopters were transferred from the IAF. The Army Aviation Directorate has slowly expanded and been prime mover behind HAL's Dhruv Advanced Light Helicopter.



Indian Army Aviation: The Challenges Ahead

46 The last 25 years, since Army Aviation Corps was established in November 1986, have been characterised by somewhat sluggish and stunted growth but also tempered in action at diverse battle fields from the arctic heights of the Siachen Glacier to the steamy jungles of Sri Lanka. In this article, Lt Gen B.S

Pawar (ret'd) who was ADG Army Aviation 2004-2006, reviews the ground realities and challenges of the near future.



Other side of the hill

52 Pakistan's Army Aviation also began on the same day as India's but there the similarity ends. As Maj Gen Waqar A Kingravi states, PAA is 'no longer a toothless supporting arm, but has a lethal punch.....'

Interview with HAL MD Helicopter Complex

54 An exclusive Vayu interview with P.Soundara Rajan, Managing Director of HAL's Helicopter Complex on present and future programmes, including progress on the LCH and LUH which are intended for large scale production and induction by the Indian Armed Forces.



Apache Joint Warrior

59 Dr Sean Wilson was on board HMS Ark Royal where the (British) Army Air Corps WAH-64D Apache AH1 attack helicopters were deployed and developing their role in a maritime environment. With exclusive photos also by the author.



Robust global market for helicopters

64 The demand for 16,900 new turbine helicopters has been forecast for the 10 year period beginning 2011, as the market responds to improving economic fundamentals and the world's military operators continue to require increased vertical lift capability.



Paris Air Show 2011

70 The Vayu editorial team covered this biennial Air Show, arguably the most important in the world, with on-the-spot reports on the main events amidst heavyweight rivalry between the global giants for airliner orders (it was A320neo all the way!). The Indian requirement for new fighters (MMRCA) saw lively sparring between the shortlisted candidates even as the Gripen NG made its confident appearance. Richard Gardner met with Chairman HAL at their chalet which continuously hosted various Indian delegations (mostly defence). In parallel paths, two Indian low-cost carriers created history by ordering 252 A320neos.

Airbus : Moving towards Vision 2050

90 Airbus has revealed it's *European Aviation Vision 2050*, an inspirational roadmap on how the sector will handle 16 billion passengers and 400 million tonnes of cargo annually. Even as A380s are going into service in Korea and A320s are being assembled in China, Vayu readers are given a preview of what passengers in 2050 will experience as per the Airbus concept.

On Wings of the Wind Spirit

125 50th Anniversary of the HF-24 Marut's first flight was celebrated by HAL in June 2011. Even as veteran 'Marutians' gathered for a weekend of bonhomie and nostalgia, the definitive history *Spirits of the Wind* by Pushpinder Singh was released at a function; an extract is taken from the book.

Also :

An Army Adventure, Israeli Companies at Le Bourget; MROs : Trends and Challenges; Missile Miscellany; 'Collective Heroism'; 'Fly (LCA) Navy, Fly'; The Final Lap.

Regular features :

Commentary, Outlook, Viewpoint, Aviation & Defence in India, World Aviation & Defence News, Tale Spin.

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Plane Truths

Air India is back in the news again with its familiar story of imminent collapse. The State-owned airline is poised to lose nearly Rs 8,000-10,000 crore this year, is paying salaries a couple of months late, is on the verge of defaulting on aircraft loans, and is snowed under Rs 42,570 crore of accumulated debt. A company with Rs 2,145 crore equity has dug itself into a Rs 100,000 crore hole in debts and losses. Does it deserve a lifeline? Astoundingly, the answer is yes if the company is owned by the government and the tab is picked up by the taxpayer. Should the airline's management be allowed to continue? Again astoundingly, yes. Moreover, the managers that brought Air India to such a pass now have the job of turning it around. The government will over the course of July review plans to park two-thirds of the bloated airline's 30,000 workers in ground handling and maintenance subsidiaries, to buy another 100 planes, to pump in Rs 43,255 crore equity, and to pay overdue bills for ferrying ministers and officials.

In the wonderland of State-run enterprises, the taxpayer is bemused. Looks suspiciously like throwing good money after bad. Yet, the bigger fleet and extra cash are needed so that Air India can earn Rs 5,000 crore more and run on Rs 4,000 crore less every year. To do this, the airline must cart 17 million people in 2015. If it manages to accomplish this, it could fly out of the red five years from now. But before the government signs over shiploads of rupees, shouldn't it be asking for some guarantees? This is not the first revival plan the airline has come up with. Air India operates in the real world, not inside central hall of Parliament where you can go round and round in circles and never turn the corner.

Air India can survive if it is run like an airline, not a ministerial fief. The question its owner must ask is how best can this be accomplished, not how to micro manage near-death experiences. If Air India serves the national purpose by expanding its operations in a rapidly growing industry, it has to be as a viable entity. Unless the government acquires extraordinary powers of delegation overnight, the airline is better left to professional managers who are answerable to shareholders. Privatising Air India has, for one reason or the other, been knocked off the government's agenda every time serious thought has gone into it. Even listing the airline with majority government ownership will bring some commercial accountability to its management. There's no point in keeping the Maharaja on life support indefinitely.

From: Hindustan Times

Marching Orders

Lord Levene's proposals for streamlining the (UK) MoD are eminently sensible. The sooner the military top brass surrenders to the inevitable, the better.

The sensible proposals by Lord Levene of Portsoken for shaking up the organisation of the Ministry of Defence are overdue. For too long, the Army, Royal Navy and Royal Air Force have wasted time and effort fighting each other for resources. And for too long, duplication among the forces has robbed the front line of cash. Lord Levene's proposals, if implemented properly, could help to address these issues.

Some have dismissed the review as a minor skirmish when the real war lies elsewhere. As an investigation by The Times

highlighted last year, the biggest problem with the organisation of Britain's defence has been the billions wasted on buying the wrong equipment, at the wrong time, at the wrong price thanks to the shambolic procurement processes. The cost of all this waste is estimated to be about £6 billion a year.

The appointment of Bernard Grey as the new head of procurement in December means this battle has already been joined, while other reviews going on within the MoD will probably prove more significant.

Nonetheless, Lord Levene's suggestions are important. Britain's pitiful record in procurement is partly due to the chronic lack of accountability in the MoD, which the proposals seek to address. His review is not, as some skeptics suggest, merely a blueprint for rearranging the deckchairs.

The immunity of the top brass to the cuts that have taken place lower down the ranks has reached Rurutanian proportions. We now have more generals than battalions, more air marshals than fighter squadrons and more admirals than ships. A bit of trimming would surely be healthy.

Putting common functions such as cyber warfare and military intelligence into a new joint forces command looks a sensible way to save money and improve delivery to the Services. Any well-run company would have done so years ago, not that the defence chiefs would like to be compared with mere chief executives.

Nor will they like Lord Levene's proposal that the single Service chiefs be removed from the Defence Board, which takes all the major decisions. The board will be headed by the Defence Secretary and should include external non-executives while the Chief of Defence Staff, currently General Sir David Richards, would represent all the Services. In theory, this should streamline the process and speed decision-making, the Services thus speaking with one voice. Some MoD civilians are skeptical that it will actually make much difference and suggest it might be better to keep the Service chiefs in the tent. But efforts to get the Services to work more closely together should be boosted by the proposal to reward officers for taking tri-Service jobs rather than sticking to their branch of the military.

In return for being turfed off the Defence Board, the Service chiefs are being promised increased control of equipment programmes and greater freedom to allocate their budgets in an attempt to improve accountability.

Liam Fox, the Defence Secretary, has strongly backed all recommendations, but then the cynics suggest Lord Levene's brief was so tightly drawn that the result was fairly predictable.

Whether the proposals make much impact will clearly depend on how they are implemented. Some senior officers are doubtful that the financial micromanagement from Whitehall will end. And they may well be right. Will they really be allowed to control their own budgets when the political cost of mistakes is so high?

In pushing through the proposals, there is clearly a risk of alienating the top brass. But that is a risk that Dr Fox should be more than happy to take.

From: The Times, UK

The tide of war

"The tide of war," President Barack Obama said of Afghanistan earlier "is receding." The storming of the Intercontinental

MBDA on CD

Hotel in Kabul, which claimed the lives of 12 civilians, was a sharp riposte. Believed to have been carried out by a suicide squad despatched by the Taliban-affiliated warlord Jalaluddin Haqqani, the assault isn't the most lethal the country has seen this summer: suicide attacks, bombings, and ambushes continue reaping the lives of Afghans in ever greater numbers. In a report recently released United Nations Secretary-General Ban Ki-moon said violence in Afghanistan caused 2,950 civilian casualties, including 1,090 deaths, in the last three months—up a dramatic 20 per cent from the number for the same period in 2010. It said anti-government forces were responsible for eight in ten of the killings; one-tenth were caused by Afghan and allied forces and a tenth could not be attributed to either side. Noting that “suicide attacks have increased significantly since March,” the report observes that “abductions and assassinations of Afghan citizens also rose.” Fighting has escalated in the country's east, and jihadist groups like the Islamist Movement of Uzbekistan are reported to have an increasing operational capability in the north, an area long considered relatively peaceful.

Earlier Mr. Obama announced a schedule for the withdrawal of 33,000 troops from Afghanistan by the end of next summer, a precursor to a final pullout. His claims notwithstanding, Afghanistan is being left to its fate: none of the strategies intended to lay stable foundations for the future has worked. Last year's surge of troops did cause heavy attrition among the Taliban, but failed to contain violence. The United States and its allies, which have now held three rounds of meetings with interlocutors for the Taliban in Europe and the United Arab Emirates, also hoped the surge would push the jihadists into agreeing to a peace deal. However, secure in the knowledge that its superpower adversary is leaving, the Taliban have good reason to escalate violence — suffering attrition in the hope of demonstrating to its supporters that it drove the U.S. out, and to its enemies, that its rise is inexorable. Islamabad, in turn, continues to shelter and fund the Jalaluddin Haqqani network as well as other Taliban elements, in return for their help in battling jihadists seeking to overthrow the Pakistani state. In the months to come, more blood will be spilt as both Afghan jihadists and their adversaries compete to secure their positions in anticipation of the final U.S. pullout. Barring a miracle, Afghanistan has little to look forward to other than a rising tide of blood.

From: The Hindu

Game not over in Asia

As the debt-ridden US struggles to reduce its deficit and a cash-rich China flexes its muscles, most of Asia is worried about a weakened America retreating from the region. Robert Gates, the departing US defence secretary, stepped in to dispel these fears. He told a gathering of Asia's defence officials in Singapore that America's “robust military engagement and deterrence posture” will not only continue but expand. Given America's deep strategic and economic interests in the Asia-Pacific region, it is not an empty assurance.

America's stake in Asia is enormous - nearly a trillion dollars in annual trade, billions of dollars of investment, to say nothing of the security of its allies, its global standing and the importance of the South China Sea that carries a third of the world's trade. Concrete reasons aside, for the US not to counter perceptions of declining commitment to the region would undermine its influence.

It is no coincidence that Gates's reassurance came mere weeks after reports of new tension between China and the South China Sea claimants - Vietnam and the Philippines. Vietnam has always been more public in its denunciations of Chinese harassment of its fishermen and exploration vessels. But last week, the Philippines too was uncharacteristically blunt in condemning hostile Chinese actions in what it claims as its territorial waters. Gates diplomatically blamed a lack of “rules of the road” for these clashes. But there was no mistaking whom he saw as responsible for not respecting agreed codes of conduct.

It was against this backdrop of Chinese assertiveness that secretary of state Hillary Clinton launched her “America is back in Asia” slogan. China's spats with Japan over the Senkaku/Diaoyu islands and its support for North Korea's aggressive behaviour have prompted its neighbours to ask for a greater American commitment. In July last year, Clinton provoked a sharp Chinese response when she offered the US's good offices for a peaceful resolution of the South China Sea dispute. Encouraged as they were by the new American assertiveness, they have since grown anxious about how impending cuts in the Pentagon's budget will impact the US presence in Asia. Gates was upfront in admitting that drastic cuts in the defence budget (of \$400 billion over the next 12 years) are in the works, but assured allies that the focus has been first on cancelling troubled or unnecessary weapons programmes and culling excess overhead. However, “key remaining modernisation programmes - systems that are of particular importance to our military strategy in Asia - will rank at or near the top of our defence budget priorities,” he announced.

In recent years, China has developed anti-submarine and anti-ship ballistic and cruise missile capabilities to counter the power projection of the US's carrier battle groups. But without mentioning China by name, Gates noted US concerns about “anti-access and area denial scenarios” and said that the US was working to develop a new concept of operations - called “Air-Sea Battle” - to ensure that America's military will continue to be able to “deploy, move, and strike over great distances in defence of our allies and vital interests”. These programmes, he said, would grow “even in the face of new threats abroad and fiscal challenges at home, ensuring that we will continue to meet our commitments as a 21st century Asia-Pacific nation - with appropriate forces, posture, and presence”. As part of an expanded US role in the region, Gates announced the deployment of littoral combat ships to Singapore. These short-range, high-speed warships, optimised for shallow-water operations with anti-submarine and demining capacity, would be best suited for South East Asian waters.

To underline America's new position in Asia, Gates noted how its former enemy Vietnam now has a “strong and vibrant bilateral relationship” in trade, security and defence. The US and India, he said, were working “more closely together than ever before”.

Worth noting is that Gates underscored America's deepening commitment to Asia while taking care to avoid antagonising Beijing. Gates pronounced China-US relations as being on “a more positive trajectory”, a view with which his Chinese counterpart readily agreed. Notwithstanding their recent provocative behaviour, Chinese leaders are aware of the limits to their power. The plain statements about the US's determination to stay in the region were thus a sobering message to take back to Beijing.

From: The Times of India

Agusta Westland on CD

Whither Indo-Russian Defence Relationship?

Strangely, there are two very divergent trends now clearly visible: there is a watershed in the long-standing defence relationship between India and Russia. On one hand, from a mere vendor-buyer linkage, the association has developed into a partnership in many spheres with projects for joint development of platforms including the BrahMos supersonic missile, the fifth generation fighter aircraft (FGFA) and the multi role transport aircraft (MRTA). On the other hand, India's dependence on Russia as the almost exclusive weapon supplier has dropped and with it Russia's share of the Indian defence market. Coupled with a major irritant, by way of poor after sales product support consequent to the collapse of the Soviet Union and the often buyer-unfriendly attitude of Russian bureaucracy, one has a scenario where the goodwill built over long decades of unswerving Indo-Soviet/Russian friendship could get mired into mutual recrimination and even distrust.

Recently, there was a frank and wide ranging discussion with this author during the *International Maritime Defence Show* (IMDS) at St Petersburg. Viktor Komardin, Deputy General Director Rosoboronexport (ROE) stated that since India was the customer, it was its prerogative to dictate terms and demand more sophisticated technology, platforms, etc. He claimed that Russia was willing to provide transfer of technology, work on joint ventures, and import knowledge to Indian experts. The times were over when Russia would merely sell licences to India to manufacture products – the current situation was one where Russia was actively pursuing joint ventures for joint development and joint production of defence equipment. However, it was for Indians to analyse and come out with their own specific needs and he admonished it against buying “one size fits all” platforms and systems from western “off-the-shelf” vendors.

On the spate of bad press that Russia has been getting on account of poor after

sales service, he admitted that there have been needless delays “caused by bureaucratic hassles on both sides and systemic problems at the Russian end”. These were now being actively sorted out. As an example, he referred to the studied success of Rosoboronservice (India) Ltd, created for after sales service. This unique organisation, formed six years ago as a joint venture between an Indian private sector company – Krasny Marine Ltd and Rosoboronexport plus seven of its OEMs on the other—has been a resounding success and sorted out a very large number of the Indian Navy's after sales service and spare parts problems. He however, admitted there was no immediate plan for a similar set-up to support to the Indian Air Force or the Indian Army “whose needs are humungous”. He also mentioned that in the case of recently supplied platforms, ROE was likely to sign long term contracts with the Indian MoD for the comprehensive supply of spares.

Asked why ROE was not more aggressive in its marketing efforts in India, Mr. Komardin said, “We do not believe in pressurising our friends through overblown marketing claims. Our product quality, reliability, dependability and functionality under battle conditions speak for themselves. Our products are not designed for show or for parades; they are designed and built to be rugged and reliable in war. The actual user understands the superiority of our military platforms and hardware. What is the use of image-building advertisements and marketing PR?” Although this sentiment sounds very commendable, it is a fact of life that good communication is a vital ingredient in all sales and marketing efforts in today's competitive world.

It is acknowledged that Russian scientists and technologists have been and still are well ahead of their counterparts in other parts of the world. Russian-origin technology is today readily available to India, something that West European and US companies

are loath to part with. As official policy, the Russian government is ready to transfer technology whenever a joint manufacturing tie-up exists. The Russians are slowly beginning to understand the compulsions of competitive markets and are consequently changing their attitudes, well realising that the days of pure vendor-customer relationships are numbered. They also appreciate that India is a vast market with not only a huge domestic demand but also the ability to cater to the needs of other countries in the South Asia and SE Asian region. They empathise with India's desire to upgrade its own manufacturing and technological base and given lower manpower costs, accept that joint venture manufacturing facilities in India would lead to a “win-win situation for all”. Indian manufacturing companies, including those in the private sector, should capitalise on this advantage and negotiate attractive terms with their Russian counterparts.

Still, what was rather disappointing to this author was that, given Russia's huge military industrial complex, its healthy economy as one of the four BRIC countries and its history of a near monopoly supplier of major military equipment to India, there were only two Indian firms present and participating in IMDS at St Petersburg this year. One was Rosoboronservice (India) Ltd and the other BrahMos Aerospace. Just two! No Indian delegation nor exhibitor was present, not from the private sector, not from the public sector. While CNN-IBN deemed the event important enough to send a team to cover IMDS, industry representatives were conspicuous by their absence.

On a brighter note, Russia's Vypel Shipyard announced that they were on the verge of forming a joint venture with an Indian private sector company, Krasny Marine Services Pvt Ltd for establishing a shipyard in India to manufacture *Mangust* waterjet patrol boats with a top speed capability of over 55 knots.

Amrish Sahgal

Eurojet on CD

It's time for Britain to merge its Army, Navy and Air Force

A reflection on the events that have led to the merger of Britain's Armed Forces will identify Liam Fox's announcement of wide-ranging reforms to the Ministry of Defence's structure as the moment when the demolition of UK's proud military traditions began in earnest. After decades of chronic under-funding, it was inevitable that a small country such as Britain could no longer afford the luxury of maintaining independent command structures for its Army, Navy and Air Force. With defence spending slashed from 5 per cent of GDP at the end of the Cold War to just 2 per cent by 2011, the individual Services had already been reduced to such a parlous state that they could barely carry out even the most basic military tasks.

The evisceration of the Royal Navy's surface fleet meant that there were more admirals than ships for them to command. Drastic reductions to the numbers of combat aircraft had seen the Royal Air Force shrink to its smallest size since the First World War, to the point where unflattering comparisons were drawn with its equivalent in Belgium, a country not renowned for its aerial supremacy. And while the Army could claim to have retained a respectable number of combat

brigades, it did not have the funds to equip them all.

Indeed, looked at from this perspective it is easy to see why, rather than simply looking to streamline the command structure of the Armed Forces – as Dr Fox proposed in June 2011 – the next generation of politicians decided to go the whole hog and simply merge the three Services into a single establishment.

The disastrous impact that years of inter-Service squabbling has had on the nation's defence capabilities suggests that the sooner such an amalgamation of military resources takes place, the better. It would, after all, solve a host of problems. Rather than the MoD being racked by petty in-fighting between the RAF and Royal Navy over which Service will have responsibility for flying combat missions off the new multi-billion-pound aircraft carriers currently under construction at Rosyth, pilots would simply be drawn from Britain's unified air command. Similarly, the looming power struggle between the RAF and the Army over whether soldiers or airmen take the controls of the new generation of Apache attack helicopters would be neatly side-stepped.

The present Government would, of course, recoil from any suggestion that the

aim of its proposed reforms is to follow the recent Canadian example of unifying the rival Forces under a single command, and doing away with centuries of military tradition in the process.

Announcing his reforms, Dr Fox said that the main aim was to undertake a wide-ranging reform of the “bloated and dysfunctional” Ministry of Defence which, a full year after he assumed responsibility for the department, is still struggling to provide him with an accurate assessment of just how large its overspending really is. Certainly, no one is going to quarrel with the Defence Secretary's determination to end the ministry's long-standing habit of indulging in “fantasy” defence projects that are both unaffordable and undeliverable. These are the primary cause of the black hole in his department's finances, which is estimated at £36 billion, but might amount to billions more.

Yet a closer reading of the good doctor's prescription for healing these self-inflicted wounds suggests he is clearly of the opinion that it is the top brass that are mainly to blame, rather than the civil servants who are supposed to be running the MoD. This is demonstrated not least by his plan to remove the heads of the three Services from the department's Defence

Boeing Defence on CD

Board – a clear indication that he sees them as ultimately responsible for the appalling cost over-runs.

The report of the Defence Reform Unit, a body of experts from private industry and senior internal officials, will propose Dr Fox to head the MoD's most senior decision-making panel. The heads of the three Services as well as the second highest officer in the Armed Forces will lose their places on the Defence Board.

Thus, the Armed Forces of the future will not only be more integrated on the battlefield but also in the way they purchase equipment, plan exercises, order supplies and even gather intelligence under the proposed reforms. The new tri-Service organisation will be headed by a four-star officer and will incorporate the military's Permanent Joint Headquarters, which already brings together the Army, Navy and RAF on operations overseas. If accorded the level of importance recommended by Lord Levene of Portsoken, its creation will make the second-in-command post for the Army, Navy and RAF redundant.

The report recommends transferring the power of the Commander-in-Chief (Land), Commander-in-Chief (Air) and Commander-in-Chief (Fleet) to the heads of each Service, who will each take on more responsibilities for their respective branch. This would help to reduce the number of costly generals, admirals and air chief marshals, though the number of senior military and civil servant posts to be eliminated has not been specified. A key gauge will be the calibre of commander appointed as the first Joint Forces Commander, who will sit under the Chief of Defence Staff, raising doubts over whether the post of Vice Chief of Defence Staff is still necessary.

Another focus is financial accountability. If adopted, the proposals will make the heads of the Army, Navy and RAF more accountable for their own budgets as they will be able to decide how their resources are split between training, hiring new personnel or buying low to medium value equipment. Big ticket items such as aircraft carriers and fighters will still be decided by the Defence Board, headed by Liam Fox, the Defence Secretary, with Nick Harvey, the Minister for Armed Forces.

Lord Levene remarked that “this new model for Defence management that we have proposed aims to build on the strengths of the individual Services. But it aims to do so within a stronger single Defence framework, which ensures the whole is more than the sum of its parts.”

In the backdrop of the Eurofighter Typhoon combat aircraft being shortlisted in a \$10.4 billion Indian tender, British Defence Secretary Liam Fox was looking to expand defence business ties with India in his flying visit to the country in early July. In his remarks, Fox said, “In today's world of multi-layered security and economic interdependence, the UK and India are looking for relationships that are built on partnership and respect, not one-off transactions” and added that “investing in the Eurofighter would give India a relationship with ‘partners of choice’ in global security. While China is seen as an emerging superpower, the UK was looking closely at how Beijing manages its internal challenges. We shouldn't see this as simply an aircraft. It's about buying into a strategic relationship. Britain's approach to these things has been too transactional in recent years. But what we now need to do is think strategically, think about interoperability, about our partners of choice in global security. The Eurofighter Typhoon not only provides India with cutting-edge operational capability, but also unmatched potential for an enduring strategic partnership in developing future defence technology.”

New Labour was never at ease with men in uniform and given its unpopular involvement in the campaigns in Iraq and Afghanistan, was in no position to undertake such radical changes at the MoD. The fact that Dr Fox now seems determined to cut the military down to size, while bestowing greater powers on the civil servants who are equally culpable for the ministry's profligacy, suggests that a significant shift is taking place in the balance of power within the defence establishment, one that is likely to have profound implications for the survival of the Services as individual entities.

In future, the only serving officer on the reconfigured nine-member Defence Board will be the Chief of the Defence Staff, currently General Sir David

Richards. This places an enormous amount of responsibility on the CDS's shoulders. As the representative of each of the Armed Forces, he will be expected to be fully informed on any issue relating to any of the Services, a position that could place him at a distinct disadvantage when challenged by the well-briefed civil servants who will occupy the majority of the seats on the board. As one senior officer remarked yesterday: “This is nothing short of a Civil Service takeover of the military.”

There will be those who see these changes as the Government's way of putting the uppity top brass back in their boxes after various injudicious comments on the limitations of Government policy on Libya and Afghanistan. Nor should it be forgotten that, having made much political capital from the public indiscretions of senior officers under Labour, the Tories are determined not to suffer similar indignities.

Yet in terms of the military's long-term future, the really ominous development for the military chiefs is the proposed change to their command structure, which will involve a sharp reduction in the “star count” – the number of expensive one-star officers and above – as well as a radical restructuring of the command chain. This will see the operational requirements of all three Services brought under the control of a new Joint Forces Command, which will have overall responsibility for directing future military campaigns.

This lays the foundations for that future merger feared by those in the military. Yet, in many respects, the Service chiefs have only themselves to blame. The bitter rivalries that erupted during last year's defence review undoubtedly had a detrimental effect on its outcome. Merging the Armed Forces into a single entity would not only put a stop to such counter-productive squabbling, it would provide us with the lean, mean fighting machine we will undoubtedly need to protect us against the many dangers that lie ahead. Our senior officers put self-interest above the national interest – and that is a luxury this nation can no longer afford.

Extracted from 'The Times', London with articles by Lord Levene, Con Coughlin and Deborah Haynes.

IRKUT

repeat 3/2011

Merkel promotes the Eurofighter

During her 24-hour visit to New Delhi on 31 May 2011, German Chancellor Angela Merkel 'hardsold' the Eurofighter Typhoon to India even as she discussed a whole range of issues with Prime Minister Manmohan Singh, including the situation in Afghanistan and Pakistan in the wake of the killing of Osama bin Laden.



"With the Eurofighter, we have made good proposals and want to intensify our relationship with India. The Eurofighter is the best on offer. We will not exert any influence on the procurement procedures which are very transparent... we believe we have a good product and we shall wait and see," she said at a joint press conference with the Indian PM after the signing of four accords between the two countries to expand cooperation in the fields of education, research and nuclear physics. German Defence Minister Thoma de Maiziere, who was among the ministers accompanying Chancellor Merkel, held separate talks with Defence Minister AK Antony.

'Indian concerns' cause France to reconsider arms sale to Pakistan

According to reports, the French Government is considering suspension of sales of heavy military equipment to Pakistan till it receives clarification on various issues. French Defence Minister Gerard Longuet has said that his Government has asked Pakistan for certain clarifications.

Longuet's statement came a day after his meeting with Indian Defence Minister A K Antony when the issue of French arms sales to Pakistan was raised. He was assured that France was processing only sales of air defence systems. France has for long been a major arms supplier to Pakistan, the entire Pakistani submarine fleet is of French origin, the Pakistan Air Force continues to operate large numbers of Mirage III/5 fighters but these are steadily being supplanted by Chinese JF-17 Thunders.

The French Minister, who was on a two-day visit to India, also made a strong pitch for the French Rafale fighter for India's \$10-billion M-MRCA contract. According to him, France is committed to providing the best technology to India. "We have one single speaking partner (Dassault) instead of four partners (European firms from Italy, Germany, Spain and UK)," he said, referring to EADS, the other company in competition.



Third and fourth C-130Js arrive

The third and fourth of six Lockheed Martin C-130J Super Hercules for the Indian Air Force departed the company's facility in Marietta en route to Air Force Station Hindon in mid June. The remaining two C-130Js on order will be delivered subsequently.



CAE's C-130J full-mission simulator for IAF

The C-130J full-mission simulator being designed and manufactured for the Indian Air Force "is progressing on-schedule" for delivery later this year to the Air Force Station, Hindon. CAE is currently developing the C-130J simulator for the IAF under subcontract to Lockheed Martin, who is providing the simulator to the IAF as part of the overall acquisition of six C-130J aircraft.

The C-130J simulator for the IAF is currently at the CAE USA facility in Tampa, Florida where it is undergoing software and systems integration as well as final assembly and testing. The simulator is scheduled for power-off at CAE's facility in October, after which it will be shipped to India. The C-130J full-mission simulator for the IAF is on-schedule to be ready-for-training in India by February 2012.

Pawan Hans repeat 3/2011

IAF Mirage 2000 upgrade programme cleared

After several years of evaluation and negotiations, the Cabinet Committee on Security chaired by the Prime Minister, finally approved on 13 July the \$2.4 billion deal to upgrade the balance of 51 Mirage 2000 H/TH fighters with the IAF. Two aircraft will be upgraded by Dassault Aviation and Thales with other supporting companies in France, two in India with French assistance and the balance 47 by Hindustan Aeronautics Limited (HAL). It will reportedly take nine years to complete upgradation of the entire fleet.



This high-priced upgradation includes a night vision goggle-compatible glass cockpit, advanced navigational systems, advanced IFF system, advanced multi-mode multi-layered radar, fully integrated electronic warfare suite and advanced beyond visual range (BVR) capability. Another \$ 1 billion would be required for new weapons which include 450 MICA missiles while HAL will spend some \$ 500 million for new facilities at its Overhaul Division, taking the total cost to about \$ 4 billion. The upgraded Mirage 2000s would therefore cost an estimated \$ 79 million per aircraft and this has been a matter of expressed concern within the Ministry of Defence and Air Force. On the other hand, it is felt that “once upgraded, the Mirage 2000s will be as potent as a new combat aircraft.” (see ‘The Merits of Fighter Upgrades’ in *Vayu* issue III/2011)

Boeing C-17 Globemaster IIIs for IAF

The 10 Boeing C-17 Globemaster III airlifters being acquired by the IAF will be powered by Pratt & Whitney F117 engines. This Foreign Military Sale, approved by the US Congress in May 2010, establishes India as the C-17's largest international customer. According to the agreement, India will take delivery of the C-17s in 2013 and 2014.

“This agreement is a reflection of the outstanding partnership India’s Ministry of Defence has with the U.S. Air Force, which worked very hard to help India strengthen its airlift capabilities with the C-17,” said Jean Chamberlin, Vice President and General Manager, Boeing Mobility. “The aircraft’s ability to transport large payloads across vast ranges, land on short, austere runways, and operate in extremely hot and cold climates makes it ideal for the region.”

Boeing will support India’s C-17 fleet through the *C-17 Globemaster III Sustainment Partnership*, a proven multinational Performance-Based Logistics programme. The GSP ‘virtual fleet’ arrangement ensures mission readiness by providing all C-17 customers access to an extensive support network for worldwide parts availability and economies of scale when purchasing materials.

Upgraded An-32REs for IAF

Four of the first batch of five An-32 tactical transport aircraft that recently underwent ‘total technical life extension’ (TTLE), overhaul and re-equipment at Ukraine were received back by the IAF on 8 June, albeit with a new nomenclature, An-32RE. Air Marshal Joseph Neri, Air Officer-in-Charge Maintenance said that the re-equipped An-32RE aircraft would fulfil tactical transport requirements of the IAF up to and beyond 2025.



Air Marshal J Neri, Air Officer-in-Charge Maintenance, Air Marshal RK Vashisht, DG (Aircraft) and Subash Chandra, Joint Secretary (G/Air), Ministry of Defence during induction ceremony of “life extended and re-equipped AN-32 aircraft” held at Air Force Station Palam, New Delhi on 8 June 2011

An-32s have been operational with the IAF since 1984, flying more than 800,000 hours on various missions which include operation from hot and high airfields. Owing to ageing and obsolescence, but still left with considerable airframe hours, spurred the IAF to consider mid-life upgrade in 2005 with the contract finalised in June 2009. The project envisages TTLE from the existing 25 to 40 years, with overhaul and re-equipment of 40 aircraft at designer certified plants in Ukraine and supply of material and ‘transfer of technology’ (ToT) for upgrade of 64 remaining aircraft at IAF’s No.1 Base Repair Depot (BRD) at Kanpur. The upgrade at Kiev is expected to be completed by March 2014 and upgrade at 1 BRD by March 2017. 100 new engines have also been contracted for.

The special features of An-32RE include modification in cockpit layout, upgraded avionics equipment, noise and vibration reduction, enhancing crew comfort, reliability and maintainability of the aircraft.

'Arudhra' medium power radar installed

The IAF installed its first *Arudhra* medium power radar on 3 June 2011 at Naliya, which strengthens air defence in the Saurashtra-Kutch region and forms an important component in the IAF's plan to achieve network centric operations. With operationalisation of the Integrated Air Command and Control Systems (IACCS), an automated command and control system of the IAF, the overall air defence of the country "would achieve quantum leap where modern radars would be networked alongside legacy radars." The IAF has already inked contracts for 19 LLTRs (low-level transportable radars), four MPRs (medium-power radars) and 30 indigenous medium-range *Rohini* radars, among others.

According to observers, the *Arudhra* is the same as the Elta Systems-built EL/M-2084 MMR,

whose full-scale replica was displayed at Aero India 2011 last February.



142 Flight Cadets pass out from Air Force Academy

On 18 June 2011, 142 Flight Cadets, including 22 women, passed out from the Air Force Academy when Marshal of the Indian Air Force Arjan Singh DFC, honoured the Flight Cadets with the President's Commission during a Combined Graduation Parade. The parade marked culmination of a year long training of Flight Cadets at the Air Force Academy, Dundigal near Hyderabad and also at Air Force Administrative College, Coimbatore, Air Force Stations at Hakimpet, Begumpet and Yelahanka.

Flying Officer Tejas Subhas Kawale, who also commanded the parade, was awarded the President's Plaque and Chief of Air Staff 'Sword of Honour' for standing first in overall order of merit in the Pilot Course. Flying Officer CS Pandey was



awarded the President's Plaque for standing first in overall order of merit among Ground Duty branches. Flying Officer Rahul Singh Rajawat received the President's Plaque for standing first in overall order of merit in the Navigation branch.

In his address to the newly Commissioned Officers, Marshal of the Air Force advised them to "acquire full understanding and knowledge of application of the latest technologies so as to exploit the true potential of aerospace power." On arrival, he was received by Air Marshal D Kukreja, Air Officer Commanding-in-Chief, Training Command, IAF Bangalore and Air Marshal P R Sharma AVSM, Commandant, Air Force Academy. An exhilarating and scintillating air show by the 'Sarang' helicopter aerobatic team led by Wg Cdr MS Siddhu provided the colourful grand finale.

Suryakiran team disbands

The *Suryakiran* formation aerobatic team of the Indian Air Force were stood down on 30 June 2011 and their nominated Squadron (No.52) number plated. The *Suryakiran* Aerobatic Team (SKAT) was formed in 1996 to serve as "Ambassadors of the Indian Air Force" and to "showcase the professionalism, the calibre and the mettle of the Indian Air Force". For 15 years the team has performed numerous demonstrations in various parts of the country and abroad, and has been regarded as amongst the three most renowned nine-aircraft public display aerobatic teams in the world.

The *Suryakirans* were mounted on the HAL HJT-16 Kiran Mk.II jet trainer and based at Air Force Station Bidar. Outgoing Air Chief PV Naik has said that the *Suryakirans* will be given Hawk advanced jet trainers once sufficient numbers have been delivered to the IAF for stage III flying training purposes.



Suryakirans painting the tri-colour in the sky



Suryakiran pilots at Yelahanka 2011 during the last major public display by them

Western Air Commanders' Conference

The two-day Commanders' Conference of the Western Air Command took place from 7 July 2011. The conference, which began with an underlying theme 'Mission Accomplishment with Integrity and Excellence' was attended by Commanders and PSOs of all formations under Western Air Command and the Principal Staff Officers of the Command.

Air Marshal DC Kumaria, AOC-in-C Western Air Command said, "As a part of the ongoing modernisation process, Western Air Command has taken rapid strides in operationalisation of C-130J Super Hercules aircraft, as well as induction of critical components essential for Network Centric Warfare. There is a need to rapidly absorb new inductions over the next few years, as Western Air Command transforms into a much more potent fighting force.



Increasing synergy with affiliated Army Commands has been an area of enhanced focus for WAC. Recent joint exercises between the Army and Air Force have highlighted this fact by bringing out the immense contribution of Air Power and the resultant synergy in airland operations between the two Services."

While praising the performance of all stations and units of WAC during the recently conducted exercise *Gauntlet IV*, he said, "The high standards achieved during the highly intensive 24x7 exercises were indicative of the imposing combat potential of Western Air Command. All the resources, energies, capabilities and potential must be directed towards mission accomplishment. We must be prepared to perform beyond the call of duty and while doing so, we must continue to look after those placed below us. Only then can we achieve our mission with integrity and excellence".

Modernisation of Airfield Infrastructure Programme

Northrop Grumman Corporation's Europe-based air traffic management subsidiary, Northrop Grumman Park Air Systems are providing a range of navigation equipment including Instrument Landing Systems (ILS) and Doppler VHF Omni-directional Range Systems (DVOR) for air bases

in India as part of the Indian Air Force's *Modernisation of Air Field Infrastructure* (MAFI) project. Under the contract awarded by The Tata Power Company Limited, Strategic Electronics Division (Tata Power SED), Northrop Grumman will supply 30 Normarc 7000 ILS and 31 Normarc DVOR systems with deliveries to be completed in 42 months. This is the first phase of the MAFI India project and the current contract provides an option for a second phase of the programme for modernising a further 30 airfields used by the Indian Armed Forces.

The project is being implemented by the Indian Air Force to upgrade its air bases for operation of a range of aircraft types operated by the IAF at all times, including new generation fighters and military transport aircraft. When completed, the project will provide the airfields with modern air traffic management, navigation and landing systems plus meteorological and communications facilities.

Admiral Nirmal Verma visits Russia

Chief of Naval Staff, Admiral Nirmal Verma visited Russia for six days in mid July 2011, his itinerary including Vladivostok, Moscow, St Petersburg and Kaliningrad where he made an assessment of all projects and held vital discussions with officials of the Russian armed forces and defence industry.

During his visit to Kaliningrad, the Admiral reviewed the progress of the Project 1135.6 (*Talwar*-class) follow-on ships, under construction at the Yantar shipyard. He was reassured that the first ship *Teg* would commence trials shortly and be delivered in six to eight months. He later made an extensive tour of the carrier *INS Vikramaditya* on his visit to the Sevmash Shipyard.



'Admiral Gorshkov' under transformation into the *INS Vikramaditya*

Avi Oil

MBDA's PARS 3 LR short listed for Indian Army

MBDA's PARS 3 LR guided missile system has been short listed for the Indian Army helicopter future air-to-ground requirement. MBDA Deutschland has delivered proposals for its PARS 3 LR multi-target, long range weapon system for HAL's Dhruv Advanced Light Helicopter and for two attack helicopters, the Kamov Ka-52 and the Mi-28.



Within the framework of MBDA Deutschland's export campaign for India, three PARS 3 LR firings were carried out from a German Tiger helicopter at the Vidsel test range in Sweden in April 2011. All three missiles were equipped with live warheads and all impacted their intended targets at the optimal hit points. Two firings were carried out within one minute of each other, the first against a static target at a range of 7,000 m and the second against a moving target at a range of 700 m. The third firing was carried out with the helicopter in fast forward flight against a static target at the range of 7,000 m.

ROS(I) to service new 'Talwar'-class frigates

Rosoboronservice India Ltd (ROS (I)) have proposed a guaranteed period after sales service for the three new *Talwar*-class stealth frigates currently under construction at the Yantar Shipyard at Kaliningrad in Russia. Preparations are underway and logistics arrangements being made to accomplish this requirement efficiently.

The three *Talwar*-class ships currently being built are the *INS Teg*, the *Tarkash* and the *Trikand*. All three will carry the supersonic BrahMos missile system, advanced Shtil-1 surface-to-air missiles, 100mm cannon as also a deck-based Kamov Ka-31 helicopter. The frigates, with a top speed of about 30 knots are powered by twin shaft gas turbines and fitted with



INS Talwar

advanced navigation, communication, anti-submarine and electronic warfare equipment. The frigates are also equipped with new generation radar and sonar systems for early detection and warning.

Russia had earlier built the *INS Talwar*, *INS Trishul* and *INS Tabar* at Balitiisky Zavod shipyard in St. Petersburg.

INS Satpura joins Indian Navy

INS Satpura, the second *Shivalik*-Class Stealth Frigate (Project 17) was delivered to the Navy on 9 July 2011 by Mazagon Dock Limited. *INS Satpura*, the second ship of *Shivalik*-class stealth frigates has advanced technology which embodies many features such as CODOG propulsion, Total Atmosphere Control system, Integrated Machinery Control system, Automated Power Management system, Enhanced Combat Management system, ATM based Integrated Ship wide Data Network and Modular accommodation coupled with low RCS, IR, Noise and ELFE signatures which indicate a paradigm shift in indigenous efforts in the design and construction of surface combatants for the Indian Navy. *INS Satpura* is equipped with weapons and sensors of Indian, Western and Russian origin, enabling her to function as a multi role and potent combat platform.



Vice Admiral (Retd) H.S. Malhi, CMD, MDL (left) handing over acceptance documents to CSO (Tech), Rear Admiral GS Pabby (on right)

INS Kabra joins Indian Navy

The *INS Kabra* fast attack craft has been commissioned at Naval Base Kochi by Vice Admiral K N Sushil, Flag Officer Commanding-in-Chief, Southern Naval Command.

INS Kabra is the eighth of a series built at GRSE. With a top speed of over 35 knots and manoeuvrability offered by water-jet propulsion, the ship is ideally suited for high-speed interdiction of fast-moving targets and useful in search and rescue operations. *INS Kabra* complies with the latest regulations of International Maritime Organisation on sea pollution control. The main armament of the ships is an indigenous 30 mm CRN-91 gun along with an Optical Sight manufactured by Ordnance Factory Medak and Bharat Electronics Limited, Chennai. It has an overall length of 49m, beam of 7.5m and a standard displacement of 320 tons. The ship has a crew of 3 officers and 39 sailors.

Final assembly of Indian Navy's first P-8I

Boeing has begun final assembly of the Indian Navy's first P-8I long-range maritime reconnaissance aircraft at the company's Renton factory. The P-8I, based on the Boeing Next-Generation 737 commercial airplane, is a variant of the P-8A Poseidon that Boeing is developing for the US Navy.



The start of assembly work follows delivery of the aircraft fuselage from teammate Spirit AeroSystems on 29 May. Boeing workers have begun installing systems, wires and other small parts onto the fuselage. The P-8I's engines and wings will be installed later this year. The aircraft features open system architecture, advanced sensor and display technologies, with a worldwide base of suppliers, parts and support equipment.

"India is our first international customer for the P-8 and we are committed to delivering this aircraft on time," said Chuck Dabundo, Boeing vice president and P-8 programme manager. "The timely start of assembly and our in-line production process will allow us to meet our goal and incorporate significant efficiencies as we move forward on the programme."

Exercise 'Tat Suraksha'

A three day Joint Coastal Security Exercise was conducted in the Andaman Sea in late May 2011 and participants included the A&N Administration, Marine Police, State Police,



Fisheries Department, Forest Department, Port Management Board (PMB), Directorate of Shipping Services (DSS), Light House authorities, Customs along with Navy and Coast Guard components of Andaman and Nicobar Command which participated in the exercise.

The exercise was controlled and coordinated from Joint Operations Centre (Coastal Security), JOC (CS), at HQANC and conducted from Regional Coastal Security Operation Centre (A&N), RCSOC (A&N), at Port Blair.

This exercise was conducted in two phases. In the first phase officials from all agencies participated in simulated drills: 'Table Top Exercises' in board room to fine tune their Standard Operating Procedures (SOPs) for Coastal Security, followed by the 'Tactical Phase' where live situations were simulated.

GENx TRUEngine Programme launched for Air India

GE Aviation have launched their GENx TRUEngine programme on the GENx-1B engine and granted TRUEngine designation to Air India's GENx-1B engine fleet. Air India's 27 Boeing 787-8 aircraft will be fitted with GENx-1B engines. Air India, under a 2010 GE Branded Services Agreement (GBSA), has been licensed to perform maintenance and overhaul work on the GENx-1B engine, the national carrier following GE-issued engine manuals, service bulletins and other maintenance recommendations.

Qualification for TRUEngine status follows a two-step process which includes the customer declaration and a submittal of maintenance records to ensure the overhaul practices, spare parts and repairs used to service an engine consistent with GE-issued engine manual, service bulletins and other maintenance recommendations.

CAE and InterGlobe forming training centre in NCR

CAE and InterGlobe Enterprises are forming a joint venture training centre in the National Capital Region for training of pilots and maintenance technicians which is expected to be ready for operation by the end of 2012. This will be the fifth aviation training facility that CAE operates in India. CAE currently trains more than 1,500 crew members every year at its training centre in Bengaluru, including pilots from several Indian airlines such as Air India, Go Air, IndiGo, Jet Airways, Kingfisher Airlines and SpiceJet.

The focus of the New Delhi training centre will be to provide 'wet' and 'dry' type-rating, recurrent, conversion and jet indoctrination training for commercial aircraft pilots. Programmes will also be offered for maintenance technicians. The training centre will initially house four new CAE-built Level D full-flight simulators, covering Airbus and Boeing aircraft types being operated in India and complementing CAE capabilities at the Bengaluru training centre.

GoAir orders 72 Airbus A320neo

GoAir has selected the A320neo for its long term fleet expansion plans with a firm order for 72 aircraft, the agreement being signed during the 49th Le Bourget Air Show. Airbus delivered GoAir's first A320 in 2007 from its original order of 20 A320s placed in 2006. The airline currently operates 10 A320s with an average age of two years which makes it the youngest airline fleet in India and will take delivery of the other 10 aircraft over the next two years.



Jet Airways flies two million passengers in May 2011

Capitalising on an improvement in the Global Business environment and the holiday season, Jet Airways Group created history by flying a record two million passengers in May 2011, which marks the highest number of passengers carried by any airline of Indian origin on its domestic and international network. Jet Airways flew a record 1.55 million guests on its domestic and international network, while JetLite flew an equally impressive 0.47 million to assist the Jet Airways Group log this truly unique milestone in the Indian Aviation sector. Jet Airways currently operates a fleet of 97 aircraft, which includes 10 Boeing 777-300 ER aircraft, 12 Airbus A330-200 aircraft, 55 next generation Boeing 737-700/800/900 airliners and 20 modern ATR 72-500 turboprop aircraft.



Boeing forecasts 1320 new civil aircraft for the Indian market

Boeing have forecast a \$150 billion market for 1320 new passenger aircraft in India over the next 20 years. "In 2011, the economy continues to do well. Indian air carriers are becoming profitable and we expect the GDP to maintain its upward trend in the long-term. As a result, both the air travel and air cargo markets will grow." Passenger traffic, which has reached 53.6 million domestic (fiscal 2011) and 13.1 million international, is expected to grow at 8.1 percent annually over the long-term.

The biggest demand will be for single-aisle airliners including the next generation Boeing 737. To keep up with demand, Boeing recently announced it will boost production to a record 42 B-737s per month by the first half of 2014.

Air India Express to fly to SAARC capitals

Air India Express (AIE) plans to operate flights to all capitals of the South Asian Association for Regional Cooperation (SAARC) countries and to new destinations in the Gulf. Besides India, the other SAARC nations are Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka.

At present, the low-cost carrier operates flights to all the cities in the Gulf, except Saudi Arabia. In view of the new services, the airline has started recruiting more cockpit crew members. "The focus is on the operational bases of the AIE in Thiruvananthapuram, Kochi and Kozhikode and Mangalore. The recruitment will also be for taking care of the future needs of the airline in Mumbai, Delhi and Chennai, and augmentation of the fleet," said an airline spokesman. AIE, which recently shifted its headquarters from Mumbai to Kochi, operates 70 per cent of the flights from Kerala with Boeing 737-800s.



India and US sign Bilateral Aviation Safety Agreement

The Bilateral Aviation Safety Agreement (BASA) between India and the U.S.A. was signed by Dr. Nasim Zaidi, Secretary, Civil Aviation and J. Randolph Babbitt, Administrator, Federal Aviation Administration (FAA) on 18 July. The signing coincided with the visit of US Secretary of State Hillary Clinton to India.



The Secretary Ministry of Civil Aviation, Dr. Nasim Zaidi and the FAA Administrator, Randy Babbitt signing the Bilateral Aviation Safety agreement in New Delhi on 18 July 2011

BASA will facilitate reciprocal airworthiness certification of civil aeronautical products imported/exported between the two signatory authorities. Indian standards would be comparable to global standards and its aeronautical products accepted by the U.S. The nascent aircraft manufacturing industry in India would be hugely benefitted which would spur trade between the two sides. "It would demonstrate that India has the capability to develop FAA certifiable aircraft articles/appliances. It would encourage the civil aeronautical products industry which will eventually lead to self sufficiency in the sector."

The next stage is to sign the Implementation Procedures for Airworthiness (IPA) which provides for airworthiness technical cooperation between FAA and its counterpart civil aviation authorities. The scope of IPA can be enhanced from time to time. The USA has signed BASA with 24 countries.

Eurocopter and HAL sign cooperation agreements

Eurocopter and Hindustan Aeronautics Limited have reiterated commitments to take their five-decade long relationship to the next level. The long-time partners are in the process of signing agreements to further strengthen their industrial cooperation and links, while the association will focus on increasing existing collaboration and exploring new potential business areas to serve both Indian and International markets.



One of the hundreds of Cheetahs built by HAL under licence from Eurocopter (nee Aerospatiale), seen in the Siachen Glacier area

"HAL is fast developing into a major player in the aerospace sector. With this increasing pace of growth, HAL welcomes opportunities for joining hands with a global player like Eurocopter. We look forward to corroborating this partnership further in the coming years," said Ashok Nayak, Chairman HAL.

Lutz Bertling, President and CEO of Eurocopter said, "HAL is one of the most important partners of the Eurocopter Group. Giving continuity to our 50 years of successful relationship, we are proud today to reinforce and extend the scope of our association in India. We remain committed to work with HAL contributing to the expansion of the helicopter capabilities of India."

With the launch of its India subsidiary (Eurocopter India Private Limited) Eurocopter has demonstrated its commitment to the Indian market and industry, in which one of the key priorities would be the extension of industrial cooperation, further building on the 50-year relationship with HAL. This industrial partnership was strengthened in 2005 with the manufacture of composite assemblies for AS550/AS350 helicopters, with HAL manufacturing 100 shipsets of these assemblies per year.

EADS technology licensing agreements

Five agreements were signed by EADS with Indian Groups during the Paris Air Show which has extended the scope of the company's technology licensing outreach with new industrial partners in India and Europe. These accords involve a contract with Germany's Grenzbach Automation GmbH for metallic production technologies based on the friction stir welding solid-state joining process, along with four Letters of Intent (LoIs) with one German and three Indian companies for metallic and composite manufacturing processes. The agreements were arranged by the EADS Technology Licensing initiative, which is managed by EADS' Corporate Technology Office and has the company's top management support in offering a full range of leading-edge technologies that are "proven, mature and available today."

Nova delivers first POP 200 System

On 2 June 2011, Nova Integrated Systems Limited delivered a plug-in Electro-Optic and Radar Integration payload to IAI Tamam Division from their Hyderabad facility. The first production unit of the Electro-Optic Stabilised POP 200 System was integrated, calibrated and tested in India by Nova, in technical collaboration with IAI-Tamam. The facility, the first of its kind in the Indian Private Sector, has been set up by Nova for indigenous design development, manufacture and life cycle support capabilities to the Indian Defence and Paramilitary Forces.

Mr. Shaul Shahar, General Manager IAI-Tamam Division said, "We are very proud of this collaborative achievement. The new facility will be utilised by IAI-Tamam and Nova for the benefit of the Indian armed forces." The ceremony was presided over by Dr. Prahlada, 'Distinguished Scientist' and Chief Controller Aero Programmes, DRDO

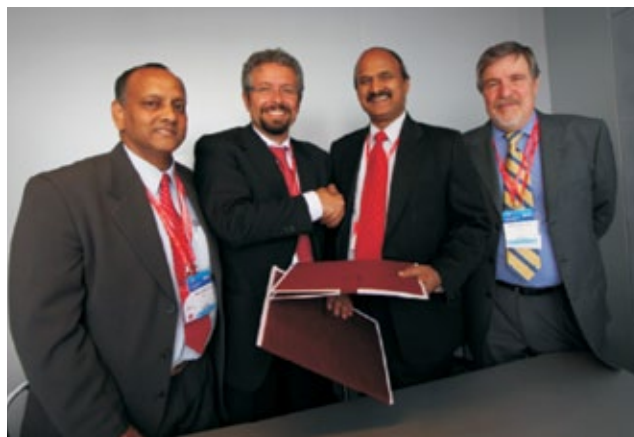
Airbus signs strategic agreement with Indian suppliers

Airbus has signed strategic agreements with Indian tier-one suppliers QuEST Global Engineering and CADES Digitech, to broaden the company's international supplier footprint in line with EADS group's *Vision 2020*. The move also focuses on partners with access to India's strong engineering services talent pool. Both QuEST and CADES are existing members of a select list of EADS Engineering Strategic Suppliers. The new agreement aims to consolidate engineering services already bought from several suppliers, and to focus the development of competences with these two tier one suppliers. Each will have offices in Europe, and dedicated centres in India. QuEST will focus on Airbus Wing & Pylon engineering activities and CADES on Airbus Fuselage engineering activities. Both were selected from over 20 suppliers and will work on a broad list of critical engineering activities across different Airbus aircraft programmes.

BELM signs MoU with Alenia Aeronautica, MoA with UAC

BELM Limited, a Public Sector Enterprise under the Ministry of Defence, signed a Memorandum of Understanding with Alenia Aeronautica on 22 June 2011 at the Paris Air Show "to pursue a mutual collaboration for designing, manufacturing and selling a new basic training aircraft." The MoU was signed by VRS Natarajan, Chairman and MD of BELM Limited and Alessandro Franzoni, Chief Operating Officer of Alenia Aeronautica.

BELM Ltd has also signed a Memorandum of Agreement with UAC of Moscow at the Paris Air Show, this between Umesh Chandra, Executive Director (Defence Business), BELM and Vladimir A. Belyakov, Marketing Director, UAC. The purpose



VRS Natarajan of BELM signing MoU with Alenia Aeronautica's Alessandro Franzoni.

of this MoA is "to explore and exploit business opportunities in production, sales, marketing and maintenance of civil transport as well as passenger aircraft in India".

Raytheon seeks to integrate Paveway on Tejas bombs

Raytheon have offered to integrate their Paveway kit on the Tejas LCA, transforming its 'dumb' bombs into precision-guided munitions. Paveway is currently in the inventory of the Indian Air Force and 41 other countries. The Paveway family of weapons are platform independent and integrated on more than 27 aircraft types, and Raytheon has delivered more than 350,000 such kits.

"Raytheon has been a trusted partner to India for more than three decades, and we hope to deepen this relationship by providing the Indian Air Force the tools it needs to defend India's sovereign interests," said Harry Schulte, Raytheon Vice President of Air Warfare Systems.

Raytheon officials also indicated that subject to the approval of the U.S. and Indian governments, Raytheon is looking for partnership opportunities to produce critical components of Paveway with the Indian industry.

HAL plan four new manufacturing plants

On 17 June 2011, HAL Director (Design and Development) NC Agarwal, announced plans to set up four new manufacturing plants stating that, "these will be for the production of medium multi-role combat aircraft (MMRCA), light utility helicopter (LUH), fifth generation fighter aircraft (FGFA) and multi-role transport aircraft (MRTA)." As per initial plans, the MRTA would be manufactured at the Transport Aircraft Division, Kanpur and the FGFA at Nasik, where currently Sukhoi Su-30 MKIs are under series production. Locations for the other two plants are still not identified.

Prithvi (P-II) missile launch

The Prithvi (P-II) tactical ballistic missile was successfully flight tested on 9 June 2011 from Launch Complex-III, ITR Chandipur in Orissa as part of regular training exercises. The missile impacted on the predefined target in the Bay of Bengal with “a very high accuracy of better than 10 metres”. All the radars, electro optical systems located along the coast tracked and monitored the Missile throughout the flight path. An Indian Naval ship located near the target witnessed the final stage.



The launch operations of the Missile were carried by the Armed Forces and monitored by the DRDO, witnessed by Dr.V.K. Saraswat, SA to RM, VLN Rao, Programme Director AD, SK Ray, Director RCI and senior officers of the Strategic Force Command.

Polar Satellite Launch Vehicle (PSLV-C17) launches GSAT-12 Satellite

PSLV-C17 on its way to the Launch Pad



The Polar Satellite Launch Vehicle (PSLV-C17) successfully launched the GSAT-12 communication satellite on 15 July, 2011 from Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota. The launch of PSLV-C17 was the eighteenth successive successful flight of the PSLV.

After a smooth countdown of 53 hours, the vehicle blasted-off from the Second Launch Pad at the opening of the launch window at 16:48 hrs (IST). After about 20 minutes of flight time,

GSAT-12 was successfully injected into sub-Geosynchronous Transfer Orbit (sub-GTO) with a perigee of 284 km and an apogee of 21,020 km with an orbital inclination of 17.9 degrees.

Preliminary flight data indicated that all major flight events involving stage ignition and burnouts, performance of solid and liquid stages, indigenously developed advanced mission computers and telemetry systems performed well. ISRO Telemetry Tracking and Command Network (ISTRAC)'s ground station at Biak, Indonesia acquired the signals from GSAT-12 immediately after injection of the satellite. The solar panels of the satellite were deployed automatically. Initial checks on the satellite indicated normal functioning of the satellite.

Short-range 'Prahaar' missile tested

DRDO successfully flight tested its latest surface to surface missile *Prahaar* on 21 July 2011 from Launch Complex III, off the Chandipur Coast in Orissa. The missile with a range of 150 kms is comparable to *ATACMS* of the United States and fills the vital gap between Multi Barrel Rockets and medium range Ballistic Missiles.

The *Prahaar* has a length of 7.3 meters and diameter of 420 mm, weighing 1280 kgs, with a single stage solid propulsion system and reaches a height of 35 kms before impacting targets at ranges of upto 150 kms in about 250 seconds. Equipped with high accuracy navigation, guidance and electro mechanical actuation systems with latest onboard computer, the missile achieves terminal accuracy of less than 10 meters.

The missile has a pay load of 200 kgs, has fast reaction time, essential for the battle field, and is launched from a Road Mobile System, which consists of six missiles that can be fired in salvo mode.



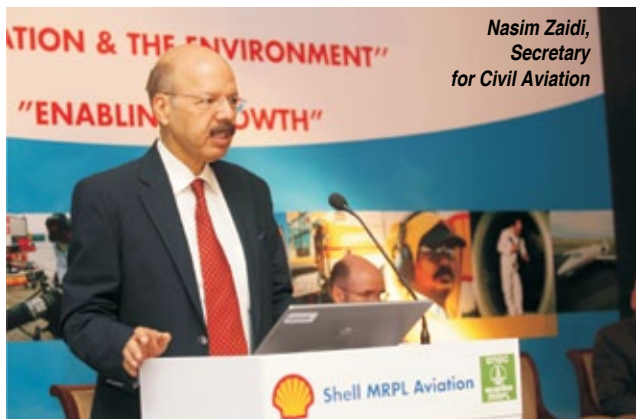
'Alternate Fuels': an imperative for the growing aviation industry

A seminar on *Aviation and the Environment and Enabling Growth* was organised by Shell MRPL Aviation as a part of the Centenary Celebrations of Civil Aviation in India on 24 June 2011. The Secretary of Ministry of Civil Aviation, Dr. Nasim Zaidi inaugurated the day long conference.

Deliberations were held on *Aviation and the Environment, Environment Trading Solutions* and *Enabling Growth*, these sessions chaired by AK Sharan, Joint Director DGCA, PN Sukul, Joint Secretary Ministry of Civil Aviation and VP

Agrawal, Chairman AAI. The presenters from Shell included Dr. Mike Farmery, Global Technical Manager, Aviation Fuels Shell Aviation, Michael Furze, Global Risk Marketing Lead, Shell International Petroleum Company Limited and Kamesan Shankar, Global Engineering Manager, Shell Aviation.

Dr. Zaidi reiterated that India was moving from being “environmentally conscious to being environmentally cautious”. He stressed on the need for a vision to reduce aviation’s contribution to environmental pollution and believed that the Ministry “was taking adequate steps to reduce the emissions”.



Dr. Farmery presented details on fuel innovation and analysed various options for alternate fuels and the pathways faced by them. He mockingly remarked “the most interesting thing about fuel is probably its cost”. He described one of Shell’s innovations, ‘Gas to Liquid’ (GTL) which he believes is a fuel of the future. He ended his presentation with the caution, “Fuel is a jewel, and we must treasure it”. Dr. Zaidi agreed and assured Shell Aviation that he would impress upon airports and airlines for testing the GTL fuel in India.

Shashi Kant Sharma is new Defence Secretary

Shashi Kant Sharma has been appointed as the new Defence Secretary at Ministry of Defence on 7 July. He succeeded Pradeep Kumar who has become the Chief Vigilance Commissioner (CVC). A 1976 batch Indian Administrative Service (IAS) officer of the Bihar cadre, Shashi Kant Sharma was due to retire next year, but has been given a fixed two-year tenure in his new role as Defence Secretary. He was earlier Secretary in the Department of Financial Services and his previous positions include the post of Secretary, Information Technology and DG (Acquisitions) in the Defence Ministry.



Shekhar Agarwal assumes charge as Secretary (Def. Production)

On 7 July 2011, Shekhar Agarwal assumed charge as Secretary (Defence Production) in the MoD. Earlier, he was Special Secretary working in the Defence Ministry for three and a half years. He has vast experience of working in Home, Finance and Personnel Administration departments, besides core areas of the Government both at the Centre and in states and belongs to the 1977 batch of the Indian Administrative Service. He is a Gold Medalist from the prestigious St. Stephen’s College, Delhi University.



International Seminar on Defence Acquisition

The Institute for Defence Studies and Analyses (IDSA) organised a three-day (12-14 July 2011) international seminar in New Delhi on Defence Acquisition. Vinod Misra, former Secretary Defence (Finance) and distinguished



fellow IDSA set the theme for this important seminar which was hugely attended by functionaries from the Ministry of Defence, the Armed Forces and the industry, both Indian and international. Discussed were a spectrum of acquisition-related subjects including technical requirement and capability definition, technical and commercial evaluation challenges, structural elements for efficient acquisition, contract and project management, IT opportunities in defence acquisition, empowering defence industrial and R&D base, the role of offsets in acquisitions and efficient logistics management.

In his inaugural address, Defence Minister AK Antony stated that, “we need to ensure optimum deterrence to fully safeguard the sovereignty and territorial integrity of the nation... we need to develop the latest strategic and conventional capabilities. However, in our enthusiasm to modernise and upgrade our security infrastructure, we must not allow our acquisition procedures to be manipulated, or corrupted. Our primary objective must be to stay competitive and yet remain cost efficient, as well as technologically and strategically reliable.”

Mr. AK Antony stressed that the objective behind India's Defence Procurement Policy was to provide a strong procedural framework for handling acquisitions. Cutting down on costs without compromising on quality was a key challenge. Also, offsets needed a far greater thrust to enhance R&D and logistic capabilities, as well as defence infrastructure. The country's priorities in defence technologies and manufacturing capabilities require clear identification and definition. “We are not averse to making changes in our acquisition policy without compromising our strategic and security interests and the principles of transparency, accountability and fairness in all procedures,” he added.

Amongst those who participated in the deliberations were Admiral Arun Prakash, former Chief of the Naval Staff, N S Sisodia of the IDSA, Vinod Misra, former Secretary, Defence (Finance), Vice Admiral Robin Dhowan, DCNS and Vivek Rae, DG (Acquisition).

Vice-Admiral Shekhar Sinha is Chief of Integrated Defence Staff

Vice Admiral Shekhar Sinha took over on 4 July as the Chief of Integrated Defence Staff to Chairman, Joint Chiefs of Staff Committee at the Headquarters, Integrated Defence Staff of the Ministry of Defence.

Earlier, Vice Admiral Sinha served as the Deputy Chief of Integrated Defence Staff Operation and Policy Planning and Force Deployment and Control Personnel Services at MoD (Navy). Vice Admiral Sinha was commissioned on 1 June 1974 into the Naval Aviation Fighter Stream and is an alumnus of the Defence Services Staff College, College of Naval Warfare and National Defence College. With over 2,700 hours of flying 18 different aircraft types, mostly from aircraft carriers INS *Vikrant* and INS *Viraat* on the Sea Harrier, he has commanded both Sea Harrier Squadrons and the the Naval Air Station at Dabolim (Goa). The Flag Officer has also commanded the Coast Guard Ship *Ranjindan* during ‘Operation Pawan’, Indian Navy Ships



Vice Admiral Shekhar Sinha, the new CIDS, is also the present ‘Grey Eagle’, as the senior most serving Naval aviator.

Saryu, *Shakti* and the Missile Destroyer INS *Delhi*. He was the Fleet Operations Officer of the Western Fleet during *Operation Parakram* and later commanded the ‘sword arm’ of the Navy, the Western Fleet.

Scientist of the Year Award 2010

In recognition of her valuable contributions Smt Padmavathi along with 19 other distinguished scientists has received the ‘DRDO Scientist of the Year Award 2010’.

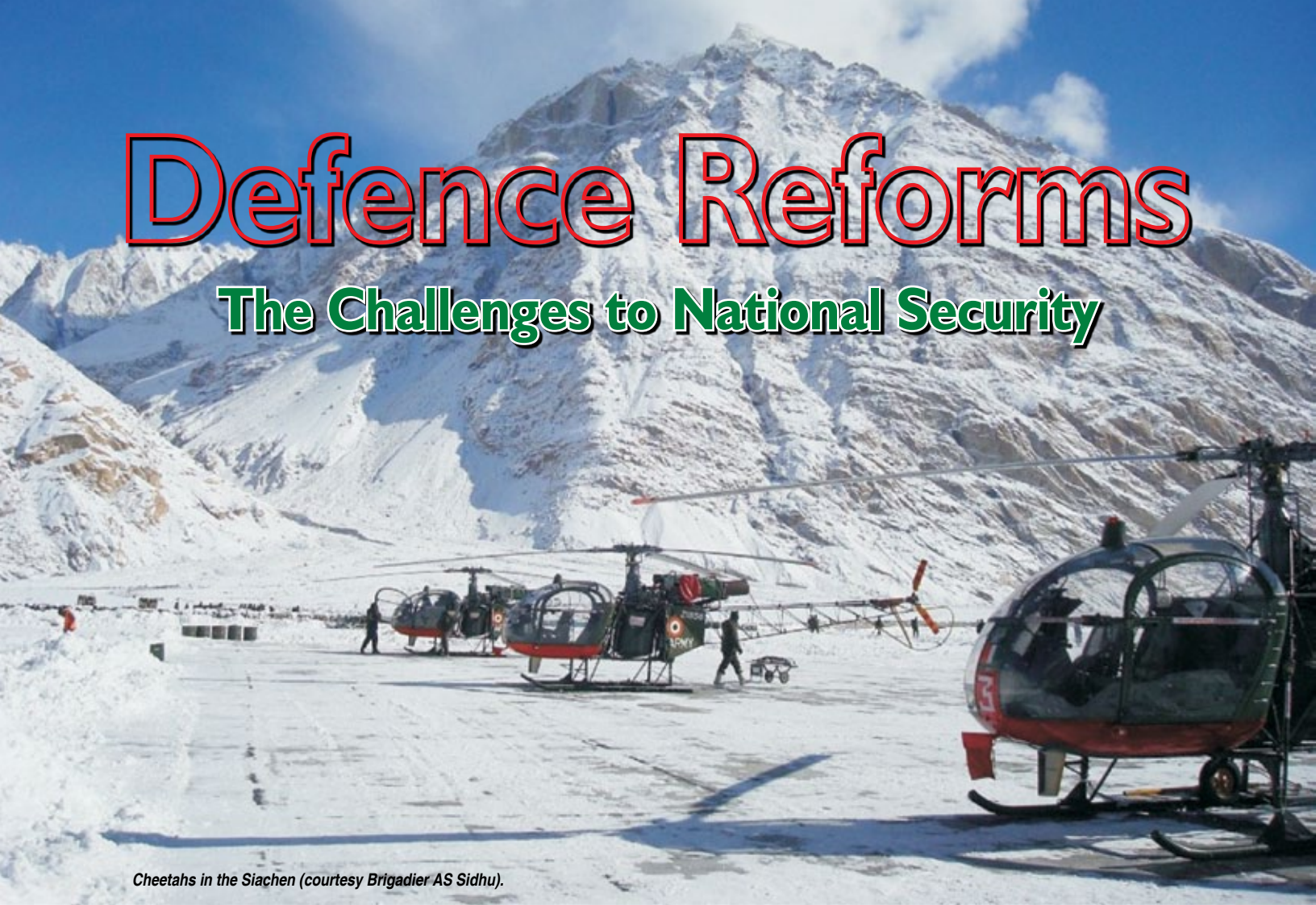
Scientist ‘F’ at Aeronautical Development Agency (ADA), Smt Padmavathi has made significant contributions in the design and development of Mission-Critical Avionics software for the Initial Operational Clearance (IOC) of the Tejas LCA aircraft. The unique feature of this avionics application software is that the architecture is based on open system principles and is developed in object - oriented Ada language. The software life-cycle model is based on IEEE-12207 standard.



Padmavathi receives the award from Defence Minister AK Antony (with Dr. VK Saraswat at the centre)

Defence Reforms

The Challenges to National Security



Cheetahs in the Siachen (courtesy Brigadier AS Sidhu).

South Asia is the second most unstable region in the world and is closely following West Asia in the race to reach the number one spot! Among the world's major democracies, India faces the most complex of threats and challenges spanning the full spectrum of conflict from nuclear to sub-conventional. Unresolved territorial disputes with China and Pakistan, insurgencies in Jammu and Kashmir and the north-eastern states, the rising tide of left wing extremism (LWE) and the growing spectre of urban terrorism have vitiated India's security environment. Yet, despite the prolonged exposure that the security establishment has had in dealing with multifarious challenges, India's national security continues to be poorly managed. In fact, no Indian government till today has ordered a strategic defence review.

The only time a review was undertaken in the recent past was after the Kargil conflict of 1999 when the Kargil Review Committee headed by that doyenne of Indian strategic thinkers, the late K Subrahmanyam, was appointed. The

Committee was asked to "...review the events leading up to the Pakistani aggression in the Kargil District of Ladakh in Jammu & Kashmir and to recommend such measures as are considered necessary to safeguard national security against such armed intrusions." Besides Mr. Subrahmanyam, who was appointed Chairman, the Committee comprised three members: Lieutenant General (Retd.) KK Hazari, BG Verghese and Satish Chandra, Secretary, National Security Council Secretariat (NSCS) who was also designated as Member-Secretary. Though it had been given a very narrow and limited charter, the Committee looked holistically at the threats and challenges and examined loopholes in the management of national security. The Committee was of the view that, "The political, bureaucratic, military and intelligence establishments appear to have developed a vested interest in the status quo." Consequently, it made far reaching recommendations on the development of India's nuclear deterrence, the management of national security,

intelligence reforms, border management, the defence budget, the use of air power, counter-insurgency operations, integrated manpower policy, defence research and development—and media relations. The committee's report was tabled in Parliament on 23 February, 2000.

The Cabinet Committee on Security (CCS) then appointed a Group of Ministers (GoM) to study the Kargil Review Committee report and recommend measures for implementation. The GoM was headed by Home Minister L K Advani and comprised Defence Minister George Fernandes, External Affairs Minister Jaswant Singh, Finance Minister Yashwant Sinha and National Security Adviser Brajesh Mishra. In turn, the GoM set up four task forces on intelligence reforms, internal security, border management and defence management to undertake in-depth analysis of various facets of national security management. These were headed, respectively, by Jammu and Kashmir Governor Girish Saxena, former defence and home secretary and principal secretary to the Prime Minister NN Vohra,

former home secretary Madhav Godbole and Arun Singh, former Union minister who was then an advisor to the Ministry of External Affairs on security matters and who had himself headed the Committee on Defence Expenditure in the early 1990s.

Despite the new measures approved for implementation by the CCS on 11 May 2001, many lacunae still remain in the management of national security. In order to review the progress of implementation of the proposals approved

Managing National Security

Much still needs to be done to improve the management of national security in India. The first and foremost requirement is for the government to formulate a comprehensive National Security Strategy (NSS), including internal security, so that all the stakeholders are aware of what is expected of them. The NSS should be formulated after carrying out an inter-departmental, inter-agency, multi-disciplinary strategic defence review. Such a review must take the public into confidence and not be conducted behind closed doors. Like in most other democracies, the NSS should be signed by the Prime Minister, who is the head of government, and must be placed on the table of Parliament and released as a public document. Only then will various stakeholders be compelled to take ownership of the strategy and work unitedly to achieve its aims and objectives.

It has clearly emerged that China poses the most potent military threat to India and, given the nuclear, missile and military hardware nexus between China and Pakistan, future conventional conflict in Southern Asia will be a two-front war. Therefore, India's military strategy of dissuasion against China must be gradually upgraded to credible deterrence which comes only from the capability to launch and sustain major offensive operations into the adversary's territory. India needs to raise new Divisions to carry the next war deep into Tibet. Since manoeuvre is not possible due to the restrictions imposed by the difficult mountainous terrain, firepower capabilities need to be enhanced by an order of magnitude, especially in terms of precision-guided munitions. This will involve substantial upgradation of ground-based (artillery guns, rockets and missiles) and aerially-delivered (fighter-bomber aircraft and attack helicopter) firepower. Only then will it be possible to achieve future military objectives.

The armed forces are now in the fifth and final year of the 11th Defence Plan (2007-12)—which has still not yet been formally approved by the government! The government has also not approved the long-term integrated perspective plan (LTIPP 2007-22) formulated by HQ Integrated Defence Staff. Without these essential approvals, defence procurement

Priority Measures

- Formulate a comprehensive National Security Strategic (NSS) policy, after undertaking a strategic defence review.
- The government must immediately appoint a Chief of Defence Staff to head the defence planning function and provide single point military advice to the Cabinet Committee on Security.
- Approve LTIPP 2007-22, the long-term integrated perspective plan of the armed forces, and the ongoing Defence Plan 2007-12, now in its fifth and final year.
- The defence budget must be enhanced in stages to 3.0 per cent of the GDP for meaningful defence modernisation and for upgrading the present military strategy of dissuasion against China to deterrence.
- The long-pending defence procurement plans such as C4I2SR, artillery modernisation, the acquisition of modern fighter aircraft and aircraft carriers and submarines must be hastened.
- Modernisation plans of the central paramilitary and police forces must also be given the attention that they deserve.
- Anomalies created by the Sixth Pay Commission have led to a civil-military divide and must be redressed early, including acceptance of the ex-Servicemen's legitimate demand for one rank-one pension.
- A national War Memorial must be constructed at a suitable high-visibility spot in New Delhi to honour the memory of all those soldiers, sailors and airmen who have made the supreme sacrifice in the service of India.

The GoM recommended sweeping reforms to the existing national security management system and the CCS accepted all its recommendations, including one for the establishment of the post of Chief of Defence Staff (CDS) – which still has not happened. As approved by the CDS, the Tri-Service Andaman and Nicobar Command and Strategic Forces Command were established. Other salient measures included the establishment of HQ Integrated Defence Staff (IDS); the Defence Intelligence Agency (DIA); the establishment of a Defence Acquisition Council (DAC) headed by the Defence Minister with two wings: the Defence Procurement Board and the Defence Technology Board; management of borders with different countries by a single border management agency (e.g. the western border with Pakistan is managed by the BSF) and the nomination of the CRPF as India's primary counter-insurgency operations force.

by the CCS in 2001 and to take stock of the new developments over the last 10 years, such as the threats emanating from the sea a la the Mumbai terror strikes and the rapid deterioration of the regional security environment due to the growing spread of radical extremism and creeping Talibanisation, the government appointed a *Task Force on National Security* in mid-June 2011. The task force is led by Naresh Chandra, former Cabinet Secretary and ambassador to the US and comprises 13 other members. The members include G Parthasarathy, former High Commissioner to Pakistan, Air Chief Marshal S. Krishnaswamy (Retd), Admiral Arun Prakash (Retd), Lt Gen V.R.Raghavan (Retd), Dr. Anil Kakodkar, former chief of the Department of Atomic Energy, KC Verma, former Secretary R&AW, VK Duggal, former Union Home Secretary and Dr. Manoj Joshi, among others. The task force has been given six months to submit its report.



Prahaar missile launched.

been waiting for long for the INS *Vikramaditya* (*Admiral Gorshkov*) aircraft carrier, which is being refurbished in a Russian shipyard at exorbitant cost. Construction of the indigenous aircraft carrier is lagging behind schedule.

The plans of the air force to acquire 126 multi-mission, medium-range combat aircraft in order to maintain its edge over regional air forces are also stuck in the procurement quagmire. All three Services need a large number of light helicopters. India's nuclear forces require the Agni-III missile and nuclear powered submarines with suitable ballistic missiles to acquire genuine deterrent capability. The armed forces do not have a truly integrated C4I2SR system suitable for modern network-centric warfare, which will allow them to optimise their individual capabilities.

All of these high-priority acquisitions will require extensive budgetary support. With the defence budget languishing at less than two per cent of India's GDP – compared with China's 3.5 per cent and Pakistan's 4.5 per cent plus US military aid – it will not be possible for the armed forces to undertake any meaningful modernisation in the foreseeable future. Leave aside genuine military modernisation that will substantially enhance combat capabilities, the funds available on the capital account at present are inadequate to suffice even for the replacement of obsolete weapons systems and equipment that are still in service well beyond their useful life cycles. The central police and para-military forces (CPMFs) also need to be modernised as they are facing increasingly more potent threats while remaining equipped with obsolescent weapons.

The government must also immediately appoint a Chief of Defence Staff (CDS) or a permanent Chairman Chiefs of Staff Committee to provide single-point advice to the CCS on military matters, along with the simultaneous establishment of theatre commands. Any further delay in these key structural reforms in higher defence management on the grounds of the lack of

political consensus and the inability of the armed forces to agree on the issue will be extremely detrimental to India's interests in light of the dangerous developments taking place in India's neighbourhood. The logical next step would be to constitute tri-Service integrated theatre commands to synergise the capabilities and the combat potential of individual Services. It is time to set up a tri-service Aerospace and Cyber Command as well as a Special Forces Command to meet emerging challenges in these fields and to better manage all available resources. A tri-Service Logistics and Maintenance command has also been long overdue. International experience shows that such reform has to be imposed from the top down and can never work if the government keeps waiting for it to come about from bottom up.

The softer issues that do not impinge immediately on planning and preparation for meeting national security challenges must never be ignored as these can have adverse repercussions on the morale of officers and men in uniform in the long term. The numerous anomalies created by the implementation of the Sixth Pay Commission report must be speedily resolved. In fact, the ham-handed handling of this issue has led to a dangerous "them versus us" civil-military divide and the government must make it a priority to bridge this gap quickly.

The ex-Servicemen too have had a raw deal and have been surrendering their medals and holding fasts to get justice for their legitimate demand of "one rank-one pension". One rank-one pension is an idea whose time has come and it must be implemented without further delay and without appointing any more committees of bureaucrats to look into the issue. While a Department of ex-Servicemen's Welfare has been created in the Ministry of Defence (MoD) in keeping with the UPA's Common Minimum Programme, till recently there wasn't a single ex-Serviceman in it! Such measures do not generate confidence among serving soldiers and retired veterans in the civilian leadership.

Finally, rather unbelievably, India is still without a National War Memorial.

Brig. Gurmeet Kanwal
Director, Centre for Land Warfare Studies,
(Views are personal.)

is being undertaken through ad hoc annual procurement plans, rather than being based on carefully prioritised long-term plans that are designed to systematically enhance India's combat potential. These are serious lacunae as effective defence planning cannot be undertaken in a policy void.

The government must commit itself to supporting long-term defence plans or else defence modernisation will continue to lag and the present quantitative military gap with China's People's Liberation Army will become a qualitative gap as well in 10 to 15 years. This can be done only by making the dormant National Security Council a pro-active policy formulation body for long term national security planning. (The Cabinet Committee on Security (CCS) deals with current and near term threats and challenges and reacts to emergent situations.)

The defence procurement decision making process must be speeded up. The army is still without towed and self-propelled 155mm howitzers for the plains and the mountains and urgently needs to acquire weapons and equipment for counter-insurgency and counter-terrorism operations. The navy has

'SOLDIERS IN THE SKY'

Vision for the next 25 years

Vayu Interview with Maj Gen PK Bharali, Additional Director General Army Aviation (ADG-AA)



Major General PK Bharali, Additional Director
General Army Aviation

PHOTO: BRIG A.S. SIDHU.

VAYU: Army Aviation is celebrating its Silver Jubilee this year. What have been the significant achievements of this fledgling Corps during this period?

ADG-AA : Army Aviation was created from the erstwhile Air OP in 1986, which itself was carved out of assets of the erstwhile 659 Army Aviation Squadron (RAF) that were divided between India and Pakistan in August 1947. Generations of aviators since then have set the highest standards of courage, valour and professionalism for us to emulate. Since its raising in 1986, Army Aviation achievements in this small span of 25 years has been outstanding, being baptized into battle immediately on raising through 'Operation Pawan' where it responded with pride and elan, wherein Chetaks and Cheetahs were aggressively employed in the armed role. Army Aviation has made valuable contribution in the highest battle fields where it is looked upon as "Saviours of Siachen". Apart from playing a pivotal role in the historic battles for controlling the glacier, it is operationally employed in life sustaining logistic support while operating in super high altitude; a feat unparalleled in the annals of aviation history.

Its contribution in the humanitarian role through the length and breadth of the country, be it the J&K earthquake in 2005, the recent cloudburst in Ladakh, Tsunami, UN Missions in Somalia and Democratic Republic of Congo etc has been stellar. Army Aviation's finest hour was during 'Operation Vijay', when the tactical skills of "Soldiers in the Sky" were recognised and the

arm received innumerable gallantry awards including two unit citations. The induction of the Advanced Light Helicopter (ALH) and in the near future induction of the armed ALH {Weapon System Integrated (WSI)} will give a boost to the tactical capability of the Army.

VAYU: The Indian Army modernisation plans have been slow and tardy and have not been fructified due to various reasons. How has the Army Aviation Corps fared in this process?

ADG-AA : Army Aviation has been under modernisation since its raising and the pace has been in sync with the overall growth of the Army. Substantial progress has been made over the past 25 years. However, further growth and modernisation of Army Aviation is related to certain issues with respect to manning attack and assault helicopters. The issues are under active consideration at the Army and Air Headquarters for a mutually agreed resolution. Army Aviation has grown from the erstwhile Air Observation Post roles utilizing the unarmed Chetak and Cheetah helicopters to the Lancer helicopters, which is a modified Cheetah with guns and rockets to support operations on ground. ALH has been in service with the Army Aviation for over 10 years, providing airlift and air assault capability to the field forces. Induction of the weaponised version of ALH (WSI) in the current financial year, is almost a reality.



VAYU : Could you elaborate on the concept of Aviation Brigade vis-a-vis Aviation Base?

ADG-AA : The Army Aviation Brigade is a fighting formation, which comprises Army Aviation units, whereas, an Aviation Base is a concept based on geographical location, where limited administrative and operational control can be exercised over the units in the base.

Concept of the Aviation Brigade would allow optimal employment of all aviation resources with variety of equipment in a Corps zone in a synergetic manner. It will exercise command and control over all Army Aviation units placed under command. The concept lends the organisation capability to deploy, group/re-group Army Aviation elements and employ task forces optimally in the Tactical Battle Area (TBA), as part of an operational plan. Whereas, an Aviation Base is restricted to exercising command and control on aviation assets located within a base.

Aviation is inherently mobile and can deploy/redeploy in conjunction with Corps operations, whereas a base would remain static, wherever it is, as the equipment and infrastructure is built around it in such a manner. The 'Aviation Brigade' fits well into the hierarchical system of the Indian Army, whereas a 'base organisation' is a unique set with limited capability

VAYU : What role do you visualise for the Army Aviation Corps in 'future wars', where the conflict may be short, swift and confined to specific areas (especially the mountains)?

ADG-AA : The future battle space envisages integrated employment of all

arms, based on combined arms concept, in order to develop an optimal combat power. The field force commander will be required to 'Look Deep' and 'Strike Deep' by harmonising all the combat resources at his disposal in the TBA. This will place a high premium on Effect Based Operations, which call for massing of effects (fires) and forces (manoeuvre), at decisive points, through the depth and extent of the TBA. To achieve the same, it is imperative that aviation resources must be made an integral resource of the field force, to enable seamless integration in the combined arms team. Army Aviation will contribute speed, mobility, and firepower to the attack, reconnaissance and assault forces, by moving and sustaining combat power at decisive points on the battlefield, with its attack and tactical battle support helicopters. Mountains pose the greatest friction to movements of any manoeuvring force. Helicopters of the Army Aviation will provide the means to the field force commander to overcome such terrain frictions and associated battle field frictions.

VAYU : There has been an ongoing debate on use of armed/attack helicopters in counter insurgency operations especially against the terrorists. Pakistan and Sri Lanka have been using these assets against insurgents in their own countries. What are your views on this issue?

ADG-AA : In the Indian context, anti social elements and insurgents are part of our own society, hence they easily merge with them. It is nearly impossible to differentiate or identify

friend and foe specially from the air. Therefore, chances of collateral damage are high, if such aerial platforms are used in insurgency areas. Moreover, Rules of Engagement in the Army are dictated by our policy of use of 'Minimum Force' for Internal Security. Our respect for civilian life and property is very high & we, thus, go into operations with maximum restraint.

VAYU : How is Army Aviation training its pilots? Most advanced armies are making extensive use of simulators. Is the Aviation Corps addressing this crucial issue?

ADG-AA : Army Aviation is undertaking its own basic training as well as advance training of the pilots. Combat Aviation Training School (CATS), which is the premier training institute of Army Aviation, is undertaking the advance training of pilots. Thereafter, the pilots are posted to field units, where they are imparted role and terrain specific training.

Simulators are highly cost effective in undertaking training of pilots. They also have special value for carrying out the training of pilots on emergency procedures and critical situations, which cannot be otherwise demonstrated on an actual helicopter. We made a beginning as far back as 2006, when we installed a basic flying simulator for Cheetah at CATS. Army Aviation plans to have considerable amount of flying training on simulators. In the long term, Army Aviation is planning to procure full motion -six axes simulators for each type of helicopters envisaged, to form part of the inventory.

VAYU : There is an exodus of pilots owing to “greener pastures” available in the civil helicopter industry. Has this resulted in a shortage of pilots in the Corps. If so, what is being done to tackle this problem?

ADG-AA : Lateral absorption in the civil aviation has been a natural process as the country requires qualified helicopter pilots in civil sector, too, and Army Aviation has the largest repository of such trained helicopter pilots. However, these pilots have left the army after completing their regimental tenures in Army Aviation units. Therefore, it has not affected the availability of pilots, nor does it affect the growth and Army Aviation operations. In fact Army Aviation continues to enjoy the status of being one of the most sought after arm and there is no dearth of volunteer young officers for Army Aviation.

VAYU : After 25 years of its existence the Army Aviation remains a purely recce and observation arm; the Air Force continues to hold onto the attack and medium/heavy lift helicopters. What action is being taken by the Army to resolve this critical issue?

ADG-AA : After creation of Army Aviation in 1986, it delinked from Air Force and graduated to reconnaissance and observation units. Since then, Army Aviation has grown with Lancers, the ALH and ALH (WSI), providing a part of the attack and lift capability to the army. However, optimum utilisation of helicopter resources in TBA can only be achieved, when all rotary wing assets including all assault and attack helicopters in the TBA are integral to the Army. Most modern armies of the world including our adversaries have been able to resolve the issue, regarding manning of attack and lift helicopters. The issue is being addressed at both the Service Headquarters to work out a pragmatic solution and modalities for the future.

VAYU : In some countries, Unmanned Aerial Vehicles (UAVs) are a part of the Army Aviation Corps, whereas in our country they are with the artillery. Is there a case for the UAVs to be placed with the Army Aviation Corps?

ADG-AA : UAV as an aerial platform is more ‘organic’ to Army Aviation than to any other Corps. However, the prime task presently being undertaken by the UAVs is surveillance, which is one of the primary roles of Artillery. Therefore, the equipment could be placed either with Artillery or Army Aviation. While a number of countries have placed UAVs under Army Aviation, in our country the same is placed under Artillery, owing to the nature of tasking, although the Army Aviation has been entrusted with the responsibility to exercise operational control when these assets are co-located with the Army Aviation bases.

VAYU : With the induction of new helicopters envisaged for the Army Aviation Corps, training and infrastructure would pose a big problem. How does the Army Aviation Corps plan to make the induction smoother?

ADG-AA : Combat Army Aviation Training School (CATS), Nasik is the alma mater for all army aviators. Plans are in progress to make it more self reliant by allocating dedicated helicopters and technical crew to increase its training capability. Technology per-se will not be new to Army Aviation. The transition from single engine Chetak/Cheetah to the free turbine twin engine ALH has already given us immense experience and the transition



Major General PK Bharali, Additional Director General Army Aviation with P Soundara Rajan, MD Helicopter Complex, HAL during the handing over of five Dhruv ALH Mk.IIIs at Aero India 2011.

methodology put in place has been successful and validated. Consequently, the enmeshing of ALH squadron in operational plans, as an integral resource has been achieved.

We are also focussing on simulator training, to assist in transition to the next generation of helicopters. In addition, initial training of pilots as well as technicians will be built in into the contract for procurement of the new helicopters. Notwithstanding the above, the type of training will remain a challenge. In the overall picture, from my vantage point, I am convinced that we already have the talent and expertise; requirement of resources and infrastructure will also fall in its place in due time.

VAYU : According to HAL, the armed version of ALH is likely to enter service soon. Once inducted, what would be its role and employment?

ADG-AA : The ALH (WSI) will be the pivotal component of the combined arms team. The precise and incisive fire power, coupled with speed and manoeuvrability in the third dimension and intimate integration with ground forces, will make it the ultimate force multiplier in the hands of the field commander. The platform will have multifaceted role in all operations of war, with capability to be employed in attack operations, air assault operations as well as aviation combat support operations.

VAYU : What is your vision for the Army Aviation Corps over the next 25 years?

ADG-AA : Army Aviation will acquire attack and assault capability, in addition to the existing reconnaissance and utility capabilities. Night enabled helicopters would give the Corps 24x7 capabilities. It would be manned by personnel permanently seconded to the Corps, enabling the Corps to adorn a rich regimental ethos. Being an integral component of the field force, it will become an inseparable component of the combined arms team. It will be the most dominant component of the manoeuvre forces, at the disposal of the field force commander. In the times to come, Army Aviation would definitely be the most sought after combat enabler and will be at the forefront in the shaping the battle space.



The refurbished Pushpak on display at Aero India 2011

An Army Adventure

Celebrating 25 years of Army Aviation

“If I am right, this very aircraft had fought two wars and flew as part of No. 660 AOP Squadron.... we will fly this new-look, refurbished Pushpak all across India to mark the Silver Jubilee of Army Aviation” said an exuberant Brigadier Amardeep Singh Sidhu, Commander, Army Aviation Base, Leh

Restoration work began in 2010 when a team deputed by HAL completed all the fabric work within a month with help from the engineers and technicians of the Patiala Flying Club. First test flight was on 30 October, 2010. The piston engine was overhauled and the aircraft was then flown south to Yelahanka where it took part in Aero India 2011.

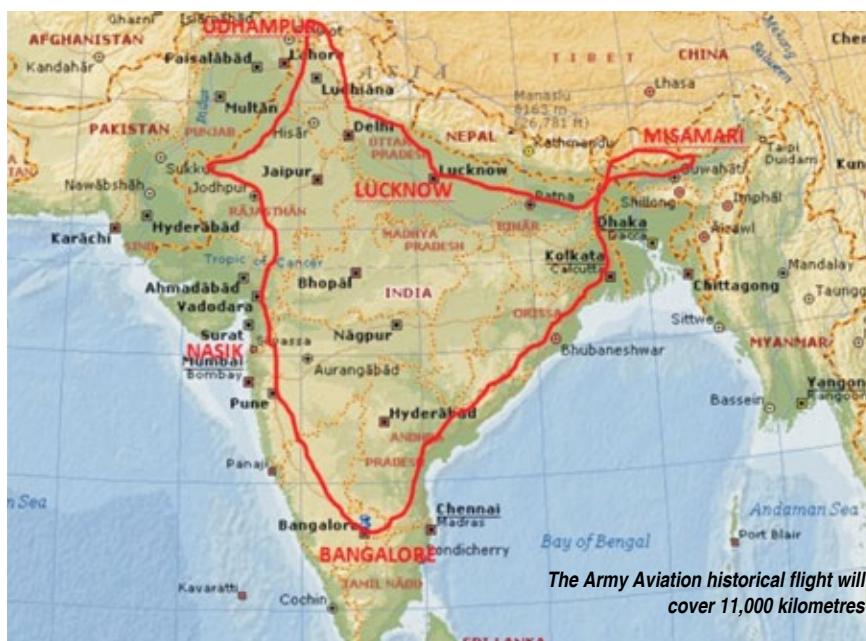


‘Fly Army!’ Ground handler rotates propeller to start engine of Pushpak AA-001

Talking to the media during Aero India Show, Brig Sidhu elaborated on the plan to “visit even some of the oldest aviation bases in India, including that made famous during the battle of Longewala. From Bangalore we fly to Nasik, Jaisalmer,

Bathinda, Jalandhar, Amritsar, Jammu, Lucknow via Bagdhora to Tezpur, Vishakhapatnam, Bangalore and conclude at the Combat Army Aviation Training School at Nasik.”

“We couldn’t have asked for a better souvenir—a priceless one—than this flight to mark the Silver Jubilee of Army Aviation.” said Colonel Dipender Singh, Commanding Officer, recently raised 205 Army Aviation Squadron.



The Army Aviation historical flight will cover 11,000 kilometres



Brig. AS Sidhu at Aero India 2011



Aviators in Olive Green



Silver Jubilee of Indian Army Aviation Corps

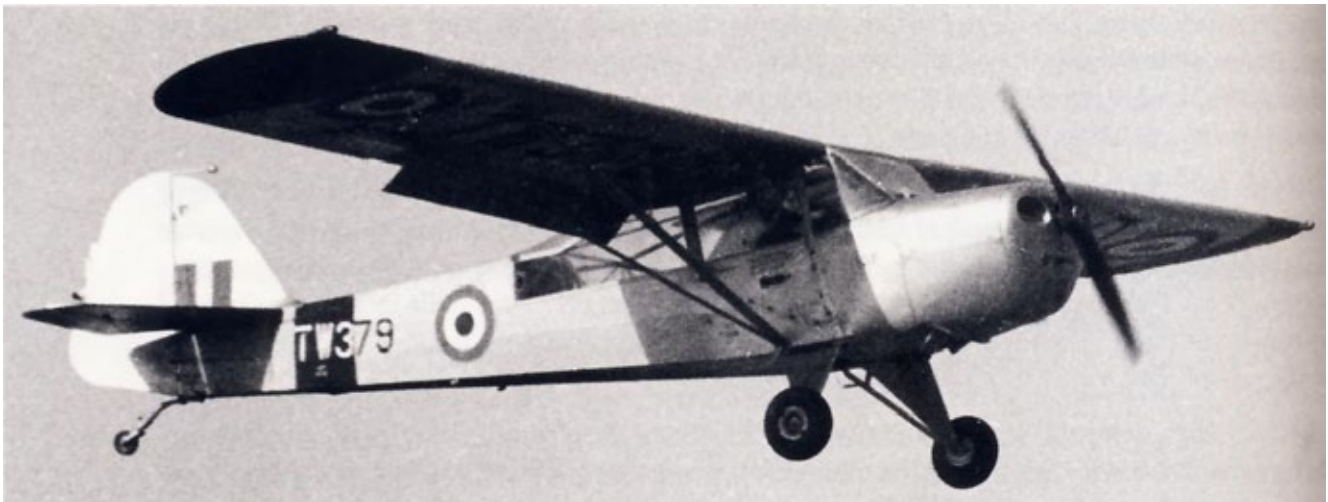
Although the Indian Army's Aviation Corps traces its foundations to India's very first day of independence, the 1st (Independent) Air Observation Post (AOP) Flight being formed on 15 August 1947, the independent Directorate came into being on 1 November 1986.

Tracing the evolution of employment of aircraft in the history of warfare, this

was, in fact, for directing artillery fire from an elevated platform which was when the 'Air Observation Post' (AOP) aspect was conceived and used in the Great War of 1914-18. First pilots of the Royal Flying Corps (RFC), later Royal Air Force (RAF), were normally gunners from the Regiment of Artillery and drills for engagement of targets were evolved by 1917, using morse code and white cloth ground panels.

Over the next decade, this was refined, radio sets were fitted and standards of procedure had evolved by the time of World War Two (WW II), when the British Army's No. 659 (AOP) Squadron was formed with Tiger Moths and Auster Mk.III's to take part in the fighting for Europe till the war ended in 1945.

Immediately post-war, this very No.659 (AOP) Squadron was moved to



A handful of Auster Mk.IVs were flown from Lahore to Amritsar on 15 August 1947 to form the nucleus of No.1 (Independent) Air Observation Post (AOP) Flight, being immediately deployed for reconnaissance over the unending refugee columns and for humanitarian tasks.



No. 1 (I) AOP Flight RIAF comprised Major Barry Jackson, Captains S.Man Singh, Govind Singh, H.S.Butalia, S.W.Shahne, R.N.Sen, Faridoon Mehta and Ranjit Singh.



Some pioneer AOP pilots with Auster at Amritsar airfield.

India, shipped to Bombay in October 1945 and then moved to Dhubulia, 80 km. north of Calcutta. The three flights were shortly detached, one to Devlali for training tasks at the Indian Army's School of Artillery, the others to Miranshah and Razmak on the north-west frontier to support operations against the tribals while detachments were deployed at Lahore and Multan to undertake reconnaissance over civil disturbances. Later, the Squadron concentrated at Lahore and was assigned to the Punjab Boundary Force.

On 14 August 1947, No.659 (Air OP) Squadron was disbanded and partitioned as well, No.1 (Independent) Air OP Flight of the Royal Indian Air Force being formed the next day. Since Lahore was now an alien city, some Auster Mk.IVs and ground equipment were retrieved by Captains HS Butalia, Govind Singh and Man Singh and moved 40 miles eastwards to Raja Sansi airfield at Amritsar. The Austers were immediately deployed for convoy direction, reconnaissance over the unending refugee columns and humanitarian tasks. They were later moved to Jullundur, commanded by Major HS Butalia while the first pilot to be trained for AOP operations in the U.K. was Capt. Faridoon Mehta.

No.2 AOP Flight was raised in October 1947 with five Auster Mk.Vs but in order to meet the increased training requirements, even as courses began at Devlali, the Indian Army continued to send officers for flying instruction to Little Rissington in the UK. The J&K Operations of 1947-48 and immediate deployment of the Flight

to Jammu for recce, direction of artillery fire and casualty evacuation from exposed advanced landing grounds earned it numerous gallantry awards.

Virtually at the other end of India, No.2 Flight was attached with the 1st Armoured Division during the Hyderabad 'police action' in September 1948 and then moved to Begumpet airport.

Austers of No.1(I) Air OP Flight were much involved during the 14-months of operations in J&K, not only in their essential role but also flying senior Generals and the Defence Minister around the Kashmir valley. Apart from Jammu and Srinagar, the Austers flew from advance landing grounds (ALGs) at Naoshera, Jhangar, Rajouri, Mendhar and Chhamb. Major air effort remained the direction of artillery fire as also casualty evacuation, all in the face of hostile anti-aircraft fire.

The decade of the 1950s was a period of consolidation but there was very little expansion because of national policy and financial constraints. No.2 Flight was moved from Devlali to Adampur in the Punjab in February 1955 and for a short time, they flew Percival Prentice trainers phased out by the IAF, a difficult aircraft and unsuited for Air OP. No.3 AOP Flight was raised on 1 June 1958 with the new Auster Mk.IX and, simultaneously, No.659 Air OP Squadron IAF was formally established at Devlali, but differences in perception, or lack of communication, between the Army and Air Force now surfaced and the latter did not



Austers of No. 1 AOP Flight flew S.Baldev Singh, Defence Minister of India from Jammu to various ALGs in the beleaguered state.

'recognise' the Squadron till January 1961, and the Flights only began functioning from May 1963.

Meanwhile additional flights were raised at Adampur, No.3 taking part in the Goa police action in December 1961. A year later, the Flight was moved to Misamari near Tezpur in Assam even as the Chinese Army was occupying large parts of the Kameng Division. No.4 Flight, based at Dimapur took part in support of the Indian Army's operations in the Naga Hills.

It was during the Rann of Kutch operations in April 1965 that No.1 (I) Air OP Flight went into action against regular armoured forces, supported by artillery and mechanised Infantry. Operating from

advance landing grounds, the Austers were in support of the 50 (Independent) Parachute Brigade, when heavy artillery duels took place, the Austers directing fire of 71 Medium Regiment, which resulted in direct hits on an ammunition dump at Biar Bet.

With the clouds of war still ominous even after ceasefire in the Rann of Kutch, the need for more Air OP, inadequacy of such cover for the Indian Army and aging Auster IX aircraft, energised Brigadier Faridoon Mehta, then Brig. Arty. Western Command to get Air Vice Marshal Harjinder Singh, then retired and Aviation Advisor to the Punjab Government, to loan Pushpak light training aircraft from Flying Clubs to



Lt.General K.M. Cariappa, GOC-in-C Western Command, strapped in an Auster before reconnaissance flight in J&K, 1948.



Some of the earlier AOP pilots of the Indian Army included Major G.S.Reen (seated, centre), Captain Baldev Singh to the right, Capt.R.C.Butalia (standing on the left) and Capt.P.C.Jaidka on the right.



Auster Mk. IXs were obtained in the mid 1950s and equipped No.659 Air OP Squadron, and detached to the Naga Hills.

the Air OP. This scheme was supported by Air Marshal Pratap Lal, the VCAS and General PP Kumaramanglam, the VCOAS and by the time the Indo-Pak War broke out in September 1965, Nos.6, 7 and 8 Flights had been raised on Pushpaks and some form of Air OP cover was available for the frontline Army Divisions on the Western Front.

No. 660 Air OP Squadron was raised at Adampur on 1 January 1965, No.5 Flight at Nasik Road on 1 April 1965, No. 6 at Bagdogra on 1 July 1965, No. 7 at Patiala on 6 September 1965 and No. 8 at Jullundur on 11 September 1965, during the war itself, the flights becoming operational in less than 15 days.

The various Air OP Flights did commendable job in engaging enemy

artillery, a number of Austers and Pushpaks being hit by ground fire even as enemy armour was engaged. Many gallantry awards were won but the glaring deficiency of Air OP Units was very obvious. Air OP lacked adequate aircraft and the Army pilots had little flying experience on Pushpaks before being launched into battle.

After the war, the Pushpaks had to be returned to the various flying clubs and pilots reverted to their ground duties. Spares for the remaining Auster Mk.IXs were not forthcoming and a QR was framed for HAL to design and develop a dedicated AOP aircraft which eventually became the HAOP-27 Krishak, a modified ag.aircraft but in the absence of any alternative, orders were placed for 30

and then 33 more and Nos. 5, 6 and 7 Flights exchanged their Pushpaks on loan for Krishaks in 1966-67 while four other Flights got Krishaks as well.

Flying training of adequate numbers of pilots was an equal problem as the IAF would only accept 10 Army pilots per year. No. 660 Air OP Squadron at Patiala, with five Flights under command, was given this additional responsibility under Lt.Col.RC Butalia which trained 27 new pilots in 3400 hours of flying.

The years 1966-68 were a period of much inter-Service debate, the Army wanting one Air OP Flight per Division while the Air Force were just not agreeable. The Army also wanted to replace the fixed wing aircraft with helicopters which was finally agreed to and the first Army pilots



The Air OP's forte : directing artillery fire, engaging targets from their elevated position; the Auster Mk.IX soldiered on for over 20 years.



Auster Mk.IX of No.1 (I) Air OP flight during operations in the Rann of Kutch, April 1965.

converted to helicopters in 1968. In 1969 planned development phase of the Air OP was started, with another 15 Air OP Flights planned for raising over a period of 10 years. The policy decision was to equip Flights in the plains with HAL Chetaks (Alouette III) and introduce the HAL Cheetah (SA315B Lama) for the mountains.

Thus, Nos. 10 and 11 Air OP Flights were raised on Chetaks at Bagdogra in March 1969, followed by No. 15 Flight in June 1971 while Nos. 12 and 14 Air OP Flights, raised at Nasik Road and Patiala, got the fixed wing Krishak. No. 661 Air OP Squadron was raised at Nasik Road on 26 January 1967.

The civil war and strife in East Pakistan had repercussions in West Bengal and Assam during most of 1971 and the



The Air AOP Flights were briefly supplemented with phased-out Percival Prentice primary trainers flown by No.2 Flight from Adampur

imminence of eventual armed action meant that even as the new helicopter-equipped flights were being positioned, Pushpak aircraft were again borrowed from various flying clubs. When war began on 3 December 1971, the Air OP provided artillery direction fire, flew communication sorties, photo and reconnaissance missions with the Corps and Division of Eastern Army Command. No. 11 AOP Flight, in support of 57 Mountain Division of



HAL Pushpaks from various flying clubs, particularly Patiala in the Punjab, were commandeered during the September 1965 conflict, hastily painted in drab camouflage paint and employed for Air OP tasks engaging enemy artillery all along the front. (see 'An Army Adventure')



Responding to the QR framed by the Army, HAL developed the HAOP-27 Krishak from an essentially ag.aviation aircraft which, in the absence of any alternative, was acceptable to the Army.

IV Corps, led IAF Mi-4s in the Meghna River crossing providing reconnaissance leading to the capture of Sylhet, preceded by dropping of surrender leaflets. The first Indian fixed wing aircraft to land at Tezgaon (Dacca) airfield at the surrender was Major Menezes in an Army Krishak.

In the western theatre, No.2 Air OP Flight operated in the Chhamb Sector in support of the 10th, 25th and 26th Infantry Divisions, flying a motley of Auster IXs and borrowed Pushpaks, being frequently chased by enemy Sabre jets. In the Shakargarh Sector, Nos.1 and 9 Air OP Flights, with Krishaks and Pushpaks supported the 39th and 54th Infantry Divisions in the face of extremely hostile air activity, one Krishak being shot down by Sabres. The XI Corps sector in the Punjab, with the 7th, 14th and 15th Infantry Divisions was supported by No. 661 Air OP Squadron with Nos. 3, 8 and 14 AOP Flights flying Austers and Krishaks, the low and slow flying aircraft bravely evading Mirage and Sabre attacks.

It was No. 12 (Independent) Air OP Flight that created history during the 1971



Lt..Col. Atma Singh, who later become the first ADG Army Aviation.

war. In support of 12th Infantry Division in the Jaisalmer Sector, where Indian forces were poised for a deep offensive, the Krishaks of No.12 Flight had instead, to contain the surprise thrust by a strong enemy armoured force towards Longewala

in the desert, with their objective of capturing Ramgarh. No.12 Flight was moved to its forward ALG at Ranau on 4 December 1971 and in absence of any FAC at Longewala, the two Krishaks flown by Major Atma Singh and Capt. PPS Sangha guided the Air Force Hunters from Jaisalmer onto the T-59 tanks, the repeated rocket and cannon attacks from dawn to dusk resulting in virtual destruction of an armoured regiment and forcing the enemy to retreat. For their gallantry, both pilots were awarded the Vir Chakra.

Over the next twelve years after the War, 1972-1984, the Air OP retired their fixed wing aircraft and all Flights and Squadrons were re-equipped with Chetak or Cheetah helicopters.

No.662 Air OP Squadron was raised at Nasik Road on 29 June 1972 and 16 Air OP Flight at Bagdora in September 1972. With the Army's need for a large number of helicopter pilots, the Air Force found it difficult to meet the requirement and the Army decided to entrust the task to No. 659 Air OP Squadron which initially converted 27 fixed wing pilots to



The Army initially placed orders for 30 Krishaks and followed this with a supplementary order for another 33 Krishaks.

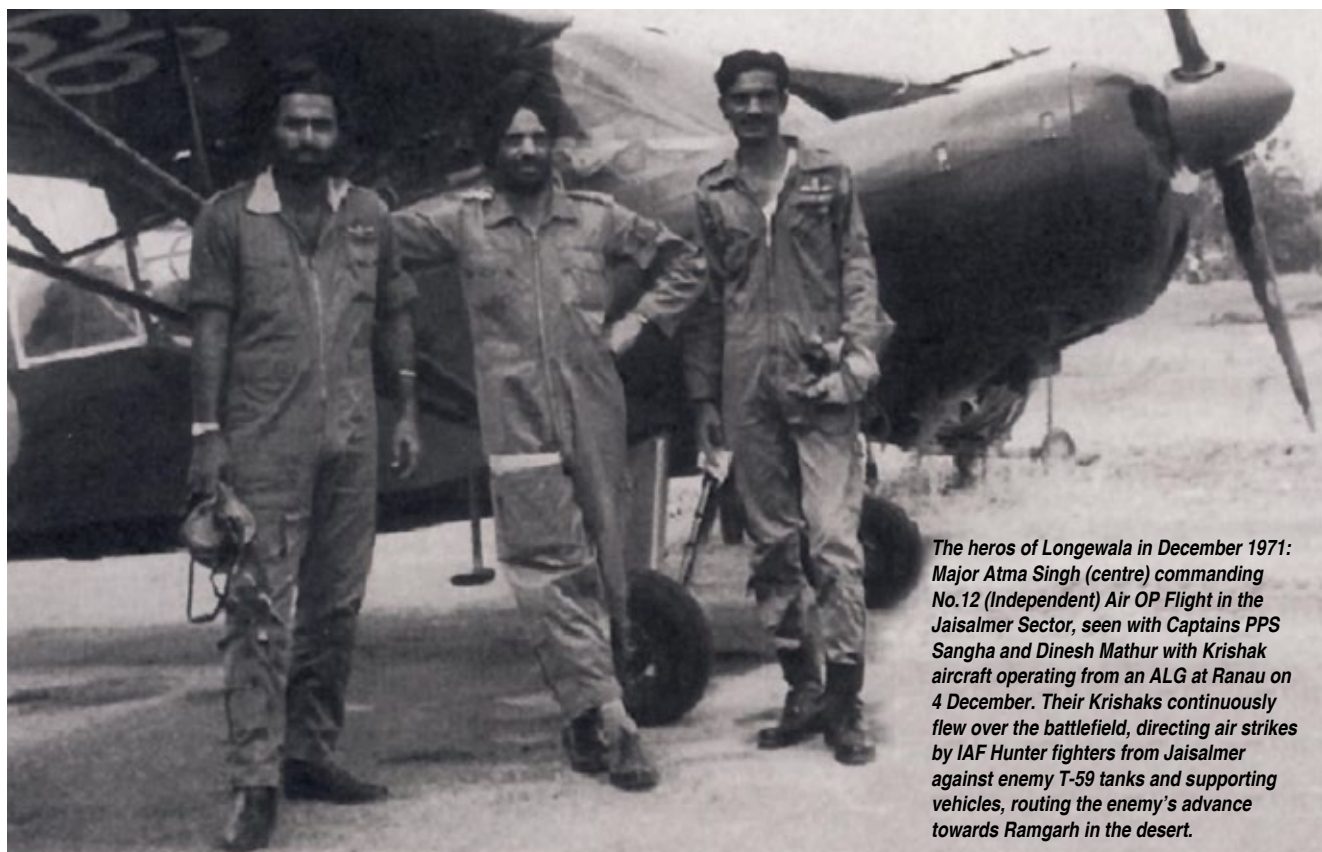
fly helicopters during 1972-73. In 1973, there were five additional raisings, Nos. 17 and 18 Air OP Flights with Chetaks and Cheetahs and No. 663 Air OP Squadron at Devlali on 1 January 1973, which moved to Srinagar on 8 February 1974. These were followed by Nos. 664 and 665 Air OP Squadrons raised at Misamari and Nasik Road respectively on 2 April 1973.

Planned raising of additional units continued from 1974 through till 1978,

25 May 1981. These humanitarian rescue missions were to stand the Army pilots in good stead when *Operation Meghdoot*, securing of the Siachin Glacier, was launched on 13 April 1984.

Earlier than that, No. 666 Air OP Squadron had been raised on 1 May 1982 at Bhatinda and Nos. 30 and 31 Air OP Flights had come into being at Pathankot and Bhuj on 1 March 1984. No. 663 Air OP Squadron which was

but dependent on the Indian Air Force for maintenance, logistics and flying training support, and following decades of painstaking effort to get their case accepted by the Government, an independent Army Aviation Corps was formally established on 1 November 1986. The requirement for an integral Army Aviation Corps had first been made in February 1963 when the JRD Tata Committee deliberated on the expansion and rationalisation of the air



The heroes of Longewala in December 1971: Major Atma Singh (centre) commanding No. 12 (Independent) Air OP Flight in the Jaisalmer Sector, seen with Captains PPS Sangha and Dinesh Mathur with Krishak aircraft operating from an ALG at Ranau on 4 December. Their Krishaks continuously flew over the battlefield, directing air strikes by IAF Hunter fighters from Jaisalmer against enemy T-59 tanks and supporting vehicles, routing the enemy's advance towards Ramgarh in the desert.

with the aim of having one Air OP Flight per Division. Nos. 21, 22, 23, 24 and 25 Air OP Flights were raised at Patiala, Bagdogra, Bareilly, Hashimara and Bhatinda, all equipped with HAL Cheetahs. On 9 September 1978, a Cheetah flown by Lt. Col. Wadalia created history when he landed at 22,277 feet above sea level, alone in order to have absolutely minimum weight, to rescue a German climber on an expedition to Nun Kun. A Japanese mountaineer was similarly air-rescued on 18 June 1979 from 22,333 feet, some of many rescue missions flown by Air OP pilots. The absolute world record was that by Capt. RS Dev in a Chetak, landing at 23,800 feet (800 feet above the service ceiling of the helicopter) on

located at Sharifabad, on the outskirts of Srinagar, placed Cheetah detachments at Leh in April 1984, No. 3 Flight being supplemented by Nos. 1 and 19 Air OP Flights, all of which got strenuously engaged in operations at the world's highest battlefield, operations which continue till today, 27 years later. Army Cheetahs have supported the troops at these extreme altitudes, at minus 40°C temperatures, flying in supplies, flying out casualties, avoiding enemy shoulder-fired missiles and directing own artillery fire. Air OP pilots were even responsible for occupation of certain enemy posts, by closely observing their status.

Then after nearly four decades of functioning as a quasi-independent force

arms of India. The case was submitted to the Government in April 1968, the concept of Army Aviation undergoing a paradigm change after induction of helicopters and large scale mechanisation, combining various arms including armour, mechanised infantry, self propelled artillery and attack helicopters, all requiring integrated command for meshing elements into a cohesive fighting force.

The Air Force still vigorously opposed such a move, professing that an Army Aviation Corps would result in duplication of aircraft, ground facilities and manpower. The 1971 conflict delayed decisions but the Army renewed its proposals in February 1977, emphasising that modernisation of the Army and rapid advances in weapons



Army Cheetah coming in to land, drop officer and take off from helipad at the vital Point 4875, overlooking the Zoji La and Mushkoh valleys in the Dras Sector.

technology made the need for an integral air arm of the Army imperative so as to enhance battle effectiveness. The Committee of Secretaries tasked with examining the issue, not unexpectedly, recommended the Army's case but the Government remained undecided. In 1981, a Study Group continued to press for a formal decision but it was several years later, on 24 November 1985, after the Army Chief General Sundarji made forceful presentations to Prime Minister Rajiv Gandhi that the formal decision was taken.

An Army Aviation Cell was created at Army headquarters under then Brigadier Atma Singh and joint implementation

instructions issued for taking over of helicopters and other assets from the Air Force for transfer to the Army. On 16 July 1986, the Government issued the broad outline for functioning of the Army Aviation Corps, namely that "the Army would have its own communication and utility helicopters, wholly manned, maintained and controlled by it, all Air OP Squadrons and Flights be transferred to the Army but all attack helicopter units and medium and heavy-lift helicopters would remain Air Force assets although the former would be placed under command and control of the Army".

The nucleus for an Additional Directorate General of Army Aviation

was sanctioned on 29 October 1986 and placed under the Director General Mechanised Forces, then Lt.Gen.Kirpal Singh Randhawa. Army Aviation came into being on 1 November 1986, with Brigadier (soon Major General) Atma Singh as the first ADG-AA. Some 170 Chetak and Cheetah helicopters, their ground support infrastructure, spares and ancillary equipment were transferred from Air Force charge to that of the Army. The Air Force was tasked to continue providing logistic and maintenance support till 31 Oct 1989. To herald this important event, four Army Aviation helicopters (2 Chetaks and 2 Cheetahs) took part at the Republic Day parade over Rajpath on 26 January 1987, flying very low over the armoured and mechanised columns.

The nomenclature Air Observation Post (AOP) was shortly changed to Reconnaissance & Observation (R&O) and it was as such that Army Aviation units took part in *Operation Pawan*, the 30-month deployment of the Indian Peace Keeping Force (IPKF) in Sri Lanka from July 1987 onwards. Nos. 10, 26 and 31 R&O Flights initially supported 54 Infantry Division in the Jaffna peninsula, with 664 R&O Squadron eventually moving to Trincomallee in December 1987. The last R&O Flight withdrew from the Ocean Island in March 1990.

On 1 June 1990, the IV Corps Army Aviation base was raised at Misamari and the existing flights placed under its command, with No.22 (I) R&O Flight located at Dinjan.



Army Chetaks operate in support of various Indian Army Corps in the north-east : HAL Chetak of No. 12 R&O Flight at Rangapahar, near Dimapur in Nagaland.

The new formation with all its flights took part in *Operation Bajrang* from November 1990 to April 1991 and *Operation Rhino* in the Brahmaputra Valley and adjacent areas from 15 September 1991 onwards.

On 13 March 1991 was raised the X Corps Army Aviation base at Bhatinda and the existing flights placed under its command. On 25 June 1998, the IV and X Army Aviation Bases were renamed as Nos. 667 and 668 R&O Squadrons.

During *Operation Vijay*, the Kargil operations in the summer of 1999, Cheetahs of Nos. 663 and 666 R&O Squadrons and a number of Independent Flights, flew more than 3100 air sorties in support of the Army's 3rd Infantry and 8th Mountain Divisions to assault and then secure the mountain heights overlooking the Kargil, Batalik and Dras Sectors, north of the Zoji La Pass in northern Kashmir. Cheetahs directed the intense artillery bombardment from a range of mountain and field guns plus heavy howitzers as also provided vital information on the enemy's deployment flew Special Forces to high mountains and evacuated numerous battle casualties. For their outstanding performance, both 663 and 666 R&O Squadrons were given COAS unit citations and their personnel awarded a number of Vir Chakras.

On 1 September 1999, No.669 R&O Squadron was raised at Leh along with XIV Corps and was fully operational by January 2000 in a record period. Its Nos. 34 and 35 R&O Flights were moved to 663 R&O Squadron and instead got 2 (I) UH Flight and 19 R&O Flight under command.

In October 2001, the nomenclature was changed from R&O Squadrons / Flights to Army Aviation Squadrons (R&O) or Army Aviation Flights (R&O). A quantum change in the Army Aviation establishment and its helicopter inventory had taken place on 15 September 2001 when No.201 Army Aviation Squadron (UH), the first with HAL Dhruv Advanced Light Helicopters (ALH) was raised at Bangalore. The Indian Army has been the prime mover behind this important programme with a stated requirement of some 130 numbers of this multi purpose new generation helicopter. The Dhruv ALH will be employed for various utility tasks, including heliborne assault, transportation of loads, including those



The armed Cheetah, called the Lancer.

underslung, staff communication and casualty evacuation, with seven utility squadrons planned. The ALH-WSI (Weapon Systems Integrated) version is being developed by HAL's Rotary Wing Research & Development Centre (RWRDC) specifically for the Indian Army which plans to raise six squadrons with this variant.

ALHs from the Army's No.201 UH Squadron carried out field trials in the desert near Jodhpur during May-June 2002 at the peak of heat, not only temperature-wise but the tensions with Pakistan and deployment of India's armed forces (*Operation Parakram*). Around 125 hrs. of problem-free operations were carried out and practical design changes incorporated



Hindustan Aeronautics Limited have played the major role in equipping and comprehensively supporting the Army Aviation Corps. Then Chairman HAL Dr.C.G. Krishnandas Nair and S.N. Sachindran, Director Planning, seen with Army Aviation officers and HAL Cheetah at Leh, the base for Nos.666 and 667 R&O Squadrons.



Army Aviation in action : (top to bottom), Dhruv ALH in exercise, para commandos await helilift, Cheetah and Dhruvs await orders.

thereafter, essentially for cabin cooling and systems accessibility. The trials included special heliborne operations, underslung load carriage and night cross-country sorties using night-vision goggles.

In July-August, 2002 these ALHs were flown to the extreme heights of Ladakh, for high altitude and cold weather trials in the Siachen Glacier. The ALHs operated from helipads at 15,800 ft. but could well have operated from those above 18,000 ft. By 2011, five squadrons of the Indian Army have been equipped with the ALH, including Nos. 202, 203, 204, and 205, the last mentioned being equipped with the new Dhruv Mk.III with the Shakti engine providing enhanced power.

The Dhruv ALH, with its WSI variant (Mk.IV) will be the backbone of Army Aviation in the next decade and there are firm plans for expansion of the Corps with new generation light observation helicopters to supplant the Cheetahs, as also for dedicated anti-tank helicopters and medium transport/assault helicopters, thereby more than doubling the current inventory of some 200 helicopters on strength. The Army and HAL are in close interaction for development of new versions of the Cheetah, an initial 12 numbers of the light attack version (Lancer) having been delivered in late 2001 to No.4(I)AA Flight. The re-engined Cheetah, with the TM333-2M2 engine with FADEC, named Cheetal, would have increased performance and payload at extreme altitudes.

Night Vision Goggles (NVG) are integrated with an helicopter mounted surveillance system (HMSS) and counter measure dispensing system (CMDS) giving the Army some force multiplication with the existing helicopters.

In anticipation of the increasing requirement for helicopter pilots and advanced combat tactics training in the new battlefield environment, the Army established the Combat Army Aviation Training School (CATS) on 1 September 2003 at Nasik Road, the 'home of Army Aviation'. The Cheetah Helicopter Simulator was introduced at CATS for the initial ground training stage of pilot training and is expected to substantially reduce costs and risks.

The Army Aviation Corps first went overseas in April 2005, when a flight of four Cheetahs was positioned with the UN



Nasik Road, close to the Army's School of Artillery at Deolali, is the home of Army Aviation. The Combat Army Aviation School was established at Nasik Road in September 2003 for flying instructor and advanced flying courses, as also for development of combat tactics.

Mission in Congo (MONUSCO), located at Goma at an altitude of 5,000 ft asl. The tasks have been both military and civil and include aerial patrol, search and rescue, terrain mapping and casevac. Over the past six years, the flight has flown over 7,900 hours.

In February 2005, severe snow storms paralysed the Kashmir valley and created several major avalanches in Kupwara, Gurez, Kapran, Verinag, Qazigund, Kulgam, with the valley totally cut off. During *Operation Rahat*, Cheetahs of 663 Army Aviation Squadron evacuated numerous casualties to the nearest hospitals.

In October 2005, there was a severe earthquake in North West Kashmir, with its epicentre in POK and lesser but still significant damage across the LoC in the Uri and Tangdhar sectors. Cheetahs of 663 Army Aviation Squadron, at Sharifabad, responded within thirty minutes of the catastrophe, some eight helicopters taking part in

Operation Imdad. The Squadron flew 207 hours, evacuated 320 casualties and inducted near 60,000kgs of relief stores during the operations.

In 2006, 665 Army Aviation Squadron (R&O) were tasked to undertake flood relief operations in Maharashtra and Gujrat for evacuating marooned civilians, delivering relief material, flying those stranded in the Nasik and Surat areas.

Two years later, this time in Bihar during *Operation Kosi Prahar*, No.1 (Independent) R&O Flight moved a

detachment to Bihta Air Force Station for flood relief in the Birpur, Madhepura and Purnia areas, being awarded the 'GOC-in-C Central Command commendation card'. In August 2010, during *Operation Cloudburst*, after Leh was devastated by flash floods, Cheetahs of No.666 Aviation Squadron (R&O) of 14 Corps Army Aviation Base were pressed into action and earned accolades for their performance.

In 2006, a new era dawned when, the first permanent cadre officer, Maj Gen.

Ajit Gadre, took over as the Additional Director General (ADG) Army Aviation. The cadre has since expanded and it is significant that the new Defence Advisor with the Indian High Commission in UK in 2011 will be a permanent cadre officer, Brig. Sandipan Handa who was earlier Commandant of the Combat Army Training School at Nasik when thirty army officers were awarded 'wings' to become army aviation pilots at a valedictory ceremony in May, 2010.



The integrated glass cockpit of HAL's Dhruv ALH.



Indian Army *Ranjit* at Vavuniya.

‘Collective Heroism’

This is an incredible account of how two critically wounded Army Aviation pilots flew back their helicopter to base.

An Indian Army Aviation Flight was located at Vavuniya airfield in north-central Sri Lanka during *Operation Pawan* as part of the Indian Peace Keeping Force (IPKF). Cheetahs mounted with two 7.62mm machine guns were called *Ranjits* and soon established a formidable reputation and demand for its fire support soon grew with field units. Medium machine gunners were attached to the Flight from infantry units, but had to go through a short training capsule for recognition of targets from the air, and ground engagement of targets from an unstable platform like a helicopter.

Although it seemed simple, in actual fact only a few could make the grade. Such training responsibility became an additional task for the AA pilots who had to take them to designated ranges and give the medium machine gunners enough practice.

One such training sortie was planned on 7 June 1989 at a practice range north east of Vavuniya Sector by the side of a lagoon.

Maj Daman Seigell (QFI) and Capt HS Kaura were the aircrew, Kaura occupying the seat on the right. They took off at about 1430 hours and set course for the practice range after climbing to two thousand feet above ground level and started following the metalled road and parallel railway line from Vavuniya to Jaffna in the north. As they got close to Pulayankulam village (after some 12 minutes flying), they saw a military convoy strung all over the road in haphazard manner. As the pilots descended to ascertain identity, they realised that an IPKF convoy had run into LTTE ambush and a fire fight was in progress.

Detailed investigations later would reveal that the LTTE had targeted the commanding officer's vehicle, appreciating that getting the commanding officer was their key to success. The CO's party consisted of three vehicles. The first fusillade of automatic fire from the LTTE weapons had killed some Indian soldiers, who were lying on the road, their weapons beside them. The Jonga driver, in which the commanding officer Col Resham Singh was travelling, had lost control and he started manning the light machine gun mounted on the protection vehicle

himself as the gunner was badly injured. His brave attempt to control the situation however was futile as they had suffered heavy casualties.

The LTTE was known to take away weapons in successful ambushes. Kaura and Daman's *Ranjit* helicopter then appeared as if prayers for deliverance from the heavens had been answered – literally. LTTE cadres springing the ambush were surprised too, as for them arrival of the *Ranjit* helicopter was a most unexpected and dangerous development. It upset their careful planning. Sensing that the *Ranjit* would soon go into action, they broke contact and started running into the thick jungles. The pilots could see 10 to 12 fleeing cadres with their automatics. They brought the helicopter to the tree top level and started engaging them with the MMGs. Daman had the controls while Kaura was guiding gunner Giri to fire. The devastating MMG fire knocked down some of the militants. However, unknown to the helicopter crew, some militants were hiding in thick jungle cover and on tree tops. These militants fired at the helicopter with their automatic weapons, a burst hitting Kaura

The Indian Peace Keeping Force (IPKF) at Sri Lanka eventually grew to four Infantry Divisions, plus independent brigades at the peak of deployment. The first troops were from the 54th (Air Assault) Division who were headquartered at Palaly (near Jaffna) followed by the 4th Mountain Division at Vavunia, the 36th Infantry Division at Trincomalee and 57th Mountain Division at Batticaloa.



behind his right ear, a bullet penetrated his right cheek, smashing his upper teeth, breaking the jaw and slicing the palate and tongue. One bullet cut his upper lip and then passed clean through the perspex. The *Ranjit's* MMGs however kept firing effectively.

As Maj Daman Seigell tried to turn away, a second burst smashed into his control column (cyclic), damaged it, broke the PTT, jammed the radio and injured Daman's right hand between his thumb and fingers, tearing away the webbing and exposing the bones. As a natural reflex action, Daman, who was flying the aircraft, left the cyclic and the helicopter started going out of control. Kaura, who was profusely bleeding, unable to speak, however held the cyclic and controlled the helicopter. Daman's tremendous experience and presence of mind came to fore. Calmly, he urged Kaura to 'hold onto it'. Grievously

injured, both the pilots tried a flying procedure that is never taught at any flying school. Kaura controlled the 'cyclic' while Daman controlled the 'collective', Daman instructing and Kaura obeying even as blood gushed out from his shattered mouth. But very much alive to the situation, Kaura was kept on his seat by machine gunner Giri who held his shoulders from behind. The pilots flew back to Vavuniya. The cyclic-collective combination between the pilots continued till when close to Vavuniya, Daman took over controls with his shattered right hand and executed a sharp flare to land.

This was possibly the rare and only example in operational rotary wing flying history when a helicopter was flown with both the pilots grievously wounded. Mission accomplished ! They had flown for 18 minutes after being injured.

Kaura unstrapped and stepped out into the arms of bewildered ground crew. They were rushed to the field ambulance where Maj SK Tyagi, the 'maroon-beret surgeon' performed field surgery in a tent (operation theatre) doing 'tracheostomy' (making a hole in the throat) to effect alternate breathing channel on Kaura without anesthesia with three persons holding on to his shoulders and legs.

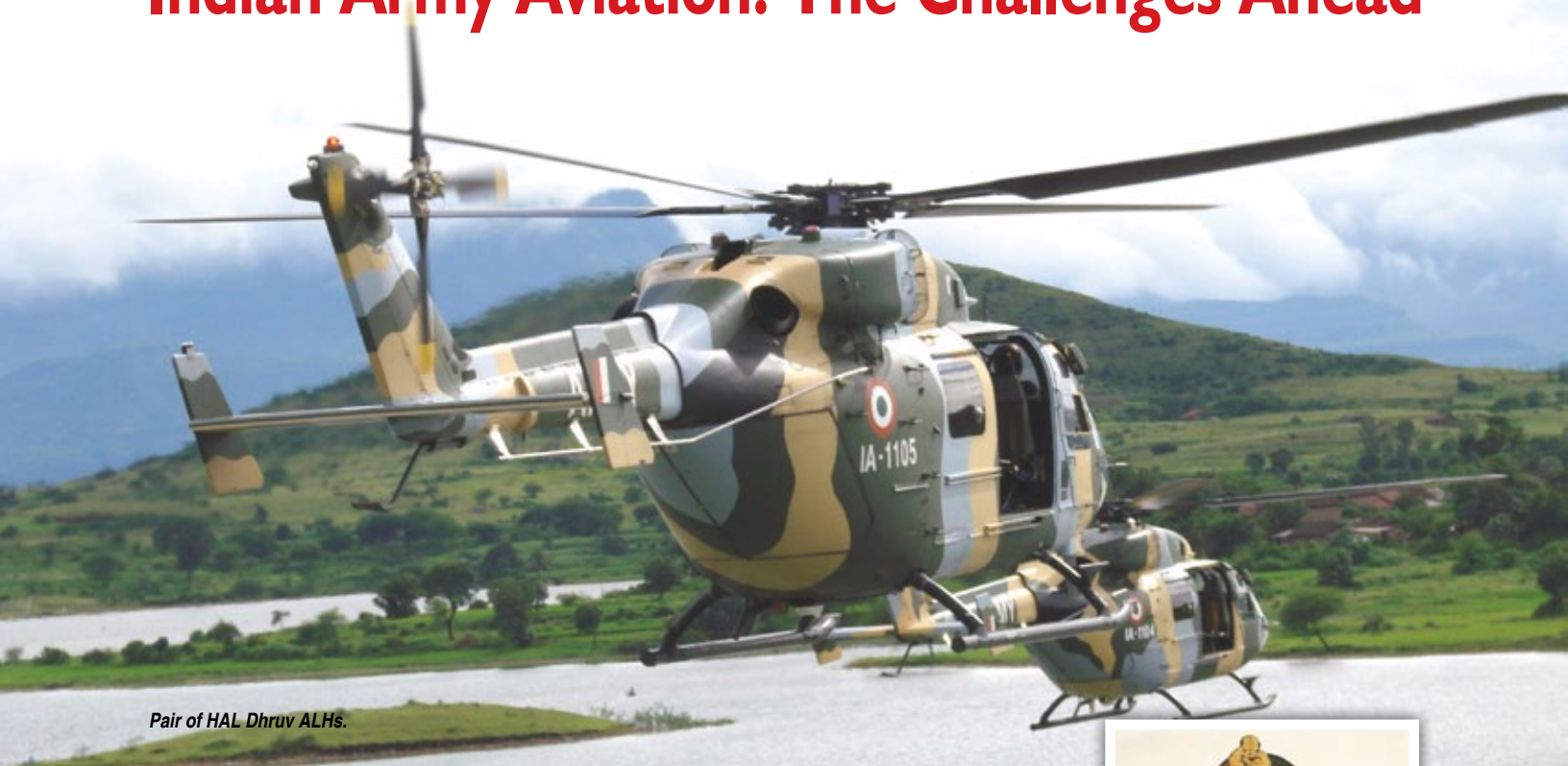
Daman, Kaura, Resham and other casualties were airlifted from Sri Lanka to Command Hospital at Pune on 8 June 1985 by an IAF An-32. Daman recovered after 4 months; Kaura took more than a year with reconstructive surgery. Daman and Kaura were awarded the Sena Medal (for Gallantry). The doctor was awarded Vishist Seva Medal. Both took to active flying again. Kaura is still fit for flying and holds a valid Commercial Helicopter Flying Licence. Such examples of raw courage and professionalism are rare.

(Brigadier H S Kaura was later Director Flight Safety, Army Aviation at IHQ of MoD, Army. He is currently working with a Global Consultancy KPMG. Daman is a senior pilot with the Jindal group of Industries).



Many years later, the Colonel Commandant's trophy is presented by Lt. General Vijay Oberoi, VCOAS to Lt. Col. HS Kaura, Commanding 32 R&O Flight, with Major General SJS Saighal, ADG Army Aviation present.

Indian Army Aviation: The Challenges Ahead



Pair of HAL Dhruv ALHs.

The last 25 years, since Army Aviation Corps was established in November 1986, have been characterised by somewhat sluggish and stunted growth but also tempered in action at diverse battle fields from the arctic heights of the Siachen Glacier to the steamy jungles of Sri Lanka.

In this article, Lt Gen B.S Pawar (retd) who was ADG Army Aviation 2004-2006 and went on to take over as Commandant School of Artillery at Devlali, reviews the ground realities and challenges of the near future.

The past quarter century for Army Aviation can be reviewed as a learning period, notwithstanding impediments in growth. Despite its stunted growth and still curbed status, this fledgling arm of the Indian Army has literally come out with flying colours, be it the 1987-90 involvement with the Indian Peace Keeping Force in Sri Lanka or the Kargil operations of 1999, as

well as ongoing counter insurgency operations in the North East and Jammu and Kashmir. Most critical have been Army Aviation's



operations in the Siachen Glacier, the highest battlefield in the world, being virtually the lifeline of troops deployed on the glacier. It is in recognition of their extraordinary performance and achievements that the President of India will honour the Army Aviation Corps presenting them Regimental Colours in November 2011.

The case for raising of Army Aviation Corps (AAC) goes back to 1963 when General JN Chaudhary, then COAS stressed the requirement for a separate air wing for the army, while discussing the issue with the *Select Body on Aviation* headed by the venerable JRD Tata. He opined that efforts at increasing the firepower and mobility of the army would not be complete without an aviation element comprising light, medium and heavy as well as



HAL Cheetah with underslung load at an high altitude helipad in the Karakoram (photo: Brig AS Sidhu)

armed helicopters organic to it. Logically, the above 'Body' also recommended immediate creation of the AAC and it is sad commentary on our political and bureaucratic apathy towards matters defence, that it took another 23 years, till November 1986, to finally detach this function from the Air Force and become an independent Corps of the Army. However, organisation of the AAC sanctioned was nowhere near that envisaged in 1963 and continues to remain so even today, lacking the wherewithal to be a full-fledged AAC. It will be pertinent to mention that the Armies of Britain, the United States and Pakistan had to go through similar endeavours to break away from their respective Air Forces and form a full fledged air arm of their own, comprising all types of helicopters as well as fixed wing aircraft. While in the case of Britain and America the Governments had to intervene, Pakistan Army Aviation got autonomy in 1958 but became a full fledged Corps only in 1977 owing perhaps to dominance of the Army in running the State. Pakistan Army Aviation has in its inventory various class of helicopters including attack as well as fixed wing aircraft for logistics and communications.

Employment Philosophy

Primary mission of Army Aviation is to fight the land battle and to support ground operations. Its battlefield leverage is achieved through a combination of reconnaissance, mobility and concentrated firepower that is unprecedented in land warfare. Army Aviation, as the manoeuvre force in the third dimension, is fulcrum of all land force operations. Reconnaissance, attack, utility and cargo helicopters, complemented by light fixed wing and support services including air traffic control and logistics, are organically required to support the Army in its range of military operations.

Army Aviation's greatest contribution to battlefield success is the capability it gives the field force commander to apply decisive combat power at critical times, virtually anywhere on the battlefield. This includes direct fire from aviation manoeuvre units or insertion of an overwhelming infantry force by air assault or artillery fire directed during action. Such versatility is the very essence of Army Aviation.

One of major challenges facing India's Armed Forces today is counter insurgency operations. While the use of helicopters for these operations has been restricted to troop carriage, logistics, surveillance and casualty evacuation, we have been reluctant to use

the gunships or attack helicopters because of collateral damage. This could be of concern in built up areas, but in remote mountainous terrain and jungles this option needs to be looked at by the Army and drills evolved accordingly. The use of armed Cheetah helicopters (Lancers) against a large body of terrorists located in



Para Commandos exit from hovering HAL Chetak during training exercises

the Pir Panjal Ranges of Kashmir during Operation 'Sarp Vinash' in 2002 is an apt example of gunship employment without causing collateral damage during counter insurgency operations. However we certainly need to guard against actions as those witnessed during the Sri Lankan action against LTTE and what the Pakistan Army



Army Cheetah providing support to civilians in the upper reaches of the Pir Panjal in Kashmir.

is doing in FATA areas with lethal weapon systems, resulting in massive collateral damage with adverse consequences.

Special Operations

The recent operation *Geronimo* by the US Special forces (Navy SEALs) to 'take out' Osama Bin Laden using suitably modified Black Hawk helicopters, clearly exemplifies the requirement of dedicated helicopters for special operations. While the Army Aviation Corps is contemplating a special operations squadron equipped with 10-12 ton class of helicopters, it must be ensured that these helicopters have suitable stealth features as well as special equipment on board as was the case with the modified Black Hawks. For surgical operations of this kind, insertion and

extraction are the most crucial phases and need excellent training and coordination between the helicopter crew and special forces personnel.

There are two areas of concern which need to be taken care of in order to ensure effective and successful use of Army Aviation assets in the tactical battle area. These are air defence and air space management. Suppression of enemy air defence by defensive measures or a combination of offensive and defensive capabilities would be essential to ensure unhindered employment of the third dimension in support of the ground forces. Air space management in the tactical battle area is a very important factor and requires detailed planning and coordination

Dhruv ALH perches on hillside in Kashmir Valley



to ensure optimum utilisation of all weapon systems operating in the tactical area.

Present Force Structure

Despite the AAC becoming a full-fledged arm of the Indian Army in 1986, its growth has been haphazard and the Corps continues to be plagued by many infirmities. Foremost amongst these is the continued opposition from the Air Force whenever the question of role expansion of Army Aviation comes up for review. Essentially, such opposition relates to 'turf battles', with the Air Force holding on to those assets which logically must come under the ambit of the Army.

The AAC has today, the largest number of helicopters amongst the three Services, majority being of the reconnaissance and observation class (Chetak and Cheetah). Despite this it has very few helicopters to carry out the extremely specialised roles in

the tactical battle area. While induction of the Dhruv Advanced Light Helicopter has commenced, the medium and heavy lift helicopters which form the core of the tactical lift capability, continue to remain with the Air Force and hence the Army's dependence on the Air Force for tactical movement continues to be near total. A similar situation exists with regard to attack helicopter units, which despite being an integral part of the land battle, remain with the Air Force. Their optimum employment in such a scenario is not possible in the present set up.

The Army's requirement of small fixed wing aircraft [HAL-Dornier 228], in limited numbers for important functions like command and control, staff transport, logistics including casualty evacuation and communication has also not fructified owing to objections from the Air Force. This, despite the fact that the Indian Navy, Coast Guard and even central police forces like the Border Security Force have fixed wing aircraft in their inventory!

A survey of military aviation organisations, within and outside the country reveal the inadequacies of Indian Army Aviation, whose present assets are completely inadequate for the size of the Indian Army and the tasks required to be performed by it. Expansion of the AAC is therefore imperative. Army Aviation should possess a mix of light fixed wing aircraft and all categories of helicopters for various roles including attack, reconnaissance, surveillance, combat fire support, as airborne command post, special operations and logistic support.

Future Growth and Challenges

Even after 25 years, Army Aviation continues essentially to remain a reconnaissance and observation force. The helicopters in its inventory (Chetak and Cheetah) are obsolescent and need immediate replacement. Trials for their replacement have been



The Army Aviation Corps went overseas in April 2005, when a flight of four Cheetahs was positioned with the UN Mission in Congo (MONUSCO), located at Goma

conducted in the past and are again in final stages with the French Eurocopter Fennec and Russian Kamov Ka-226 in the fray. Replacement of the ageing Cheetah and Chetak helicopters is crucial and needs to commence at the earliest. Any further delay in this procurement will have disastrous consequences on India's security.

In the light utility category, induction of the HAL Dhruv (ALH) has commenced. Three squadrons have already been raised and are operational. A total of seven such squadrons are planned for raising, each with ten helicopters. This will give capability to the field force commander to move up to a company of troops within the tactical battle area at critical junctures of the battle without having to wait. The ALH is all-weather, night capable, twin engined machine with state of the art avionics. The availability of this resource will give additional tactical capability to the field commanders in execution of their operational tasks. The ALH has recently been test evaluated for high altitude operations with the fitment of the more powerful Shakti engine being produced by HAL in collaboration with the French Turbomeca. This will give a major boost to enhancing the load carriage capacity while operating at high altitude areas, especially in the Siachen Glacier.

In the medium lift category, the Air Force continues to stonewall all attempts of the Army to acquire a suitable helicopter of the 10-12 ton class. At the same time they are not prepared to transfer the Mi-17s held with them. These are presently being refurbished for night operations and additional Mi-17-V5s are being acquired for replacing the ageing Mi-8 helicopters. This capability is basically required for Army intra - theatre move of reserves and equipment including ammunition and for special operations. HAL is examining the feasibility of a joint venture

with a foreign vendor for a 10-12 ton class multiple purpose utility helicopter (the Army's nomenclature for this type is the Tactical Battle Support Helicopter), but little progress has been made. The Army needs to pursue this approach more vigorously so as to acquire this class of helicopters.

In the heavy lift capability, India's resources are almost non-existent with only a handful of Russian Mi-26 helicopters presently held with the Air Force. Induction of the Ultra Light Howitzer into the army (trials completed), for deployment in the mountains has triggered the requirement for suitable heavy lift capability, with appropriate helicopters capable of carrying these howitzers slung under in the mountains. The



The Dhruv ALH at high altitude in North Eastern Kashmir (photo: Brig AS Sidhu)



Two of the AAC's helicopter types in joint exercises: Dhruv ALH with Lancer, both from HAL's Helicopter Division

process for acquisition of this class of helicopters has commenced under the aegis of the Air Force despite these being for the Army. Shortlisted are the Boeing Chinook CH-47F and the Russian Mi-26. The eventual requirement is for four to five such units with 10 helicopters each at the Command level to give such capability to the Theatre Commander in helilifting an entire battalion, as well as for transporting/ lifting heavy equipment/light guns intra- theatre, including major logistical support. It is clear that the operational tasks and roles of this class of helicopters have to be directed by the Army.

Armed ALH: The armed version of the Dhruv, called the ALH Weapons Systems Integrated (ALH WSI) is at an advanced stage of development. Although not a typical attack helicopter, this will have an array of comparable weapons systems which include a 20mm turret gun, 70 mm rockets,



HAL Dhruv ALH-WSI during firing trials at the Army Aviation ranges

air-to-air missiles (MBDA's Mistral) and air-to-ground missiles (ATGM). Integration of the weapons systems (less the ATGM) is currently going on at HAL. However, the main weapon in the arsenal of the armed/attack helicopter, the ATGM, has neither been developed nor acquired. The indigenously produced Nag anti tank missile (air version 'Helina') which is claimed to be a third generation fire and forget missile, is not ready and not likely to be available in the near future. As per reports the Army is scouting for a suitable air-to-ground missile to equip its initial armed ALH units. Thereafter it is expected that the 'Helina' would hopefully be ready for induction into the armed forces. The 54 ALH-WSIs on order would be part of the key Pivot Corps, ideal for employment in the cold start strategy.

Attack Helicopters: This is the weakest link. The meagre resources held (two units with Mi-25/Mi-35 attack helicopters), although under nominal command of Army, are in fact manned, controlled and operated by the Air Force. These helicopters of Russian-origin are vintage, although some upgrade has been carried out to make them night capable. Trials for their replacement are currently on. In the competition are the American Apache AH-64D Longbow and the Russian Mi-28 (Havoc). Both are state-of-the-art modern attack helicopters with an array of lethal weapon sub systems which include guns, rockets, air-to-air and air-to-ground missiles as well as helmet mounted targeting systems and advanced self protection suite. The Apache has been extensively used in Iraq as well as the in the ongoing operations in Afghanistan.

In this context, development of the Light Combat Helicopter (LCH) by Hindustan Aeronautics Limited is a milestone achievement. The LCH will join the exclusive club of the state of the art attack helicopters which include Eurocopter's Tiger, Bell's AH 1Z Super Cobra and China's Zhisheng 10 (Z-10).



Based on the Cheetah airframe, the Lancer features a redesigned 'bubble' made up of smaller toughened perspex panels and carries two jettisonable combination gun-cum-rocket pods, one on each side.



The Indian Army has an announced requirement for over 100 Dhruv ALHs which will equip seven UH squadrons with another 54 of the Weapon Systems Integrated (WSI) or Mk IV version.

Antecedents of the LCH can be traced to the ALH and the weaponised ALH. The LCH is designed to fit into an anti-infantry and anti-armour role and will be able to operate at high altitudes (16,000 feet), a distinct advantage over other attack helicopters. Unlike the ALH the LCH will have tandem seating cockpit and stealth features, but will carry the same weapons package now being qualified on board the ALH-WSI. Two prototypes have been flying since 2010 and the helicopter is expected to enter service by 2014. The LCH/Attack helicopter units will be the main punch of the manoeuvre force commander for induction and would be inducted into the Army Aviation Corps to operate in support of the Strike Corps, both in the plains and mountains.

Overall, Army Aviation needs to develop organisations that enhance aviation capabilities to support the concept of field operations. The force structure should be tailored to meet the evolving

operational requirements. In addition, the aviation organisation should include appropriate maintenance and logistic support elements as required to maintain the force. Corps Headquarters should have 'Aviation Brigades' orbated to them for suitable command and control and to ensure optimal utilisation of diverse aviation assets located within the Corps. In fact, unlike the Air Force which operates from fixed bases, during operations Army Aviation units will necessarily operate from forward composite aviation bases which would ensure not only security of helicopters but provide essential maintenance, fuelling and arming facilities and cater for replenishment in terms of fuel and ammunition. It is understood that the concept of Aviation Brigades has already been validated operationally. Each Aviation Brigade will have 3-4 aviation squadrons/units with recce and observation elements, light/medium/heavy lift capability and attack/armed helicopters, including maintenance support units.

Infrastructure Development: While we have reviewed the requirement for equipment and organisation, there is also urgent



Indian Army skydivers exit from an ALH



Mil Mi-35 gunship helicopter of the Indian Air Force: this formidable attack helicopter is flown and maintained by the IAF but its replacement is sought to be part of the future Army Aviation Corps inventory

requirement to establish suitable infrastructure and have this in place to absorb the new equipment and supporting organisations. These include air traffic control, met equipment, maintenance equipment etc, which also need upgradation and refurbishment. Lastly - perhaps most importantly - training facilities for aircrew and ground personnel needs urgent attention. The importance of simulators for this purpose cannot be over emphasised. A modest start was made with the installation of the fixed base Cheetah Simulator in 2005 at the Combat Army Aviation School at Nasik. HAL in a joint venture with a Canadian firm (CAE) has established a full motion simulator for training of ALH pilots. Keeping in mind the vast expansion plans of the AAC in the coming years and induction of sophisticated, state of the art equipment, simulators are essential for future training methods for cost and time saving.

The Coming Years

Army Aviation needs to play a vastly enhanced role in land operations in the coming years. This is only possible if the arm grows, both quantitatively and qualitatively. For dominating



Army Commandos slither down from a hovering Mi-17 assault helicopter of the Indian Air Force: again, the Army is seeking integral medium/heavy helicopter capability

the tactical battle space of the 21st Century, the Army must go beyond fielding light observation and light utility helicopters and employment of attack helicopters by "proxy". The need is to create a dedicated and operational AAC capable of night operations. Resistance from the Air Force will persist, but the Army will have to take a firm and unambiguous stand for its legitimate and logical demands. While the modernisation process has commenced, it is woefully slow and needs to be fast tracked. Army Aviation is the arm of the future, a force multiplier which can tilt the balance in any future conflict.

Other side of the hill



“Pakistan’s Army Aviation Corps is no longer a toothless supporting arm, but a lethal punch which can change the course of battle through its inherent flexibility, mobility and fire power. Its employment in Low Intensity Conflict (LIC) and asymmetric warfare is all the more relevant and the results are evident in the ongoing war against terrorism”.

**Maj Gen Waqar A. Kingravi, Colonel Commandant,
Pakistan Army Aviation**

Pakistan Army Aviation (PAA) also began on the same day as India’s did, the division of assets in August 1947 comprising four Auster Mk 5/6s. These, and subsequently other aircraft, were operated by the Air Force till 1958 when Pakistan Army Aviation came into being. However, full Corps status was achieved only in 1977. The United States have long partnered and supported expansion of Pakistan Army Aviation, stemming from 1954 when Pakistan joined the CENTO and SEATO pacts.

Pakistan received 60 O-1/L-19 Bird Dogs in 1958, many of which were delivered and some of which were later assembled at the Army’s 503 Workshop at Dhamial near Rawalpindi. In 1963,



Pak. Army Mi-17 in the Northern Territories.

under the Mutual Pact, 18 Bell-47/OH-13 helicopters were added for AOP, liaison, and FAC tasks and these were in the thick of action during the September 1965 war against India.

For the first time equipment from the Soviet Union was received in the late 1960s with 12 Mi-8Ts acquired which gave the PAA medium lift and heliborne assault capabilities. The issue of product support was resolved by China and in 1997 PAA doubled its medium lift inventory with 12 Mi-17s received from the CIS. 32 Aerospatiale SA330J Pumas had earlier been acquired (in 1976) to augment the force.

For the northern high altitude areas, the PAA acquired 40 Alouette IIIs from France, these being supplemented by the SA-315B Lama (also operated by the Indian Army and Air Force as the HAL licence-built Cheetah). Even as the Indian Army's urgent requirement for a new light observation helicopter for high altitude operations has been dogged by delays, the PAA have acquired the Eurocopter AS 550U-3 Fennec which has been frontrunner in the Indian case.

Perhaps the most glaring difference between the Pakistan and Indian Army Aviation Corps concerns attack helicopters. While the Indian Air Force operates a score of Mi-25/35s (funded by the Indian Army) the PAA have 40 AH-1F/S Cobras which have been modernised over the years including the C-Nite system which enables operations at night.

In September 2008 the Defence Security Cooperation Agency notified Congress of "a possible Foreign Military Sale to Pakistan of AH-1F Cobra helicopter



refurbishment as well as associated equipment and services". The Government of Pakistan had also requested warranties, system integration, spare and repairs parts, including transportation for the parts, support equipment, personnel training and training equipment, publications and technical data, U.S. Government and contractor engineering and logistics support services, and other related elements of logistics support.

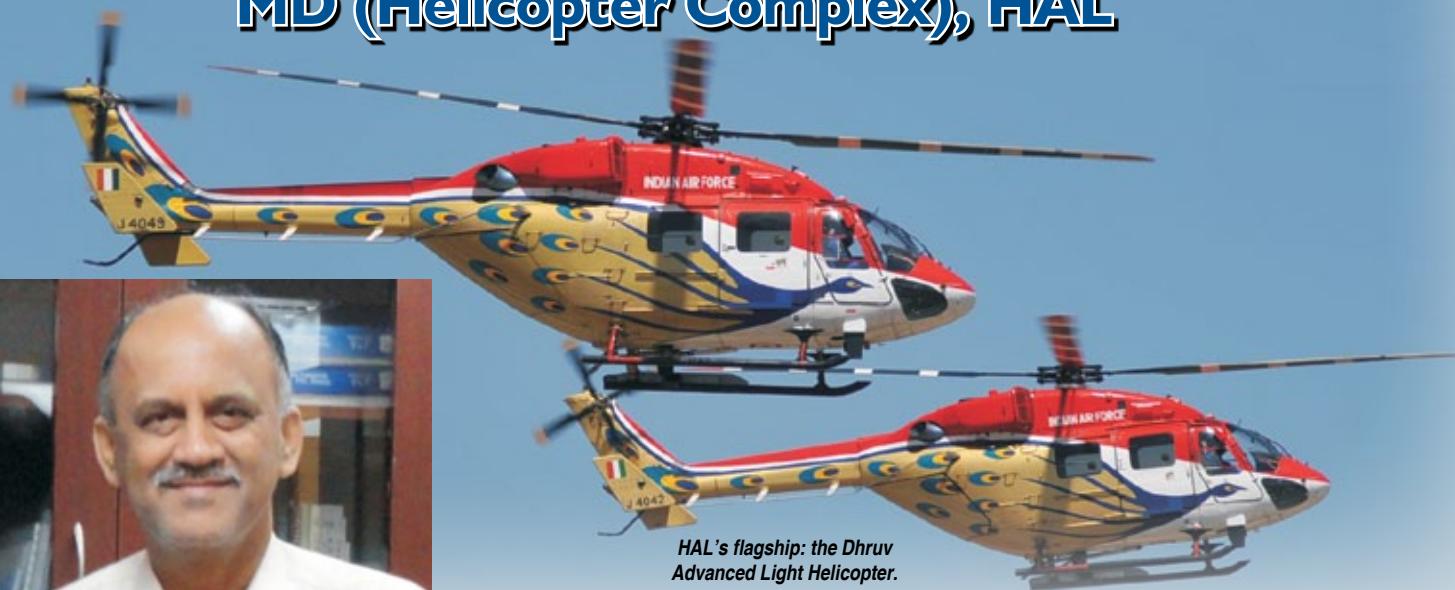
In 2007, the United States handed over 25 Bell-412 utility helicopters to the

Pakistan Army "as part of the ongoing anti-terror cooperation between the countries".

The Pakistan Army Aviation School which started as an Air Observation Post school in 1959, initially began at the Dhamial Camp and was later shifted to its current location in Gujranwala cantonment. The school has incorporated the needs of the 21st century by initiating many courses including combat conversion courses and the establishment of a Mountain Flying Cell.



Vayu Interview with P. Soundara Rajan MD (Helicopter Complex), HAL



HAL's flagship: the Dhruv Advanced Light Helicopter.

VAYU: Having assumed additional responsibilities as Managing Director, HC, please give our readers an overview of the genesis of HAL's Helicopter Complex, its mandate and planning for the next decade.

MD, HC: The Helicopter Division was established in 1962 as a part of Bangalore Complex for manufacture of Chetak Helicopters under license from Sud Aviation, France. This Division was also responsible for repair and overhaul of these helicopters and to provide product support to the customers. A team for the design and development of Helicopters was set up in 1970 in consonance with the recommendations of the Aeronautics Committee as a part of Helicopter Division. Separate Helicopter Design Bureau, currently known as Rotary Wing Research and Design Centre, was formed in 1982. This Design Bureau was placed under Director (Design).

HAL took up indigenous design and development of an Advanced Light Helicopter in 1984. Series production of these helicopters was taken up in the Helicopter Division in 1998. In order to provide a close interaction between Design & Production groups on this major indigenous D&D project, the Helicopter Division was also brought under the control of Director (D&D).

Over the years, Helicopter Division has produced 352 Chetak helicopters, 275 Cheetah helicopters, 10 Cheetal helicopters and 107 Dhruv helicopters (ALH) till March 2011. Considering the need for ramping up the production of ALH and focused attention required for Repair/Over Haul (ROH) & product support of Helicopters in service, it was decided to segregate the manufacturing and overhaul activities into different production divisions. Two Divisions were formed in 2007, one for ROH of

Cheetah/ Chetak at Barrackpore, and the second at Bangalore for ROH of ALH. A separate Division was also formed in 2007 to manufacture composite parts, which are extensively used in the ALH.

In view of the large number of design & development programmes and a significant increase in the helicopter design, manufacturing and overhaul activities, it was considered prudent to create a Complex for Design & Development of fixed wing aircraft and a separate complex for Helicopter business.

The mandate of the Helicopter Complex would encompass, production, repair & overhaul of Chetak, Cheetah, Cheetal and Dhruv helicopters as well as future developed helicopters, Design & Development of Weaponised version of ALH Dhruv, Light Combat Helicopter(LCH), Light Utility Helicopter(LUH) and the Indian Medium Range Helicopter(IMRH).

VAYU: You have recently stated that 'in the next 10 years, some 1500 helicopters of various types will be produced by HAL, including the ALH, LCH and LUH plus the yet-to-be-defined medium lift helicopter'. Can you elaborate on the planning for development and production of these various types and as to whether new facilities would be located for some of these programmes?

MD, HC: Presently, Chetak, Cheetah, Cheetal and Dhruv Utility version are in full production. Weaponised version of the Dhruv helicopter would be certified in the current year. HAL has already embarked on a design & development programme for the Light Combat Helicopter (LCH) and the Light Utility Helicopter (LUH) to meet the immediate needs of the defence services and these would be under production by 2014-15. The design development of the Indian Medium Range Helicopter (IMRH) would follow soon. It is envisaged that the Chetak, Cheetah, Cheetal, Dhruv as well the LCH are planned to be produced in the existing plants while a new Greenfield complex was planned for the LUH, IMRH production as well as ROH.

IAI Lahav on CD

VAYU: The Dhruv ALH is regarded as HAL's 'flagship' programme: please give details of the present status, orders received and executed, customer wise.

MD, HC: Dhruv has been the flag ship and the performance of the helicopter is encouraging. This has also given hopes for the Services to plan for more acquisitions in the coming 5 year plans. Currently more than 100 helicopters are flying in India and 10 in other parts of the world. We anticipate additional 200-250 helicopters to be manufactured in the coming years.

VAYU: The first batch of Dhruv Mk.III with the Shakti engine, were handed over to Army Aviation during the Aero India 2011 Show. What are the initial reports of the type in operational service? Have there been any problem areas between the IDS and Shakti engine?

MD, HC: Initial performance reports have been very encouraging and good. Customer pilots are very happy with the high altitude performance of this helicopter.

VAYU: What is the status of ALH-WSI Weapon Systems Integrated Programme and the certification process? When is the first example to be handed over?

MD, HC: ALH-WSI programme includes integration of mission systems (Electro Optic Pod, Helmet Pointing System, Warning & Countermeasures) and Weapon systems (20 mm Turret Gun, 70 mm Rockets, Air to Air Missile, Anti Tank Guided Missile) with other on-board systems like Integrated Architecture & Display System (IADS). Mission & Weapon systems identified till date have been integrated and tested in stand alone configuration to assess their efficacy. Also the mission systems have been integrated with IADS successfully. Presently the weapon systems in integrated configuration (IADS) are undergoing ground testing. Firing trials of 20 mm Turret Gun are planned in September 2011 and firing trials of rockets & air to air missiles are planned in November. Initial Operational Clearance (IOC) for the programme is expected by December 2011 and delivery of the 1st WSI Production Helicopter is planned by March 2012.

VAYU: The Border Security Force are operating a batch of Dhruvs, but there are reports of their 'under utility'. Please comment, particularly on the civilian certification issues.

MD, HC: ALHs with the BSF have been doing well with good average serviceability. Quick re-configuration between

sorties, maximising the payload potential etc are challenges in any civil registered helicopters. Also, the operating crew, with increased experience in the future would be able to fine-tune their procedures and increase the payload.

VAYU: A recent CAG report states that "the ALH was not able to fly above 5,000m. though the Army's requirement stipulated an ability to fly upto 6,500 m". Please comment.

MD, HC: It needs to be highlighted that all versions of the ALH have been flown up to 7500 m altitude. It is only at high ambient temperatures that there is a shortfall in payload in the Mk.I and Mk.II variants with 2B2 engines. However, it may be noted that even the Mk.I and II are far ahead of any other equivalent weight class helicopters. This shortfall has been more than covered up in the Mk.III variants, with the Shakti engines, which are presently in the process of deployment.

VAYU: The ALH has now been operating in Ecuador for nearly two years. What has been their utilisation and are repeat orders likely? Any other export orders in the near future? What is the potential for export in other Latin American countries?

MD, HC: HAL and Ecuadorian Air Force (FAE) signed a contract for supply of 7 Dhruv helicopters in August 2008. One helicopter was to be delivered in six months and remaining between 12 to 30 months. At the request of FAE, HAL delivered five helicopters (FAE601 to FAE605) within six months (March 2009) of the order. One helicopter is in VIP configuration (FAE601) and is exclusively used by the President of Ecuador. The helicopter is supplied along with role equipment like Emergency Floatation Gears, Rescue Hoist, Cargo Hook, Air Conditioning system etc.. HAL conducted training for first batch of FAE pilots (twelve) and technicians (fifteen) in HAL Bangalore. HAL pilots also provided flight training on terrain familiarisation to FAE pilots at Ecuador as further flight training support. These helicopters have extensively flown and the lead helicopter has completed more than 600 hrs of flying. The cumulative flying hours of the helicopters at Ecuador is over 2600 hrs. The sixth (FAE 606) and seventh (FAE 607) helicopters were supplied in June 2011. FAE have completed the delivery reception procedures. The helicopters are expected to start flying from the current month. To facilitate fast track procurement of spares HAL has developed an on-line Price catalogue and posted on web portal fully dedicated to Ecuadorian Air force. The security key of web portal has already been handed over to Ecuadorian Air Force pilots and will be functional shortly. Based on the performance during the last two years, HAL expects more orders from Ecuador. Vast potential is seen for the Dhruv helicopters in the Latin American countries.

VAYU: What is the current indigenous content of the ALH? Are any private firms being identified for joint ventures in manufacture of major components/systems, including the integrated glass cockpit? How much of the ALH production is being outsourced to major groups such as Tata and L&T?

MD, HC: In Dhruv nearly 5000 individual parts are to be manufactured to build the helicopter structure. Every single part is manufactured indigenously within HAL and through outsourcing. More than 50% of these parts are made by our supply chain (nearly 40 private industries mostly SMEs and also by big industrial houses such as Tata & L&T). Shakti, the high power engine is



Dhruv WSI prototype with armament.

manufactured by HAL. Equipment and systems are sourced from a supply chain abroad and through domestic suppliers including from sister divisions of HAL in Hyderabad, Lucknow and Korwa. Currently HAL has no JV with any private firm for manufacture of ALH major components/systems, including the glass cockpit.

VAYU: Reports suggest that HAL is looking for another helicopter engine partner after Turbomeca quoted higher prices. Please comment.

MD, HC: HAL has issued a Global Tender for supply of a suitable Turboshift Engine for powering the LUH. This competitive bidding process will enable HAL to select a suitable engine for LUH considering a long term perspective. This tender includes manufacturing of engines within HAL through Transfer of Technology (ToT).

VAYU: What is the development test flying schedule for the light combat helicopter (LCH)? How many prototypes and pre production of the LCHs are planned?

MD, HC: A total of 3 prototypes / technology demonstrators are planned. TD-1 and TD-2 are already flying and test schedules are in progress. We have planned for the first batch of off-base trials (sea-level trial) to be conducted by October, this year. This would be followed by a series of other off-base trials such as cold weather and hot weather trials at high altitude in the northern sector. Weapons trials are also planned between the hot and cold weather trials. We expect to complete flight testing by Feb. 2013.

VAYU: Have firm orders been placed for the LCH by the Indian Armed Forces? What would be the split between the Air Force and Army requirements? What percentage of the ALH systems are incorporated in the LCH?

MD, HC: No firm orders have been placed for LCH by Indian Armed Forces. IAF has confirmed requirement of 65 LCHs. Indian Army also has intended requirement of 114 helicopters. About 40 percent of the ALH systems are incorporated in the LCH. This includes mainly the transmission system, rotor system, propulsion and some of the electrical and avionics systems.

VAYU: There was a comparative analysis done between the Indian LCH and Chinese ZW-10 (Vayu Issue II/2011). How can HAL work towards gaining a 'healthy' export market for the LCH alongside the Chinese competitor?

MD, HC: Indian LCH and Chinese ZW-10 have similar Max Take off Weight (5800 kg for LCH and 6000 kg for ZW-10). The armament fit are similar for both LCH and ZW-10. However, LCH can carry bombs such as iron bombs and cluster bombs. Both Helicopters have similar performance considering

the Max. Level Speed, Cruise Speed and Ferry range. With respect to the Service Ceiling, LCH is 6500 mts. as against 6000 mts of ZW-10. LCH is fitted with 2 Shakti engines with power rating of 1000 kW each, where as ZW-10 helicopter has WZ-9 Turboshift Chinese engines with power rating of 957 kW each. LCH, with comparable performance and higher Service Ceiling, having been fitted with proven Shakti engines from Turbomeca, will definitely score better in the market.

VAYU: What is the progress on the design and development of the Light Utility Helicopter (LUH)? When is the prototype to make its maiden flight? What is the market forecast for the LUH in India and will this include civilian variants?

MD, HC: HAL has successfully completed the 'Configuration Freeze' milestone in June 2009, 'Design Freeze' milestone August 2010. The process of selection of various equipment is in progress. The design of Transmission and Rotor Systems is completed as a fully indigenous effort based on the experience gained through our ALH and LCH platforms. Design aspects have been critically reviewed by RCMA and concurrence has been obtained for completion of 'Transmission and Rotor



Mock up of the LUH.

Systems design' milestone. Realisation of the Transmission and Rotor Systems is in progress. Assembly Jigs and Fixtures realisation is also in progress. It is planned to build the Ground Test Vehicle (GTV) and 3 Prototypes (PTs) for LUH Programme. The commencement of GTV and 1st flight of PT-1 are planned in the year 2012. The Initial Operational Clearance (IOC) is planned to achieve by the year 2014. Currently the Indian Army and Air Force have a total requirement of 187 Helicopters for LUH. This number is expected to increase once the LUH is certified. Further, there is a big demand of about 100 helicopters for the civil variant in this 3000 kg class within India.

VAYU: The Indian Army/Air Force requirement for a light observation helicopter has still not been fulfilled. Could the HAL LUH be offered to meet the entire requirement (near 400 units)?

MD, HC: The LUH being designed and developed by HAL would technically meet the entire requirement of 384 Helicopters projected by the Indian Armed Forces. The production facility can be planned to cater to the demand in case the Armed Forces offer the entire requirement to HAL.



Second prototype of the LCH.

VAYU: At Aero India 2011 HAL handed over the single example of the Cheetah to the Government of Namibia. What is the total number of Chetak/Cheetah light helicopters built so far and will the production line continue, at a reduced rate?

MD, HC: More than 630 helicopters have been manufactured so far. Production line will continue for another 4/5 years till the new light helicopters either imported or indigenous (LUH) enters the service. However, maintenance support for these helicopters will continue for another 10/15 years.

VAYU: HAL has created an MRO Division for after sales support of their helicopters. Please elaborate on this vital necessity and need for a still larger and proactive network.

MD, HC: ALH, the flagship helicopter of HAL is now operating in various squadrons of the defence forces. Being a state of the art technology helicopter, it is required to provide effective after sales support to the fleet. Accordingly, a separate MRO Division with dedicated facilities and organisation structure was created in 2006-07. More than 6 helicopters have completed their overhaul life and have been inducted for major servicing at 1250 hrs.

Other than servicing of helicopters, the Division provides spares support, AOG support, calibration and maintenance of equipment, training, documentation and all aspects of full life cycle support to the fleet. In a move to be closer to the customer, the Division has placed contingent of fully trained technicians and officer at every operating base of the customer to provide logistic and technical support. This includes detachments in Ecuador, Mauritius and Male also.



First prototype of the LCH.

VAYU: One of HAL's future projects includes Naval Rotary Unmanned Aerial Vehicle (NRUAV) based on the Chetak. What is its status?

MD, HC: Indian Navy had approached HAL for construction of a Navy Rotary Unmanned Aerial Vehicle (NRUAV) with Chetak helicopter as the basic platform. HAL has completed feasibility study and provided Project Definition document to Navy. In fact, HAL is keen to have Helicopter UAV technology. The project approval by government is awaited.

VAYU: How many pilots have completed training at the HATSOFF facility? Can such training be offered to foreign students?

MD, HC: HATSOFF started training in their facility from 3 July 2010 for Bell 412. Training on Dhruv Civil started on 24 May 2011. Training is generally of two types recurrent and Type rating (Basic Conversion). HATSOFF has trained 106 pilots on Bell 412 and 14 pilots on Dhruv till date. Training can be offered to foreign students also subject to clearance by their National Aviation Authority for civil pilots and by their Defence Headquarters for their military pilots.



HAL Cheetahs are the life line for the Indian Army at the Siachen Glacier. (photo Brig A.S. Sidhu)



Apache Joint Warrior

At the tip of the (British) Army Air Corps (AAC) spear is the Westland/Boeing WAH-64D Apache AH1, an attack helicopter that has developed a fearsome reputation. Currently involved in operations in Afghanistan, providing top-cover for support helicopters and coalition troops on the ground, this combat-proven asset is also taking the next step in the ongoing process of developing its role in the maritime environment. Dr Séan Wilson/Prime Images reports exclusively from HMS Ark Royal, operating off the West Coast of Scotland during Exercise Joint Warrior 10-2, as the Apache embarks on its first major deployment on board the Royal Navy's flagship.

"The Apache adds another arrow to our quiver when it comes to completing our mission. So taking it to sea and being able to pop-up over the horizon at any

time, any place with that sort of capability is a significant enhancement in our combat power. Given the technological advances in that aircraft it gives us a whole new capability to strike targets ashore" explains Capt Jerry Kyd, commanding officer of HMS Ark Royal.

Relations between Draconia and Caledonia have been tense for many years. The northern disputed zone (NDZ) is legally claimed by Caledonia but has become home to many ethnic Draconians. The NDZ has become an area plagued by pirates and smugglers. A United Nations Security Council Resolution has established a multi-national force (MNF) to maintain freedom of passage for merchant shipping and to stop illegal activities. HMS Ark Royal (R 07) has been sent to reinforce the MNF.

While the countries involved may be fictitious for the purposes of *Joint*

Warrior, the scenario itself reflects real situations that are currently being played out in certain parts of the world. In light of the recent Strategic Defence and Security Review (SDSR), and the resulting decision to retire the Harrier in 2011, the UK faces a fast jet maritime strike capability gap until the arrival of the Lockheed Martin F-35 Joint Strike Fighter (JSF), referred to as the Joint Combat Aircraft (JCA) in UK service. Therefore in the immediate future the only maritime strike asset available might be the Apache.

The maritime role

The art of operating from a ship is a difficult, yet highly rewarding, skill to master and one that AAC Apache crews having been working on since 2005. The first ship-borne trials with an Apache took place in early-2004 aboard the Royal Navy's helicopter carrier HMS



Ocean (L12). Conducted by Test Pilots from Boscombe Down and Westland, the trials were designed to establish Ship Helicopter Operating Limits (SHOLs) and flight deck procedures. Data obtained from take-offs and landings from each spot on the ship enabled a graphical depiction of wind tolerances from any angle all around the Apache, also taking into account the ship's pitch and roll, to be constructed. This information, referred to as SHOLs, is essential in order to allow Flight Control to coordinate with the ship to position it in the appropriate

direction at the optimum speed to give wind, pitch and roll conditions that are most favourable for any given spot on the ship.

Further trials were conducted in June and September 2005, again on board *HMS Ocean*, involving crews from No. 656 Squadron which at the time was assigned to 9 Regiment AAC. This was the Apache's first major ship-borne deployment and subsequently, in October 2005, it was declared that the type had achieved Initial Operating Capability (Maritime) (IOC[M]).



Having demonstrated its capability to operate in the maritime environment the next major milestone came in November 2006 when an Apache from the AAC's Development and Trials Squadron, No.667 Squadron, landed on *HMS Ark Royal* as the ship lay alongside at Portsmouth Naval Base. This marked the first time the type had landed on an *Invincible*-class aircraft carrier and on this occasion the aim was to give *Ark Royal*'s aircraft handlers the opportunity to move the Apache around the flight deck and hangar. Deck landing trials at sea were subsequently completed by No. 667 Squadron on board *Ark Royal* in 2007. Prior to this, in order to further expand the number of classes of ship the Apache could operate from, No.667 Squadron conducted deck landing trials on board *HMS Albion* (L14) and *RFA Argus* (A135) in 2006.

Owing to commitments in Afghanistan the next opportunity to train in the maritime environment came in October 2009, again on board *HMS Ocean*. In a combined effort by 4 Regiment AAC, crews from Nos 654, 656 and 664 Squadrons had the opportunity to deck qualify.

Comparing and contrasting carrier operations to the land-based missions currently being conducted by AAC Apache crews in Afghanistan, Maj Mike Neville, officer Commanding No.656 Squadron, 4 Regiment AAC, said: "The Royal Navy has been exercising the logistics chain for hundreds of years, that's the chain we use. We embark with the spares back-up that we consider is the most likely to be used spares. Taking an intelligent view we go with what we know the aircraft is most likely to use. The aircraft is the same aircraft in either location [on land and at sea]. Of course there are the imponderables, the unscheduled things that will inevitably go wrong with a complicated machine and then you rely on the Royal Navy's logistics chain. With regard to missions once we get over the land environment there is no difference to us. The same tactics, techniques and procedures are used. In terms of on the target the mission is the same. The only difference is flying from and to a ship."

'Marinised' Apache

While an Apache is at depth maintenance ashore it receives a degree of 'marinisation' during a process referred to as Corrosion

Protective Treatment (CPT). Essentially the majority of the major components and access panels are removed and sealant applied between the fuselage skin joints to prevent moisture ingress. Preparing a 'base-level' aircraft specifically for the maritime environment involves the application of a range of corrosion protective compounds (CPCs) to various areas or components, which during an embark is carried out on a daily basis. The type of compound varies depending on the material it is being applied to, with some used to protect metals while others are used to create a seal between access panels.

The US Marine Corps elected to continue utilising the Bell AH-1 Huey Cobra rather than opting for the Apache as they believed it could not be operated in the demanding maritime environment. The AAC however have demonstrated quite clearly that it can. Maj Neville explained: "We've got to the point now where I'm confident that I can launch an integrated land environment mission from the ship. The USMC does this with the Cobra and they have a well worked-

up maritime solution. We are in the early days of this. I suppose there's a chance that we could be proving something and that's quite exciting. It's yet another part of the capability that this aircraft can give us. This exercise will be a significant milestone in proving that the Apache can work at sea. The maritime environment is more demanding but considering that you can deliver capability by sea to pretty much anywhere on the planet it's obvious that we should be developing this capability."

Asymmetric attacks

Joint Warrior provided No.656 Squadron, 4 Regiment AAC, with a unique opportunity to reinvigorate the Apache's maritime capability. Between September 24 and October 15 the eleven Apache aircrew logged a total of 320 deck landings. During the first week the focus of attention was on deck qualifications, which for seven of the aircrew was a completely new experience. Flying both day and night sorties the crews then made good use of the Cape Wrath range, firing 6,000 rounds from the Apache's M230

30mm cannon. Several strike missions were launched against targets ashore with one such mission including a high value, time sensitive target handover from a pair of Swedish Air Force Saab JAS-39A Gripens via an RAF Boeing E-3D Sentry AEW1. In addition to the more familiar land attack sorties the Apache crews were also engaged in counter shipping and counter Fast Inshore Attack Craft (FIAC) missions. The importance of the latter is highlighted by the tragic events of 12 October 2000. While the US Navy destroyer the *USS Cole* (DDG 67) was anchored in Aden, Yemen, suicide bombers pulled up alongside in a small craft and detonated explosives killing 17 sailors and injuring 39 others.

This attack sent shockwaves through the naval community and developing measures to counter such a threat is a high priority for the Royal Navy as Capt Kyd explained: "Obviously we are looking all of the time at the different threats that can present themselves to a ship or a convoy at sea. One of the things we are of course worried about now is what we call asymmetric attacks, particularly in





the maritime environment from piracy but also from small boat attacks which we saw against the USS *Cole*. Dealing with small boats, possibly suicide boats, perhaps in a swarm when they try to surround a ship is a real challenge. One of the advantages of course of fielding an aircraft like the Apache, with its excellent weapons systems and radar, is developing tactics and procedures to counteract that sort of threat. So again the Apache adding its value at sea in a force protection posture is something we will be looking at very carefully indeed.”

Given the capabilities of the Apache it makes sense to utilise it as a fleet protector as Maj. Neville went on to say: “The Apache is an excellent strike platform from a ship in the maritime environment and we are looking to further develop this capability. One of our goals during *Joint Warrior* is to develop the TTP [Tactics Training Procedure] for Fast Inshore Attack Craft. This is quite a threat to any ship and if you have an asset like the Apache that is manoeuvrable in all planes and has various munitions on it in

terms of weapon-to-target matching then it makes sense to develop the use of that asset as a protector for a fleet. That’s quite a big step really to be fair. For this part of the exercise we’ll go up to Loch Ewe [in the Northwest Highlands of Scotland] to evaluate how the sights and sensors of the aircraft can pick up the Fast Inshore Attack Craft at various ranges.”

A tactical edge

In order to give the Apache a technological edge, particularly in Afghanistan, they have received a number of urgent operational requirement upgrades and quite understandably the AAC are keen to keep quiet about the exact details of these. There are however certain upgrades that they are happy to discuss. In 2008 the AAC’s fleet of 67 Apaches entered an upgrade programme to replace the Target Acquisition Designation Sight/ Pilot Night Vision Sensor (TADS/PNVS) with a new system known collectively as Modernised TADS (M-TADS). This advanced electro-optical system replaces the direct-view optics of the legacy TADS/

PNVS and features a CCD camera and enhanced FLIR targeting and navigation sensors, offering improved day, night and adverse-weather capabilities. The first two enhanced helicopters were handed over to the Ministry of Defence (MoD) in November 2008 and the final Apache is expected to be completed in October 2010.

Also included in the upgrade programme is the replacement of the co-pilot/gunner’s optical relay tube (ORT) with a new unit referred to as the TADS Electronic Display and Control (TEDAC). Featuring a 5”x5” flat-panel active matrix LCD screen in place of the ORTs small CRT display TEDAC presents high resolution imagery captured by the M-TADS. In addition to its improved image quality TEDAC eliminates the direct-view optics and heads-down display of the old system. The advantages of ‘heads-up/eyes-out’ in a combat situation are obvious.

First deployed to Afghanistan in early summer 2009 the upgraded Apache offers crews a tactical advantage as Maj. Neville explained: “Essentially it’s a generation on



from FLIR. When you're looking through infrared it develops a picture out of the differences in temperature, however M-TADS is far more tuned. It gives you a greater granularity of picture, much better resolution. From a flying perspective obviously that gives you a far clearer picture. From a targeting perspective that gives you the ability to identify targets at longer ranges which is therefore safer for yourself and tactically a far superior place to be."

Given its reputation the mere presence of an Apache overhead is enough to deter insurgent activity. In order to extend their loiter time AAC Apaches have been operating with external fuel tanks, referred to as Reduced Size Crashworthy External Fuel System (RCEFS), since summer 2009 as Maj. Neville went on to explain: "In order to give us a bit more time on target, and this is a response to Afghanistan, we've got external fuel tanks that have a degree of ballistic tolerance. If I add an external fuel tank I then have to consider what that does for my weapons load. The aircraft can perform a running

take-off, like an airplane, if there is not enough power to hover. Obviously we sacrifice a pylon for each fuel tank but interestingly in Herrick at the moment we're not struggling for the need of more ammunition. Due to the nature of operations there it's actually loiter time we need and that allows a good balance between fuel and ammunition."

A multi-environment asset

On 15 January 2007, Royal Marines literally strapped themselves to the outside of an Apache during an attempted daring rescue. Tragically they were only able to recover the body of their fallen comrade but this type of mission has demonstrated that the Apache can be called upon for support no matter what the situation.

Exercise *Joint Warrior* has further demonstrated the capability and flexibility of the Apache and following additional exercises at sea in 2011 it is anticipated that the type will be declared Full Operating Capability (Maritime) (FOC[M]) by the end of 2011. Maj. Neville gave his thoughts on the future

maritime role of the Apache: "We have proved that the Apache can be the same agile strike platform in the maritime as it is in the land environment. The SDSR has presented an opportunity. The Harrier will retire soon and JSF is nine years away. Apache is about to be the only flying maritime strike capability available to Defence and HMS *Ocean* and *Illustrious* are suitable platforms for it to operate from. The Apache has performed above expectations. This is a capability we must continue to develop, as part of Contingent Ops, to be truly multi-environment and rapidly deployable. Significant progress has been made and the capability is ready for a detailed examination on exercise in the spring of 2011. The Apache is ready for the maritime role."

Article and photos by Dr. Sean Wilson

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The robust global market



Demand for 16,900 new turbine

Eurocopter UH-72As.

Rolls-Royce has forecasted long-term growth in demand for new turbine-powered helicopters. Over the ten-year period beginning 2011, total helicopter deliveries are predicted to be more than 16,900 units as the market responds to improving economic

fundamentals and the world's military operators continue to require increased vertical lift capability. In both segments, demand for replacement of retired and aging helicopters will combine with new technology offerings to enhance civil and military market demand.

Patricia O'Connell of Rolls-Royce, North America said, "While the market has not returned as quickly as the industry desired, basic indicators such as emerging market demand and access to favourable financing terms, are beginning to support a positive environment for civil rotorcraft.

for helicopters

with an overall airframe value estimated at \$34 billion and associated engine value of \$4.6 billion.

Military original equipment manufacturer (OEM) deliveries are predicted to total approximately 6,070 new military helicopters during the ten-year period, with an airframe value



The Sikorsky S-92.

helicopters forecast

Likewise, defence rotorcraft requirements, particularly for humanitarian and theatre transport, continue with increased importance on hot and high operations.”

Rolls-Royce projects deliveries of more than 16,900 new turbine helicopters valued at \$140 billion during the 2011-2020 period. These helicopters will require approximately 27,000 new turbine engines valued at more than \$12 billion. The civil market will experience modest unit growth, especially in new entry-level turbine helicopters. Rolls-Royce forecasts around 10,900 civil helicopters to be delivered during the ten year period,

of approximately \$106 billion and an associated installed engine value of around \$7.8 billion.

A market study on ‘The Military Helicopter Market 2011-2021’ confirms that helicopters certainly play key roles and are expected to remain doing so in the foreseeable future. Thus, programmes related to their development and acquisition remain remarkably resilient to cuts in defence spending. Although there have been fears that helicopter spending would be scaled back, after recent announcements in major markets, helicopter programmes



The AgustaWestland AW139



have mainly survived or even thrived, enjoying the support of government budgets. Consequently, countries are expected to continue making military helicopter a priority. Based on the study, global spending on military helicopters amounted to \$12.6bn in 2010 itself.

The US expectedly spends the most on military helicopters as these aircraft are in great demand in military operations, increasingly so in the vast spaces of Afghanistan. Major European powers like the UK, France, Italy and Germany remain key markets despite

frozen or reduced overall defence budgets. Countries such as India, South Korea and Turkey are also embarking on major helicopter development and acquisition programmes.

Helicopters have time and again proven to be essential to the majority of 21st century military operations in both conventional wars and counter-insurgency-type campaigns. Helicopters, after all, can provide means for moving personnel and cargo even in areas where prepared airfields and roads are poor or do not exist. The ability of the rotorcraft

to hover or to fly slower than fixed-wing aircraft, also make them invaluable in surveillance and providing air support. Helicopters embarked on naval vessels also significantly extend the reach and capabilities of these ships. Helicopters have further been useful in humanitarian operations where they are often the best, or even the only, means of transport in disaster-stricken areas.

Forecast International projects that 4,434 medium/ heavy military rotorcraft will be produced from 2011 through 2020. The value of this production is



Bell Helicopter's Bell 407



HAL's Dhruv ALH.



The Boeing CH-47F Chinook.

estimated at \$100.4 billion in constant 2011 U.S. dollars, defining a rotorcraft as medium/heavy when it has a gross weight of at least 6,804 kilograms (15,000 lb).

The medium/heavy military rotorcraft market has remained robust in recent years, the market boosted by continually high levels of helicopter acquisition by the U.S. military and other operators, as well as by production ramp-ups of a number of new models that have recently entered service. The *Forecast International* study projects that the annual production in the medium/heavy military market will increase through 2013.

According to the study, market growth will not continue indefinitely. They estimate that yearly production will begin declining as soon as 2014, and continue declining through 2020, as current procurement programmes run their course. Order backlogs for many models are declining as new orders have not been coming in the door at sufficient rates to increase the backlogs or even maintain them at previous levels.

Meanwhile, the winding down of the Afghan and Iraqi conflicts, combined with competing domestic budget priorities, is putting downward pressure on US defence spending. According

to senior aerospace analyst Raymond Jaworowski, "Efforts to close the U.S. budget deficit will result in future trade-offs that negatively impact Pentagon spending levels. Even without this budgetary pressure, though, the current modernisation cycle in U.S. military rotorcraft procurement would be nearing an end."

The U.S. is not the only nation that has been contributing to increased demand for medium/heavy military rotorcraft. A number of countries, though, are in the midst of acquisition programmes that will

soon run their course. The study projects that annual production of medium/heavy military rotorcraft will total 418 units in 2011, increase to 504 units by 2013, and then gradually but steadily decline to 366 units by 2020. The study also includes market share projections by company for the 10-year forecast timeframe. These projections indicate that Sikorsky will lead the market during the 2011-2020 period in both unit production and production value. Other major players in the market will include AgustaWestland, Boeing, Eurocopter and Russian Helicopters.



Russian Air Force Mi-8MTV-2

The final lap:



In competition: Russia's Mi-28N

Attack helicopters for the Indian Armed Forces

In 2009, the Indian Ministry of Defence released a request for proposal (RFP) for acquiring 22 twin-engined attack helicopters. Although Italian, Franco-German, South African and Korean attack helicopters can be counted amongst the world's leading contenders for this exacting role, the Indian competition has narrowed to two types vying for the order: Boeing's AH-64D Apache Longbow and the Mil Mi-28NE 'Havoc'.

During the recent Paris Air Show, Chris Chadwick, President of Boeing Military Aircraft said that, "For the attack helicopter requirement, the trials have been completed, they completed the written evaluations and we expect (the decision) will be announced within the next few months. On the heavy helicopter, that's about six months out - they have finished the flight evaluations and now they have to go through the process of the written evaluations and make a decision later this fall."

Boeing Defence, Space and Security state that, "12 nations fly and have ordered or have selected AH-64D Apache helicopters for their defence forces. The U.S. Army has ordered more than 600 Apache Longbow aircraft through multi-year contracts and follow-on purchases. The first U.S. Army Apache Longbow was delivered in April 1997. International

customers include Egypt, Greece, Israel, Japan, Kuwait, The Netherlands, Saudi Arabia, Singapore, the United Arab Emirates and the United Kingdom. The first international AH-64D Apache was delivered to the Royal Netherlands Air Force in May 1998. More than 300 new and re-manufactured international AH-64Ds have been delivered or are in production. As of March 2011, nearly 800,000 flight hours have been clocked by U.S. Army Apache Longbow helicopters in combat duty during *Operation Iraqi Freedom* and *Operation Enduring Freedom*."

According to Mikhail Barabanov from the 'Moscow Defence Brief', "The scale of the Mi-28N production programme is unprecedented for post-Soviet Russia. The Russian MoD signed a nine year contract for 67 Mi-28N helicopters, 38 of which were made at the Rosvertol plant in the five years to 2010. In 2009, first deliveries of the Mi-28N were made to the combat troops stationed in Caucasus. In the autumn of 2010, the MoD signed another contract for an additional 30 helicopters to be delivered by 2015 increasing the total to 97". Ten Mi-28N helicopters were ordered by Venezuela in April 2010 becoming its first export customer. India has asked for customised Mi-28s fitted with French and Belgian avionics. A version of Mi-28N has also been offered to North Korea.

Tactical Comparisons

An advanced version of the AH-64A Apache attack helicopter, the AH-64D Apache Longbow was first delivered to the US Army in 1997. The Apache is a twin-engined army attack helicopter designed by Boeing (originally McDonnell Douglas) equipped with an improved sensor suite, a glass cockpit, and weapon systems. A dome is installed over the main rotor housing the AN/APG-78 Longbow millimetre-wave Fire Control Radar (FCR) target acquisition system and the Radar Frequency Interferometer (RFI). The Apache carries fire-and-forget Longbow Hellfire air-to-ground missiles. The AH-64D Block III version is powered by General Electric Aviation's T700-701D turboshaft engines of 2,000 shp (1500 Kw). The British Armed Forces use a Rolls-Royce Turbomeca RTM322 variant of the engine with 2,100 shp (1,600 kW).

The AH-64 was designed for all weather, day and night, frontline environment using avionics including the Target Acquisition and Designation System, Pilot Night Vision System (TADS/PNVS), passive infrared countermeasures, GPS and the IHADSS. In the Apache Longbow, Lockheed Martin has fitted a new system called Arrowhead which uses a second-generation long-wave

infrared sensor to replace and strengthen the existing TADS/PNVS.

The maximum take-off weight of the helicopter is 10,433kg while the empty weight is 5,165kg. With a maximum climb rate of 889m/min, the cruise speeds vary between 279 and 284 km/h.

Mil Mi-28NE

The Mil Mi-28NE is also designed for all-weather, day and night operations and the combat helicopter has a five bladed rotor for better stability. The Mi-28 is a dedicated attack helicopter with armoured cockpit, under fuselage cannon and wing stubs for anti-tank munitions. The Mi-28 is considerably more capable than its predecessors including the



Boeing AH-64D Apache Longbows.

Mi-24/25. The Mi-28's nose houses electronics while a narrow-X tail rotor (55 deg) has reduced noise characteristics.

The Mi-28NE is capable of performing combat manoeuvres with vertical overload of up to 2.6 g, sideways and tail-first flights at a speed of up to 100km/h plus helicopter aerobatics. The basic version is powered by two 2,200 shp Klimov TV-3-117VM (t/n014) gas turbines and is equipped with a top-mounted millimetre wave radar station, IR-TV, and laser ranger. In terms of missiles, the Mi-28NE uses *Ataka* missile racks along with B-13L rocket pods, each able to carry S-13 rockets.

Following Russian operational philosophy, the Mi-28NE retains a small passenger compartment and can carry three people with the ability to rescue downed air crew.



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Paris Air Show 2011

Vayu on-the-spot report :

It was A320neo all the way!



The way it was! Dark clouds and incessant rain- but which did not dampen the spirits and, as if to compensate for the weather, companies went on an overdrive signing orders and contracts worth billions of dollars.

The Paris International Airshow (20-25 June 2011) was in continuously a tsunami mode: abuzz, dominated and ending five days later with the hero being the Airbus A320neo, an upgraded, more fuel-efficient medium-haul workhorse. The European planemaker celebrated the best week of sales in aviation history by boasting of 730 orders for its jets worth 50 billion euros (\$ 72 billion) and breaking two records: booking its biggest-ever single aircraft order and racking up the highest number of orders for any manufacturer during any air show thanks to the popularity of its new A320neo jet.

The medium-haul market remains the most important segment of the aircraft industry, and Boeing still estimates it will likely account for nearly half of all commercial airplane sales over the next 20 years. However, the US firm has yet to decide whether to give the old favourite new engines, as Airbus has done with the A320, or to develop an entirely new airframe, but has promised to make up its mind by the end of the year. While Airbus has started to win business from its main competitor, experts point out that the game for Boeing is far from over.

But apart from this heavyweight rivalry, other manufacturers also stepped into the breach in Paris. Embraer, the world's fourth largest commercial airplane company in the world, took 39 orders for its E-jet series of regional aircraft, worth \$1.7 billion. Clearly proud of this haul, Embraer boss Paolo Cesar De Souza e Silva said that the company had now topped 1,000 orders, with 750 letters of intent for the E-jet series.

"Embraer, like the Canadian Bombardier, is a well-established company that started out making 50 to 60-seat planes, and is now expanding into the market for 100+ seaters," say experts. "That makes them a direct competitor to Airbus and Boeing." But they believe the challenge for the upstarts is not so much making bigger and better planes than Boeing or Airbus, but getting the logistics right. "Spare parts is an area where the airlines always pay close attention.

How reliable is the worldwide delivery of spare parts? Planes need spare parts all the time, and if they're not available immediately all over the world, then it can cost the airlines a lot of money."

In the larger picture, the aircraft industry is experiencing something of an upswing. But it is a very long-term omen, and one that is continually being tripped up by recent recessions. Nevertheless, companies are predicting that they will also sell around 10,000 new business jets in the current decade, worth \$210 billion altogether. That compares very well with the 9,029 that were sold for \$169.9 billion between 2001 and 2010.

Back to Airbus, the Paris Air Show was certainly a fantastic experience for them as they signed multiple deals with a variety of airlines to purchase a variety of their aircraft. The majority of these orders were for the increasingly popular A320neo which features improvements to the existing A320 models. The main reason that Airbus was able to sign so many deals is likely owed to their focus on improving fuel efficiency and reducing emissions in the new models being sold. With record high fuel prices and increasing pressure to reduce emissions airlines are looking to order aircraft that meet both of these criteria. By ordering aircraft that are more fuel efficient, the airlines will be able to save money in the skies in terms of reduced operating costs for fuel. With high fuel costs being the bugbear, it is no surprise that airlines would seek aircraft that offer greater efficiency. This is similar to the automobile market which has moved away from gas guzzling SUVs to more fuel efficient sedans.

After an embarrassing start to the show, when an Airbus A380 clipped its wingtip while moving on a taxiway, things turned around in grand fashion. In fact they set two records for the largest aircraft order ever made. The first record breaking order was by the airline IndiGo, which was broken just a few days later by AirAsia when they placed an order worth over \$18 billion, for 200 Airbus A320neo aircraft.

Boeing's new aircraft and innovative technologies also attracted thousands of customers, partners, government officials and media at the 2011 Paris Air Show. "The excitement and enthusiasm for the products and technologies Boeing showcased at the show have validated our belief in the strength of what is the world's newest and most innovative family of commercial airplanes," said Charlie Miller, vice president, International Communications. "We also highlighted the breadth and depth of our defence business and we met with literally thousands of our key customers, partners and suppliers."

PAS 2011 saw the international debut of Boeing's newest commercial aircraft models - the 747-8 Intercontinental and 747-8 Freighter - together with the appearance of the innovative 787 Dreamliner. The new 747-8 Freighter flew to Le Bourget with all four engines powered by a fuel blend containing 15 percent camelina-based biofuel, achieving the world's first transatlantic crossing of a commercial jetliner with biofuels. Boeing and American Airlines announced that the airline would be the launch partner for the ecoDemonstrator Programme, a Next-Generation 737-800 aircraft that will be used to flight test emerging technologies and accelerate their market readiness.

Other Boeing highlights at the show included the presence of an Air Berlin 737-700 with the new Boeing Sky Interior, a Qatar Airways Boeing 777-200LR, C-17 Globemaster III military airlifter, an F-15E Strike Eagle multi-role fighter jet and a CH-47F Chinook heavy-lift helicopter. As evidence of the market's continuing recovery, airline and leasing company customers announced orders and commitments for 142 aircraft representing models from across the Boeing family: Next-Generation 737, 767, 777, 787 and the 747-8. Combined, the orders and commitments are valued at more than \$22 billion.



Boeing 747-8 Intercontinental

Bombardier Aerospace announced a very successful week with up to \$4.7 billion US in firm orders, options and purchase rights for its technologically advanced CSeries airliner and large cabin Global 7000 and Global 8000 business aircraft.

"The Paris Air Show has been a resounding success for Bombardier," said Guy C. Hachey, President and Chief Operating Officer, Bombardier Aerospace. "Apart from strong sales on both sides of the business, we've enjoyed the opportunity to showcase our products and engage in productive meetings with all of our stakeholders from across the industry and around the world. After only 25 years in aviation, we have emerged as an industry leader in product innovation. Our customer-centric focus is at the heart of our business strategy and is what will propel us to forefront of the market."

CSeries aircraft orders at the show capped a remarkable month for Bombardier's new family of aircraft. In June alone, five new customers joined the CSeries programme. Braathens Aviation and three unidentified customers placed firm orders for 33 CSeries aircraft and Korean Air signed a letter of intent (LOI) for up to 30 additional CSeries jetliners. Korean Air, a marquee airline, has ambitious plans to mobilise CSeries jets in the Asia-Pacific region, including new routes to China. In addition to the firm orders placed in June, commitments for 49 additional aircraft (options and LOI) were also placed.

Bombardier also confirmed firm orders for its newest business aircraft during the air show. Vistajet, an industry leader in luxury aviation, which exclusively purchases and operates Bombardier business aircraft, placed a firm order for 10 Global 8000 jets. This latest order raises VistaJet's order backlog value to

approximately \$2 billion US. AVWest, a large Australian corporate jet operator, placed overall firm orders for four Global 7000 and two Global 8000 jets, two of which were placed earlier this year.

At this year's Paris Air Show, Bombardier featured six of its aircraft on static display; the Learjet 60 XR, Challenger 300, Challenger 850, Global 6000, Q400 NextGen and CRJ1000 NextGen aircraft, as well as a geodesic dome which housed the new CSeries cabin mock-up, representing the latest CSeries aircraft interior design configuration, look and feel.

ATR kept increasing its order book throughout the show. During the event, ATR announced 60 new orders and 37 options, which add to the 28 orders and 5 options previously revealed this year. The addition of all has enabled ATR to reach such an historical record of 88 firm orders and 42 options at the Paris Air Show. Since the beginning of the programme, ATR has sold 1,162 aircraft and delivered 929. This brings ATR's backlog to 233 aircraft (worth 5.4 US\$ billion). This order book translates to more than three years of production. Filippo Bagnato, Chief



Good Show for the ATR 72

Executive Officer of ATR, declared: "This is a totally outstanding and historical air show for ATR. Our list of customers, both airlines and leasing companies, is dramatically increasing, and ATR aircraft are today flying in almost 100 countries. This clearly underlines the ATR product as the optimal solution for regional transportation. We are pleased to welcome our new operators and customers, and we are honoured of the confidence that some others have placed in ATR for years".

Hawker Beechcraft Corporation (HBC) highlighted its trainer, light attack and special mission programmes. At their static display were the T-6C Texan II military trainer, a Special Mission King Air 350ER turboprop and a King Air B200 operated by the Government of Malta, outfitted with highly sophisticated Aerodata surveillance equipment. "The Paris Air Show remains a great venue for meeting current and potential customers, with its great tradition and anticipated attendance of more than 130,000 business representatives," said Jim Maslowski, HBC president, U.S. and

International Government Business. “Paris continues to attract visitors from more countries around the world than any other international air show, so it allows us to conduct business in a shorter period of time than virtually any other event.”

CFM International booked firm orders for 910 LEAP-X1A engines to power 455 Airbus A320neo aircraft. The engine orders are valued at more than \$11 billion at list prices. AirAsia placed the single largest order in aviation history, selecting the advanced LEAP engine to power 200 Airbus A320neo aircraft. In addition to powering the A320neo, CFM also provides the exclusive Western powerplant for the Chinese COMAC’s 150-seater C919 aircraft. The LEAP-X1C has been ordered to power 100 C919 aircraft to date. LEAP development is progressing on schedule and the engine is on track for entry into service in 2016. The foundation of the LEAP engine is heavily rooted in advanced aerodynamics, environmental, and materials technology development programs. It will provide 15 percent better fuel consumption and an equivalent reduction in CO2 emissions compared to today’s best CFM engine, along with a 50 percent reduction in oxides of nitrogen emissions, and up to a 15 decibel reduction in noise. All this technology brings with it CFM’s legendary reliability and low maintenance costs.

The company also booked firm orders for 420 CFM56-5B and CFM56-7B engines during the 2011 Paris Air Show, the largest one-week total in the company’s history.

EADS with its various Divisions Airbus, Astrium, Cassidian and Eurocopter had a major presence at the show with a wide array of products, services and technologies on display that demonstrated the capabilities of the aerospace and defence group. “As the world’s largest aviation and space show, Le Bourget is a very important venue for the EADS Group to showcase its products and future technologies to trade visitors, the media



and the general public,” said Pierre Bayle, Head of Corporate Communications for EADS. “Visitors can see the group’s broad portfolio of commercial, defence, security and space products and services on the ground, in the sky and at the stands. They will experience ‘The Future, by EADS’,” Bayle said.

On the stand, Airbus provided an insight into how it sees the future of aviation while Cassidian demonstrated its technologies in the fields of security, defence and services. Eurocopter presented a scale model of the high speed X3 helicopter demonstrator and



Tom Enders, Airbus President and CEO. John Leahy, Airbus Chief Operating Officer, Customers. (Below, the star of the show).



highlighted future helicopter innovations. Astrium presented a 3D digital mock-up of the Ariane 5 Midlife Evolution and demonstrated other future projects. EADS Innovation Works presented a number of projects including a conceptual study into more efficient and passenger-friendly airports.

In the flying display, Airbus’ flagship double-decker A380 made a return to Le Bourget while Airbus Military’s A400M transport aircraft was seen flying for the first time at the show. Airbus Military also had a C295 on the static display. An Italian Air Force Eurofighter took part in the flying display while Cassidian had the DRAC/Tracker fixed-wing mini Unmanned Aerial System on the ground display as well as a full scale mock-up of the Talarion long-endurance aerial drone system. Eurocopter’s X3 helicopter demonstrator and the new EC175 medium twin both appeared in the flying display. The static display presented new product evolutions such as the EC145 T2 while the Tiger, the NH90 and the EC725 were present on the French General Directorate for Armament’s (DGA) static display. The all electric Cri-Cri aircraft, which has been jointly developed by EADS Innovation Works, Aero Composites Saintonge and the Green Cri-Cri Association, also took to the skies.

Cassidian presented its entire range of security solutions for the world of aerospace and the challenges of the future. With 30 years’ experience as a system integrator, Cassidian is expert in all aspects of Unmanned Aerial Systems (UAS) from development to in-service support. All UAS R&T and projects are managed by a unique programme organisation that allows cross-fertilisation between production systems and new projects.

At the Paris Air Show, Cassidian demonstrated its experience in protecting highly sensitive and complex networks, and particularly in protecting critical national infrastructures. In its Touch Lab, using a 3D scenario to illustrate critical national infrastructures Cassidian staged a cyber attack along with its proposed solutions for warding off such threats.

As mentioned before, Eurofighter Typhoon was present with daily flight demonstrations. With 707 aircraft under contract and more than 270 delivered it is Europe’s largest military collaborative programme. More than 100,000 jobs and over 400 supplier companies are involved in the programme; Eurofighter Jagdflugzeug GmbH manages the programme on behalf of the Eurofighter Partner Companies: Alenia Aeronautica/

Finmeccanica, BAE Systems, EADS in Germany and Spain. The Typhoon is still at the beginning of its in-service life and thus enjoys an enormous growth potential: the aircraft is one of the two aircraft shortlisted for India's M-MRCA programme.

After one year of industry funding, the Eurofighter and Euroradar consortia have received renewed strong support from the Partner Nations and have agreed to continue the full scale development programme of the next generation E-Scan radar, confirming the 2015 entry into service date. Eurofighter GmbH and Euroradar began full scale development of the new CAPTOR-E radar in July 2010. "The new radar will have AESA capability that far exceeds any other radar available today and in the foreseeable future and will be developed to satisfy the requirements of the Partner Nations and customers across the globe" states the company. The new radar will retain the key features of the existing Captor-M radar in order to exploit the maturity of the current system, using latest generation technology to provide further advanced performance. The Typhoon's AESA radar will offer a variety of benefits over M-Scan, including increased detection and tracking ranges, advanced air-to-surface capability and enhanced electronic protection measures.

Eurocopter's commitment to innovation was showcased where the company's high-profile participation included the first public flight demonstrations of its X3 hybrid demonstrator and the new EC175 helicopter. Their presence also comprised displays of the enhanced EC145 T2 and AS350 B3e helicopters; an AS565 Panther outfitted with the Stand Alone Weapon System (SAWS); the EC135 configured for law enforcement and customs missions; and a version of the EC175 tailored for search and rescue operations.

"Eurocopter applies innovation every day in expanding the boundaries of flight, and the X3 is an excellent example of how we are preparing for the future," said Lutz Bertling, Eurocopter's



Eurocopter's X3 hybrid demonstrator.

President & CEO. "I am sure that professional visitors and the public alike will be impressed by the X3's extraordinary flight demonstrations which are unequalled in aviation."

The X3 demonstrator is powered by a five-blade main rotor system and two propellers on shortspan fixed wings – a



Eurocopter products on static display.

combination that delivers excellent vertical takeoff and landing capabilities of a helicopter, along with aircraft-type fast cruise speeds and maneuverability. Eurocopter anticipates a wide range of utilisations for the X3 hybrid helicopter concept, including long-distance search and rescue (SAR) missions, coast guard duties, border patrol missions, passenger transport, offshore operations and inter-city shuttle services. Also taking part in the Paris Air Show's daily flight programme was the EC175, which is being developed by Eurocopter in a joint programme with China. This multi-role helicopter is in the seven metric-ton weight category, fitting into Eurocopter's product range between its AS365 Dauphin and the AS332/EC225 Super Puma aircraft families.

Bell Helicopter announced that it received 18 signed contracts for new helicopter sales during the week of the Paris Air Show. "The Paris Air Show is an outstanding event for all things aviation," said John L. Garrison, president & CEO, Bell Helicopter. "Having the opportunity to spend time with our customers and listen to their needs and direct feedback is priceless. The signed contracts we received during the show are yet another indication that the Bell Helicopter commercial product line is what our customers want to meet their mission needs," he said. The signed contract model mix spans the entire Bell Helicopter commercial product line and represents several regions, including Europe, Asia Pacific, Africa and the Middle East.



Bell's 407GX and 407AH.

The company displayed their newest helicopters, the 407GX and 407AH, both making their first international debut since their introduction at the 2011 Heli-Expo in Orlando in March. "We've received tremendous customer acceptance of these two new helicopters since their introduction," said Larry D. Roberts, Senior Vice President, Commercial Business for Bell Helicopter. "The Bell 407GX is in a league of its own with the capability and situational awareness provided by the Garmin G1000H glass flight deck. Customers are really seeing the benefits of this innovative technology and the Bell 407AH provides unique flexibility for parapublic missions that cannot be found anywhere else in the market."

After the Paris Air Show, the 407GX and 407AH embarked on international demonstration tours that will last several months. The 407GX will demo throughout Europe, while the 407AH will be shown throughout the Middle East.

Tapestry at Le Bourget 2011



The President of the French Republic President Nicolas Sarkozy inaugurated the Paris Air Show 2011 on 20 June. After being shown around various aircraft on static display and some flight demonstrations, Sarkozy urged the airline industry to accept globalisation, but at the same time felt that the success of the French Industry was at least owed in part to decades of investment by the state. "If France is in the first line of aeronautical and space powers, if France is one of the rare countries in the world able to master all the technologies, it is thanks to decades of public investment in programmes, research and training, side by side with industry."

For companies such as Dassault, Le Bourget was an opportunity to display its combat aircraft with a 'tried in battle' label. As for civilian aircraft, it is the Asian market that will play a key role, as proved by the very large numbers of Airbus airliners ordered by Asian carriers including IndiGo and GoAir of India which combined orders for 252 A320neos.



Painted in a bright red and orange scheme with an obvious bias towards customer airlines in Asia-Pacific (regarded as market of the future) and displaying a tail fin depicting a rising sun, was the prototype Boeing 747-8 intercontinental on static display during the Paris Air Show 2011. This was maiden landing of this latest variant of the 'Jumbo jet' outside the United States, and was flown across the Atlantic by Captain Steve Taylor, president of Boeing Business Jets. Interestingly, eight Boeing 747-8s have been ordered for VIP operations by various heads of state and as super deluxe corporate transports.



The first Airbus A380 of Korean Air which flew into Le Bourget and was displayed at the Show, is powered by GP7200 engines. The Airline is the first carrier with the entire upper deck dedicated for Prestige (Business) Class passengers, with 94 flat bed seats. Korean Air had ordered ten A380s.



The specially painted Dassault Rafale taxis past the Dassault chalet at Le Bourget after its scintillating flying display. The painting on the fuselage is in celebration of 30,000 flying hours recorded by the type at St. Dizier (Airbase 113), with the fin flash carrying an image of 'Little Prince' character, which was conceived by the well known aviator and writer Antoine de Saint-Exupéry, who also served at St. Dizier.



Tail Spin of another kind ! An Air Berlin Boeing 737-700 along side the 787 Dreamliner (ZA001) which flew in to Le Bourget from Seattle for the PAS 2011.



Model of the Sukhoi Superjet 100 at the UAC stand at the Show. Two major events have taken place with in-service of the first aircraft with the Armenian carrier, Armavia, in April 2011 and delivery of the first Superjet 100 aircraft to Aeroflot in early June, several years late. The 'real thing', Sukhoi Superjet 100 was seen in the resplendent new colours of Aeroflot at Le Bourget and took part in the flying display.



AgustaWestland's new AW149 military medium twin helicopter at its maiden public appearance during the Paris Air Show 2011, having previously been seen in mock-up form two years earlier at the 2009 Air Show. This AW149 prototype "P2" performed its first flight at AgustaWestland's Vergiate plant in Italy on 26 February 2011. The AW149 will achieve initial operational capability by 2014. Meanwhile the AW159 Wildcat was also on display at PAS 2011 and has been ordered by the British Army Air Corps and Fleet Air Arm.



Under a threatening sky (this Paris Air Show was marked by intermittent showers) the greats of aviation history are displayed alongside Ariane space launch vehicles : the classic Super Constellation (with Swiss flag) and tail of an Air France Boeing 747.



Type certification has been received by Europrop International GmbH from EASA for the TP400-D6 engine that powers the A400M military transport. This is the first large turboprop engine to have been certified by EASA and the first military engine to have been certified by the Agency to civil standards from the start. The first engine ran in late 2005 and since then TP400 has completed all major development testing, as well as achieving over 12,000 running hours, some 8,000 of which have been completed during the A400M flight test programme.



The Hawker Beechcraft King Air 350ER special mission aircraft on static display at Le Bourget. The aircraft is equipped with an under belly radar radome, a electro-optic/infrared (EO/IR) lift and fairing plus additional special mission equipment. It can be employed as an air ambulance or as a five-seat transport.

PARALLEL PATHS

Indians at the Paris Air Show 2011

The tricolour fluttered high above HAL's double-storied Chalet (A124-126), most strategically located at the crossroads of Le Bourget, a beacon guiding Indians and visitors alike to this rendezvous for meetings over a cup of tea or more. The Chairman HAL Ashok Nayak and Managing Director Helicopter Complex P Soundara Rajan were gracious hosts to the myriad of visitors, official and otherwise, through the week even as they were themselves inundated with meetings.

The Indian Minister of State for Defence Dr M M Pallam Raju was on hand to meet with his counterparts from the French

in the Ministry of Defence have for some time been examining entry into the new dimension of aerospace and now signed a multiple of agreements and MoUs at Le Bourget. With Alenia Aeronautica, BEML will collaborate to design, manufacture and sell a new generation primary/basic training aircraft, "this initiative to help finding a reliable source for basic training aircraft (BTA) and a befitting replacement for the existing



Jeh Wadia, the Managing Director of GoAir.

Ministry and others visiting the 49th International Paris Air Show. The Minister, and his delegation which included P K Kataria, the AFA and PK Mishra, Joint Secretary (MS) in the Department Defence Production were certainly much sought after by Government officials and Industrial CEOs considering the imminence of decisions to be taken on India's burgeoning defence purchase programmes.

The Indian Air Force delegation was led by Air Marshal Ravi Sharma, Deputy Chief of Air Staff accompanied by Air Vice Marshal Pradeep Singh, Technical Manager (Air) while the Indian Navy and Coast Guard were represented by Rear Admiral Sudhir Pillai, Flag Officer Naval Aviation from Goa and Commodore Amit Bhandari, Principal Director Aviation. There were several officers from the Aviation Research Centre (but not in uniform!).

V.R.S. Natarajan, Chairman BEML from Bangalore certainly notched an impressive tally at the Paris Air Show. This public sector undertaking under the Department of Defence Production



Dr M M Pallam Raju, Minister of State for Defence flanked by the TM (Air) and JS (MS).

HPT-32 Deepaks trainers". This further adds *mirch-masala* to the ongoing effort to select and buy (off the shelf) 75 basic trainers from international vendors (the Pilatus PC-7 Mk.II has reportedly been selected on basis of it being 'L-1') even as HAL's own HTT-40 turboprop trainer project remains 'on hold' after preliminary design studies have been completed.

BEML have also signed a memorandum of agreement with United Aircraft Corporation of Russia "to explore and exploit business opportunities in production, sales, marketing and maintenance of civil transport as well as passenger aircraft in India".

That India's private sector is increasingly involved with high technology systems in aerospace and defence, was apparent with the Samtel Group being visited by numerous potential collaborators and customers at their stand in Hall 4 where were displayed Samtel's range of avionics and engineering services. The Chairman Satish Kaura had with him Puneet Kaura, Executive Director at Samtel Display Systems Limited.

However, in their own space and virtually unknown to Indian officialdom, were India's dynamic private airlines, much sought after by giants of the world's civil aviation industry. Dwarfing the military aviation business, billions of dollars worth of new orders were announced at Le Bourget even as champagne flowed in the large and 'standing room only' chalets of Airbus and Boeing. The value of new civil airliner business announced on the very first day of the Show was some \$ 35 billion! While international lease/finance companies forged MoUs for scores of A320neo and other family airliners, GECAS boosted orders for 60 A320neos to be powered by CFM International Leap engines. The biggest orders for the A320neo however, were placed by IndiGo for a record 180 aircraft worth \$ 16.2 billion while fast expanding GoAir ordered 72 A320neos in a deal worth about \$ 6.1 billion. Managing Director Jeh Wadia stated that GoAir's new aircraft would be delivered from 2015 onwards to meet its ambitious expansion plans for domestic routes (as an indicator in relative terms, HAL recorded a turnover of \$ 3.6 billion in 2010-11).

Shape of things to come ? For instance in the UK (as in the rest of Europe) the civil aircraft 'boom' is doing much to dispel the gloom in defence

spending, with over all spending on aerospace research and technology recording 'historically low figures'. This should be very relevant to India's civil airliner programme which is being spearhead by the National Aerospace Laboratories (NAL) which envisages a 90-seater turbofan-powered aircraft : one hopes those at the helm of the NCA's conception and development were usefully impressed (sobered?) by the scale and scope of the world's civil aircraft industry. It is pertinent to benchmark the NCA with the Mitsubishi Regional Jet (MRJ) whose prototype is under completion with first flight planned for 2012.



P Soundara Rajan, who is concurrently Managing Director HAL Helicopter Complex and Director Corporate Plans & Marketing.



The busy host : Chairman Hindustan Aeronautics Limited Ashok Nayak.



Air Vice Marshal Pradeep Singh, Air Cmde. S.K Ghotia, Air Marshal R K Sharma and Air Marshal Harish Masand (retd) at Le Bourget.

Samtel Display Systems showcases its avionics capabilities



Satish Kaura, Chairman Samtel Group at his stand in Hall 4.

Samtel Display Systems (SDS) showcased their high-technology products for avionics and military applications. As Puneet Kaura, Executive Director, Samtel Display Systems said, "The Show provides a great opportunity for India to showcase its technological capabilities on an international platform. The Indian Aerospace and Defence industry has come of age now and global players recognise the potential of the Indian players and the opportunities available to them in India. We are glad that Samtel is at a stage that it can offer a repertoire of state-of-the-art avionics displays and advanced systems to meet the customised requirements of the worldwide aerospace industry."

At their stand, Samtel exhibited its 12"x9" and 6"x8" Smart Multi-Function Displays (SMFD), TopOwl Helmet Mounted Sight & Display, Infra Red Search and Track (IRST) and the Rugged Display for Airborne, Land and Naval applications.

**HAL
DPS to come**

HAL
DPS to come



Paris Air Show 2011

SPOTLIGHT ON HAL

During the 2011 Paris International Air Show, the 49th to be held at Le Bourget, Richard Gardner of the *Vayu Aerospace Review* met with Mr Ashok Nayak, Chairman of HAL, to gain his perspectives on the Show where India's forthcoming selection of a new Medium Multi-Role Combat Aircraft was a major topic in and around the corporate chalets. This is an edited version of their conversation.



Richard Gardner:

Sir, this Show has thrown the spotlight on India and its growing aerospace and defence industrial capabilities to a far greater extent than ever before! With so many programmes now underway, either in production or in development or flight test, how well can your organisation cope with such a busy schedule and so many technical challenges?

Ashok Nayak:

While it is true that we do indeed have many programmes in hand at the present, with more to follow over the coming years, you need to recall that we do have an enormous degree of experience at HAL covering a very wide range of activities supported by our factories that are used to handling large scale production. Working with various government agencies we also have a growing track record in research and development, designing, testing and putting into production indigenous as well as foreign-designed aircraft. And we have become very expert at upgrading and extending the operational lives of older aircraft to give them a new extended life, equipped with modern systems and suitable for many years of service. We are learning more with each programme that we undertake and getting better and more capable all the time.

RG: So how many aircraft were produced over the last year for example, to give an idea of the scale of industrial activity at HAL?

AN: Well, last year we built 78 aircraft altogether. The biggest production programme saw 25 Su-30MKIs produced. We are now building these completely from raw materials in India, not from a kit of parts. This is a very substantial and important programme and involves a total of over 100 aircraft. The second biggest production total was for the Dhruv ALH. This is proving to be an excellent helicopter, well suited to local conditions. Next was the Hawk Mk.132 advanced trainer programme, with 15 aircraft built. This has now ramped up to an established manufacturing flow and will become an important source of activity over the next few years. The radar equipped HAL-Dornier 228 patrol and light

utility transport remains in production and is proving to be a very capable aircraft in the maritime surveillance role with the Indian Navy and Indian Coast Guard. Recently, the Coast Guard took delivery of the 100th 228 to be built in India. The Coast Guard is taking over 40 of these aircraft, and more serve with the Navy and Air Force. RUAG has re-started Dornier 228 production, with a different engine, and HAL is supplying 'green' airframes back to Europe from its Indian production line. During the last year three



HAL HJT-36 model at the chalet.

Eurocopter on CD

examples of the Tejas LCA were produced, along with two HJT-36 Sitara trainers and six Cheetah light helicopters. The LCH Light Combat Helicopter is flying successfully. If you add all these programmes to forthcoming ones that range from a new transport aircraft, the MRTA to the Fifth Generation Fighter Aircraft, that we will work together on with Russia, you will see that HAL is going to be kept quite busy for many years.

RG: The LCH looks to be an interesting helicopter. Is HAL going to see it equipped with a full range of weapons and systems from India?

AN: The first prototype is now flying and we have built two aircraft so far. The third will join the other two in a few months. It will be very fully equipped by HAL and selected suppliers. There will be a helmet targeting system linked to a GIAT 20mm rapid firing gun and the helicopter will have four wing pylons for a variety of weapons. There will also be Electronic Warfare Suite, missile warning and countermeasures dispensing systems. A new IR suppressor system has been developed by HAL and the modern glass cockpit has indigenously designed and built hardware and software. The mission computer will give an automatic flight control system. This also applies to the LUH, which is to be acquired by the Air Force and Army. Risk reduction work is underway at the moment, but this helicopter will have to meet very tough requirements for operations in hot and high environment.

RG: You are producing the Su-30MKI, looking for a new M-MRCA, have the LCA and will be embarking on the new FGFA. This is a very ambitious military workload is it not?

AN: Yes it is, but we in India face developing threats around us and the government is very supportive of our need to have a good balance of air power to defend our interests in the region. This means we need different aircraft types to carry out different tasks. There are also export opportunities to be addressed as well as satisfying our own defence needs. We are working on advanced avionics and communications as well as the new airframes and engines for them. We are now producing engines for the Su-30MKI from raw materials. The T.50 FGFA may run to a 250 aircraft programme and the LCA Mk.2 with a GE.F414 engine offering more power will involve around 50 aircraft. A naval version will eventually join the MiG-29Ks. We think the LCA has excellent export potential and we are looking to certification by December 2012.

RG: What will the Indian share of the FGFA comprise?

AN: We are entering a five year development programme and first of all we will buy one or two complete aircraft from the Russians and use them for intensive test flying before we introduce Indian features for our production aircraft. It is too early to detail these but the Indian aircraft will be two-seaters.

RG: You have just bought a new mix of C-130J and C-17 transports from the USA. Where does this place you on a new multi-role transport aircraft programme?



Richard Gardner admiring the HAL LCH in model form.

AN: The MRTA will be for a quite different requirement. It will be a JV between India and Russia and we are working on the business case for the two partners, with a view to offer this also for export. It is needed to replace the An-32 and An-12 (in some countries).

RG: How is the Hawk programme working out?

AN: This is going well. We are far advanced on design aspects, nearing Indian production and have assembled UK-supplied aircraft. The first batch comprises 66 aircraft, with a second batch of 57. We are working closely with BAE Systems and will share upgrade work with them in the future. Our design skills have been upgraded too!

RG: Whoever wins the M-MRCA competition, HAL will need to take another great step forward to open up another new production line. Will you have capacity?

AN: We will introduce a new dedicated production facility and HAL will expand accordingly. We are also very busy with major upgrade programmes as well. A good example is the Jaguar. This is a 40-year old design but has already had two major upgrades and is about to have a third. This will see it continue effectively with new engines and systems in operational service to at least 2030. And we also envisage that the Su-30MKI fleet will continue for at least another 20-30 years in service.

RG: With all the interest here at Paris on the competition between Typhoon and Rafale, what are the most important factors in examining the choice?

AN: The longer term factors are all-important. The transfer of digitisation and cooperation on long-term support are essential for India. We do not want to be exposed to risk, but we are seeking a good offset deal that will help us get up and manufacturing as quickly as we can after the selection.

RG: Thank you very much Mr Nayak, and good wishes for the Show and HAL's future prospects!

‘Seconds out of the ring’ The MMRCA gloves are off !



An Italian Air Force example of the Eurofighter Typhoon at Le Bourget 2011.

Le Bourget 2011 was the ‘ring’ and the ‘boxers’ were warming up in their corners. The Eurofighter chalet and static aircraft display were superscribed with the delighted announcement that the Eurofighter Typhoon was ‘MMRCA shortlisted’. Dassault were less exuberant, displaying



No mistaking this message, painted at the entrance of the Eurofighter chalet!



little Gaullic emotion, even though French President Nicolas Sarkozy is known to be personally monitoring Rafale marketing efforts and prospects.

Dassault CEO Charles Edelstenne was first off the corner when he rained a series of (metaphorical) punches on his opponent. At his press brief, the Dassault boss began with quoting the French Marshal Ferdinand Foch who said “I have less

Thumbs up ! In-flight refueling probe of the Rafale vies for attention at Le Bourget with the French tri-colour in the background.



Major General Staff Pilot Mohammed bin Suwaidan Saeed al Qamzi, the UAE Air Force and Air Defence commander, of stern countenance, at the Paris Air Show 2011.

The UAE Air Force delegation enter the Rafale chalet at Le Bourget. As this issue goes to press, news has it that the UAE have initiated negotiations with Lockheed Martin for additional F-16E/F fighters as they find the Rafale offer 'too costly ... but negotiations are still ongoing, with both sides looking for a compromise'.

respect for Napoleon, now that I know what a coalition is". No guesses as to his reference to the four-nation partnership (coalition) that has designed and is building the Eurofighter. Edelstenne then went on in all flurry, describing the Eurofighter programme as "a federation of incompetencies, but I do not mean to say that the companies themselves are incompetent". An example was of cockpit voice command functions being assigned to Spain, a non-English-speaking country with a warm and balmy climate! Defending himself on prices, Edelstenne remarked that the Rafale's cost overrun was only about 4.7% while that of the Typhoon is 60%.

Shifting the place and date, British Defence Secretary Liam Fox, when visiting New Delhi on 8 July 2011, proclaimed that "investing in the Eurofighter would give India a relationship with 'partners of choice' in global security." In an interview he said that the choice was not simply of an aircraft but "buying into a strategic relationship". India would be building a relationship with four European partners ... "which gives India a much better chance in terms of a constructive longer term relationship, concerning technology transfers. France, for instance, has a completely closed defence industrial sector."

Box on !

Swedish Technology : keeping pace in a changing world



At his Press briefing on 21 June at the Saab chalet, Håkan Bushke, President & CEO of Saab AB reiterated that the Gripen 4+ generation multi-role combat aircraft is the company's "flagship programme", and basis for future combat aircraft technologies, including those for UCAVs.

Håkan Bushke confirmed the company's increased global R&D efforts, with a centre planned in India to transfer identified programmes and technologies in aerospace, defence and urban innovation including civil security. The Swedish-Brazil R & D centre on the other hand will focus on transport and logistics, defence and security, energy and the environment.

The Gripen NG Demo flew in to Le Bourget on second day of the Show, taking time out from Linköping and the flight test programme (over 200 flights made). This very example was involved in the Indian Air Force flight evaluation trials last May, making an unprecedented, long range trip from Linköping to Ladakh and back (with intermediate refueling halts), and then carrying out extreme altitude trials from Leh. The NG demonstrator is considerably modified with new avionics fit to prove future distributed modular architecture. The flight control system and mission functions of the aircraft have been delinked to facilitate quick changes without requalifying the entire avionics system.



Håkan Bushke.



Swedish Air Force Inspector General Anders Silwer.



The Raven ES-05, AESA radar.

The Sea Gripen Design Centre in the UK will be functioning from September 2011, "using UK technical expertise in maritime jet operations".

On questions concerning the Indian MMRC program, Håkan Bushke confirmed meeting with the Indian MoD delegation at the Show and a number of clarifications were provided particularly on the AESA radar status ("tremendous progress with full Swedish Government commitment on the ES-05 Active Electronically Scanned Array (AESA) radar"). This clear and unambiguous statement should be of particular import to the Indian MoD and its Air Force.

On 22 June at the traditional meeting of the *Swedish Air Force Fan Club*, Air Force Inspector General Anders Silwer said that the Swedish parliament has extended the Air Force 'Karakal' contribution to the Libya campaign by a further three months. The new mandate will see five Gripens perform reconnaissance

missions over a wider area of Libyan territory. "Before we had a little bit of a limitation, but now we are more integrated into the process" he elaborated.

General Silwer said the Gripens have performed well so far in what is Sweden's first such operational commitment in 50 years, and that first use of a new Link 16 datalink capability has added a valuable capability to the type's interoperability.

Presently in service with five Air Forces, the Gripen has clocked over 160,000 flight hours and the type currently remains deployed in action over Libya, the first time Swedish fighters have been in action overseas after Saab J-29s became part of the UN forces in the Congo in 1961 (alongside Indian Air Force Canberra interdiction bombers). Over Libya, the Gripens have provided NATO extremely important imagery with their modular recon pod system, concentrating on the important Misratah airbase which has been used by the Libyan Air Force for counter insurgency operations.



Paris Air Show 2011

Israeli companies and their defence systems at Le Bourget

Displayed outside the Israeli pavilion was the Barak-8, being jointly developed by Israel and India as the essential LR-SAM/MR-SAM for the Indian Navy and Indian Air Force respectively. This new generation of medium-range surface-to-air missile is covered in the \$2.47 billion project approved by the Indian Cabinet Committee on Security. Each of the 18 firing units will come equipped with a command and control centre, an acquisition radar, a guidance radar and three launchers with eight missiles each.



The Israeli mission to the 2011 International Paris Air Show comprised 15 companies representing Israel's top defence systems manufacturers: Israel Aerospace Industries (IAI), Elbit Systems, Rafael Advanced Defense Systems, Controp and Aeronautics Defense Systems, to name a few.

Three Israeli defence systems made their debut at the show: Rafael and IAI's *Iron Dome* missile defence system, which carried a "field proven" label; the *Magic Wand* which is currently in its testing phase and *Windbreaker*, which is an anti-tank missile. "Presenting these systems, especially in light of Iron Dome's operational success, has the potential to significantly propel Israel's defence exports," said Defense Ministry Director General Udi Shani. Avi Heffetz, head of the Israel Export Institution, noted that Israel's pavilion was ranked among the show's top five pavilions.

Two of the most exciting products from Israel this year – and, observers said, two of the most exciting products to be on display

at the Show altogether – were the *Iron Dome* short-range rocket defence system, and the *Trophy Windjacket* active protection system for light and heavy armoured fighting vehicles.

The *Iron Dome* system, already successfully deployed in southern Israel, is developed by Rafael Advanced Defence Systems and was designed to intercept short-range missiles fired by Hamas at Israeli towns and villages. The version shown at the Paris show can be mounted on trucks, allowing it to redeploy at different positions quickly. The *Trophy* system intercepts and destroys missiles and rockets fired at tanks and armoured vehicles with a shotgun-like blast. This system, too was developed by Rafael, in coordination with IAI's Elta Group, and was successfully deployed for the IDF earlier this year.

Other products and technologies on display included Israel Aircraft Industry's MLGB (Medium-weight Laser Guided Bomb), an advanced laser/GPS-guided long-range projectile with a 115 kg warhead, said to be highly accurate and providing rapid point-



IAI Tamam MOSP3000



IAI's MLGB.

and-shoot capabilities from fighters and light aircraft. IAI also showed its AD-STAR (Air Defence and Air Traffic Control Radar) 3D portable radar system used for air defence, early warning, and air traffic-control purposes.

Also on display were the latest developments for Rafael's popular Spike Anti-Tank Guided Missile series, in use by 20 countries around the world and considered among the most accurate missiles in the world, as well as new versions of the SPYDER anti-aircraft missile system.

Israel Aerospace Industries' Tamam Division (IAI/Tamam), presented new versions of its Multi-Mission Optronic Stabilised Payload (MOSP3000) and Miniature Plug-in Optronic Payload (MiniPOP). The new payloads are equipped with integrated Inertial Navigation Systems/Global Positioning Systems (INS/GPS) enabling geo-referencing and geo-pointing capabilities during identification, surveillance, target acquisition and reconnaissance (ISTAR) missions. Shazar, Tamam's General Manager, said: "We are very excited to present these new payloads, since Tamam's core technologies - inertial navigation and electro-optics, are combined in one product. Our customers will enjoy the best systems to date. The integration of Tamam's INS/GPS systems on the payload gimbals significantly increases the EO payloads' pointing accuracy, reduces target location error, and enables advanced GEO referenced functions and potential persistent awareness capabilities." MOSP3000 is a multi-sensor electro-optic and infrared (EO/IR) payload. The system is available in 14-inch and 15-inch diameter configurations, with identical internal design. The 14" unit is designed primarily for UAV and aerostat platforms, while the 15" unit



IAI AD STAR.

is designed primarily for helicopters, fixed-wing aircraft, naval vessels and ground applications that require enhanced ruggedized structures.

MiniPOP is a part of the ever-expanding MiniPOP family of advanced, lightweight, single Line-Replaceable-Unit, observation and targeting payloads. Hundreds of payloads are deployed in the field worldwide with leading military and security forces.

MiniPOP is uniquely small (8") and light (6 - 7.5 kg) and can be equipped with up to five sensors, providing the best performance in its class.

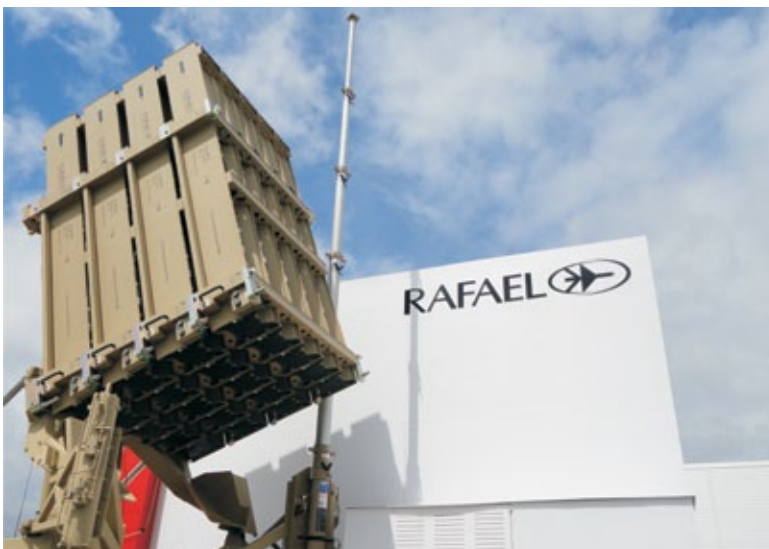
Israel Aerospace Industries (IAI) also presented its advanced air defence, surveillance, threat alert and air traffic control radar (AD STAR). AD STAR, designated ELM- 2288, is ELTA Systems' cost-effective 3D solid-state long-range S-band surveillance radar system, designed for rapid deployment and is transported by air, sea or ground by folding its antenna on its shelter roof. ELM-2288 is the latest addition to IAI-ELTA's operationally proven family of air defence/multi-mission radar systems that include the ELM-2080

Controp launches the T-Stamp and TD-Stamp

A new member to the Controp family of STAMP Stabilised Miniature Payloads is the T-STAMP Triple Sensor Stabilised Payload. The T-STAMP includes day/night observation cameras and a Laser Pointer, all packed in a less than 3kg fully gyro stabilised payload. The thermal camera is available either cooled or uncooled, yet both options have the unique Continuous Optical Zoom lens, like most of Controp's thermal cameras. The T-STAMP is ideal for airborne applications on board of UAVs, aerostats and other small platforms. The system is available with INS/GPS providing inertial target tracking mode, point-to-coordinates mode, hold-coordinates mode, scan mosaic mode and more. Soon to be available will be the unique state-of-the-art lightweight new TD-STAMP – an EO/IR payload including a Laser Designator weighing only 5kg – ideal for military VTOL operations providing a superior quality gyro-stabilized image. The new TD-STAMP fills what was previously a critical technological gap – now providing a lightweight payload with a laser designator for operational capabilities which are appropriate for small UAVs and VTOLs.



An array of Rafael's air defence missiles, including the Python-5 (right) and Derby (centre) which have reportedly been ordered as the standard next generation close combat and beyond visual range missiles respectively by the Indian Air Force. These missiles also form basis of the Spyder air defence system which automatically selects the most effective missiles for the target, initially launching a Python and keeping the Derby for more challenging interceptions.



Rafael's 'Iron Dome' counter-rocket missile system, on display at the Israeli Complex at Le Bourget. The company displayed a range of its air defence missiles including the Stunner and Spyder, the later being shown as a complete mobile system. According to Mr Lova Drori, Executive Vice President of Rafael, "development of the Iron Dome has demonstrated the unique capability of Rafael to expedite new solutions, meeting urgent operational requirements in record time. Overall, Rafael invested about \$60 million in its development, to meet the tight operational requirements".



Green Pine, the Anti-Ballistic Arrow Defence System Search, Acquisition and Fire Control Radar and the ELM-2084 Multi-Mission-Radar family.

Also new was IAI's MLGB, a new advanced Medium-weight Laser Guided Bomb. It is a dual mode laser guided/ GPS guided weapon optimised for light attack aircraft. The MLGB is 170 cm long and weighs just 115 kg, of which the bulk, is the capable warhead.

Precise homing of the MLGB is achieved against both stationary and moving targets, taking advantage of its laser homing capability.

Elbit Systems' engaging multimedia presentation demonstrated a cross-section of the Company's products and capabilities which seamlessly integrate to deliver persistent area surveillance and control for a complex operational scenario. The mission was to seize and control a defined area utilising Elbit Systems' innovative networked response based on the WAAPS (Wide Area Aerial Persistent Surveillance) concept comprised of the SAND (Smart All-Terrain Networked Detectors), PAWS (Passive Approach Warning System), MUSIC (Multi-Spectral Infrared Countermeasure) and the Hermes 900 Unmanned Aircraft System (UAS).



Also displayed at the IAI corral outside the Israeli pavilion were some of the Malat Divisions new concepts for battlefield observation. The ETOP (electrical tethered observation platform) is a light observation platform using four electrically driven rotors to lift a 20 kg payload up to 100 meters above the ground. ETOP is tethered to the launch platform by a cable via which communications and sensor data is transmitted.

Airbus : moving towards Aviation

Airbus has made even bigger savings than expected when it launched cuts in midst of the crisis in 2007 and remains competitive despite rise of the euro. Senior Director Fabrice Bregier stated that “the targets have been well exceeded” and that the so-called *Power 8* programme had enabled the company to save “2.5 billion euros (\$3.65 billion), which means as much extra profit, and 10 billion euros in cash.” The company was thrown into a severe crisis by delays in the manufacture and delivery of its mega A380 airliner. These delays revealed far deeper problems concerning strains between France and Germany both in the boardroom and in the industrial structure of the group.

Bregier said that the *Power 8* programme was intended to transform Airbus from being a “constellation of national entities gravitating around a central function” into “an integrated business.” Although the profitability of the group remained weak, with a net margin of about 1.2 percent in 2010, “Power 8 has enabled us to remain competitive, despite a euro which has risen from 1.08 dollars to a euro in 2006 to 1.30-1.40 dollars today.” Whenever the dollar fell by 30 cents against the euro, the cost to the group amounted to about 3 billion euros in terms of operating profit. Of a total of 10,000 jobs due to have been cut under the Power 8 plan, “7,900 have been shed.”

Meanwhile, to cope with the launch of the A350 airliner and an increase in the rate of production, the group had hired 2,200 people in 2010, of whom half had been recruited in France, and it planned to take on 3,000 more this year in the fields of engineering.

Speaking at a major EU summit in Madrid, Airbus President and CEO, Tom Enders urged “Europe to invest in improving an infrastructure that so much of the world’s economic and social development relies on”. The Airbus CEO’s comments followed the launch of *The European Aviation Vision 2050*, an aspirational roadmap on how the sector will handle 16 billion passengers and 400 million tonnes of cargo annually. Airbus



Vision 2050



Spectacular view of an A330-200 of Jet Airways, India.

has been involved in developing such 'vision' which highlights the need for investment in education and research to meet global demand for a sustainable and greener transport network.

The *European Aviation Vision 2050*, aims to reduce CO₂ by 75%, NOx by 90% and noise by 65%, compared to levels in 2000, while handling around 25 million flights per year within Europe. It suggests that by then 90% of travellers will be able to complete European journeys in four hours and that flights will arrive within one minute of planned arrival times, reducing flight times and fuel burn due to air traffic congestion.

Airbus to deliver over 20 A380s in 2011

Airbus expects to deliver more than 20 A380 'superjumbo' airliners this year. "We still expect to be in the mid-twenties and at least above 20," EADS finance director Hans-Peter Ring predicted. Production of Airbus's flagship, the world's biggest passenger airliner, was disrupted by modifications that became necessary after a Rolls Royce engine on a Qantas A380 exploded in flight on November last year. Only five of the aircraft were delivered in the first four months of 2011, but Ring said the company's plant was getting back up to speed.

Enders added, "The implementation of fuel saving technology in our aircraft has allowed us to satisfy a 45% increase in demand for air transport over the last decade with only a 3% increase in the use of jet fuel. Innovation has allowed us to do more with less, but these ambitious goals set out by this 'Vision' need investment and action now in order to safeguard Europe's position as a leader in sustainable aviation, in a changing economic and political landscape," stressed Enders.

"Aviation supports 33 million jobs and 8% GDP. It is imperative that our investment in air transport reflects the huge economic and social benefits it brings", he concluded. The *Vision 2050* echoes the findings of the Airbus Passenger 2050

Airbus single aisle production to increase to 42 per month

Airbus will increase the production rate of its A320 Family of eco-efficient single-aisle aircraft to 42 aircraft per month in the fourth quarter of 2012. Currently Airbus produces 36 A320 Family aircraft each month, a production rate that will steadily rise to 38 in August 2011 and to 40 in the first quarter of 2012. Currently the production rate for Airbus' long-range A330 Family is 8.5 per month, increasing to nine in early 2012 and ten in the second quarter of 2013. Airbus delivered a total of 510 aircraft in 2010, including 401 A320 Family aircraft. By the end of April, Airbus had already delivered 132 A320 Family aircraft and is well on track to exceed previous years' deliveries.



global survey, which reveals that seven out of 10 people expect to fly more, in greener aircraft and with access to their 'digital world'. "The future of aviation must take into account technological advances, but also passenger demands", said Enders. "Air traffic demand doubles every 15 years and as more people travel by air, it will take huge step change

Korean Air Celebrates delivery of first A380

Korean Air celebrated the delivery of its first A380 at a special ceremony at Airbus in Toulouse. The ceremony was attended by Korean Air Chairman

Yang Ho Cho and hosted by Airbus President and CEO Tom Enders. EADS CEO Louis Gallois was also present at the event. Korean Air is the sixth airline

to take delivery of the A380 and has ordered a total of 10 aircraft. Korean Air will initially operate the A380 from its Seoul hub to selected destinations

in Asia, followed by non-stop services to North America and Europe. The airline has specified an extra-spacious layout for its A380 fleet, with accommodation for 407 passengers in three classes. Special features on board the aircraft include the world's first ever duty free showcase area and a stylish onboard bar and lounge on the upper deck for premium passengers.





Another new development from Airbus—the A320neo (new engine option).

advancements to handle this increase in traffic while simultaneously preserving our environment.”

The survey was part of *The Future by Airbus* initiative, which aims to promote debate about the challenges and choices faced by the industry as it seeks to look to the future.

The eco-efficient A320neo marks a new step in Airbus’ continuous evolution of the A320 Family. As this new engine option offers maximum benefit with minimal changes from baseline A320 Family aircraft, the A320neo will be built using Airbus’ existing industrial system - with airframes for both versions manufactured in parallel for high production flexibility. In addition to the integration of Sharklets and two new engine choices - CFM International’s LEAP-X and the PW1100G by Pratt & Whitney - modifications for the A320neo configuration include certain structural changes to specific airframe areas, along with a new engine pylon. Earlier this year, customers selected the PW1100G as lead development engine, allowing the A320neo’s industrial development phase to begin in earnest. Originally scheduled for a service entry in 2016, this date was moved up owing to high market demand. Airbus now is targeting the fall of 2014 for maiden flight of its A320neo,

with certification to follow about one year later. Current planning calls for an eight-aircraft flight test programme, which will accumulate a combined total of approximately 2,600 flight hours. Meanwhile, the success story continues for the A330 Family. The twin-engine A330 is one of the most extensively-used widebody aircraft in service today, with

more than 1,000 bookings for its various versions to date. As further evidence of its strong commercial appeal, current A330 order totals have almost returned to levels achieved before the global economic downturn of recent years. According to the head of A330/A340 marketing Crawford Hamilton, the A330 has never experienced such a

EasyJet and its 200th Airbus

EasyJet have become the world’s youngest and quickest airline to reach a fleet of 200 Airbus aircraft. To celebrate the 200th Airbus, easyJet and Airbus unveiled an A320 in a unique all orange colour scheme. Its maiden flight with passengers from Toulouse for Paris and then onto London was appropriately given flight number EZY200.

easyJet already operates the world’s largest fleet of A319s with some 166 in service today. Including their A320s, which have recently joined the fleet, the airline has grown to become Europe’s largest A320 Family operator. Since easyJet took delivery of its first Airbus aircraft (an A319) in September 2003, Airbus has delivered an aircraft on average every 14 days over the last eight years.





An A380 tailcone in Getafe, Spain.

period of sustained high production and consistent demand. “[There] is a simple reason for this continued success: the best economics of its generation,” he said. “The aircraft is seen as a long-term investment by airlines and investors.” Airbus plans to raise the A330 Family’s production rate to ten aircraft per month beginning in the second quarter of 2013, representing a

two-aircraft increase from current levels.

Building on this momentum, the A330’s position as one of “the most efficient jetliners in commercial aviation” is being further improved by Airbus, with an A330-200 passenger version now certified for a maximum takeoff weight (MTOW) of 238 tonnes - translating to an extra 3.4 tonnes of payload capacity or a

range enhancement of 330 miles. Airbus also is launching an A330-300 with a 235-tonne MTOW that is due for certification by the end of 2011. In addition, the A330 is the initial long-haul aircraft certified for Extended-range Twin-engine Operational Performance Standards (ETOPS) of up to 240 minutes, which further augments its routing opportunities.



Airbus President and CEO, Tom Enders.

50th A320 Family aircraft assembled in China

Less than two years after Airbus delivered the first A320 Family aircraft assembled by the Airbus A320 Family Final Assembly Line in China (FALC), the company has handed-over of its 50th aircraft assembled by FALC at the Airbus (Tianjin) Delivery Centre to Chinese customer, *Juneyao Airlines*, a Shanghai-based privately-owned carrier.

The FALC is a joint venture between Airbus and a Chinese consortium comprising Tianjin Free Trade Zone (TJFTZ) and China Aviation Industry Corporation (AVIC). Since the first delivery of a FALC assembled A320 Family aircraft to Sichuan Airlines in 2009, 50 A320 Family aircraft, of which seven are A319s and 43 A320s, including the latest, have been delivered by Airbus in Tianjin to nine Chinese Airlines.



Airbus delivers 100th aircraft to British Airways

British Airways has taken delivery of an A320 aircraft, making it a member of a prestigious airline club that can boast of 100 or more aircraft deliveries from every member of Airbus’ Single Aisle aircraft Family. The airline has already taken delivery of two A318s, 33 A319s, 48 A320s and 16 A321s. The 100th aircraft (an A320 powered by IAE engines) is also the 205th Airbus single aisle delivered to International Airlines Group, which was formed in January 2011 following the merger of British Airways and Iberia.

British Airways became an Airbus operator in 1988, when it introduced the A320 in its fleet. It added the A319 in 1999, the A321 in 2004 and the A318 in 2009.



A panoramic view of '2050'

In advance of the Paris Air Show, Airbus invited the 'passengers of 2050' to discover its Concept Cabin—a whole new flying experience inspired by nature. Personalised zones replace traditional cabin classes to offer tailored levels of experience. While taking a hop between destinations, according to Airbus, passengers in 2050 could join an interactive conference; enjoy a game of virtual golf; read the kids back home a bedtime story and recharge in a 'vitalising seat' whilst watching the planet spread out beneath their feet.

This latest instalment of *The Future by Airbus – a vision of aviation in 2050*—follows last year's unveiling of the revolutionary Airbus Concept Plane, packed with technologies to reduce fuel burn, emissions, waste and noise. The Airbus Concept Cabin now gives further insight into some of the innovations and technologies that will shape future passenger experiences on board.

The aircraft's bionic structure mimics the efficiency of bird bone which is optimised to provide strength where needed, and allows for an intelligent cabin wall membrane which controls air temperature and can become transparent to give passengers open panoramic views. The Concept Cabin has an integrated 'neural network' creating an intelligent interface between passenger and plane. It can identify and respond to passenger needs and enables bespoke features such as morphing seats which change to your body shape.

New personalised zones replace the traditional cabin classes in the Airbus Concept Cabin to offer new tailored levels of experience. The 'vitalising zone' is all about wellbeing and relaxation allowing you to proactively recharge your batteries with vitamin and antioxidant enriched air, mood lighting, aromatherapy and acupressure treatments whilst taking in the infinite view of the world around you. There are no limits to the kinds of social scenarios in the centre zone of the concept cabin—the "interactive zone". The virtual pop up projections in this area can transform you to whichever social scene you want to be in, from holographic gaming to virtual changing rooms for active shoppers.

The 'smart tech zone' is tailored towards the more functional oriented passenger with a chameleon style offering, to meet individual needs ranging from a simple to a complete luxury service, but all allowing you to continue life as if on the ground. By offering different levels of experience within each zone, airlines would be able to achieve price differentials and give more people access to the benefits of air travel with minimal environmental impact.

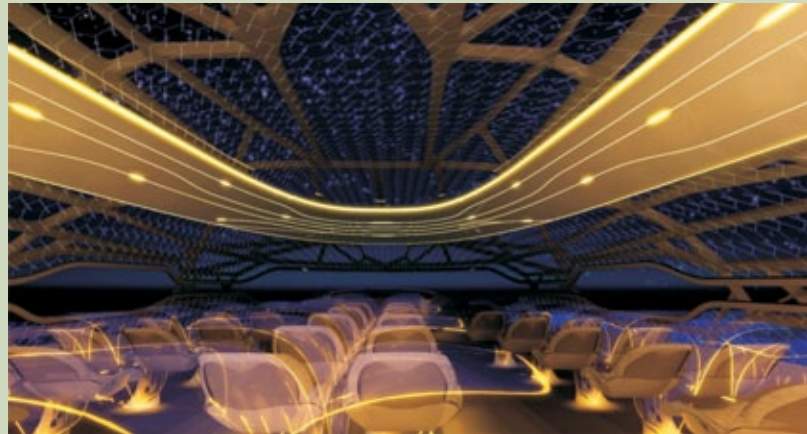
Showcasing the innovative interior design, Charles Champion, Airbus Executive Vice President Engineering, said "Our research shows that passengers of 2050 will expect a seamless travel experience while also caring for the environment. The Airbus Concept Cabin is designed with that in mind, and shows that the journey can be as much a voyage of discovery as the destination. Whichever flight experience is chosen, the passenger of 2050 will step out of the Airbus Concept Cabin feeling revitalised and enriched."

More than 90 percent of Airbus' annual research & development investment of over €2 billion has environmental benefits for current and future aircraft. For example, thanks



to advances in technologies, the concept cabin will be 100% recyclable. It will have self-cleaning materials made from sustainable plant fibres which reduce waste and maintenance and will harvest passenger body heat to power cabin features.

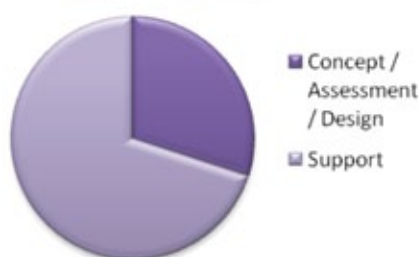
Such technologies are already being developed and, while they may not be seen in the exact same manner as in the Airbus Concept Plane and Cabin, some of them could well feature in future Airbus aircraft programmes.



MROs: Trends and Challenges

The Government of India's Economic Survey report for 2010-2011 has estimated the GDP growth at 8.6% in real terms and envisages 8% growth over the next decade. There has been sustained growth of commercial and military aviation in India in the last years. The civil aviation industry which was hit hard by the global financial meltdown and high fuel cost, saw strong recovery in 2010 with the domestic passenger traffic rising around 12%. The Economic Survey has also predicted huge potential for higher levels of growth in the sector in the near future. The demand for new aircraft is expected to reach 1000 in the next two decades. The freighter market is also expected to grow exponentially. The increasing military and defence expenditure and modernisation programmes will ensure massive demand for military combat and transport aircraft.

Equipment Lifecycle Costs



An Aircraft Life Cycle Cost analysis shows that 70% of the entire life cost is incurred when the equipment is in-service. Maintenance, Repair and Overhaul (MRO) thus forms a major component of the 'in-service' cost of the equipment.

As India expands its aircraft fleet size, there is an impending (and huge) market space for Maintenance, Repair and Overhaul (MRO) companies. According to the recent study done by Confederation of Indian Industries (CII) and PWC, India's MRO segment is expected to grow to \$2.6 billion by 2020, which makes it relevant to examine current and future trends that drive the MRO business globally. It would also be significant to view the impact of technology and information systems that facilitate the current and future trends in MRO.

There are three distinct categories of fleet operators viz. Commercial Aircraft Fleet Operators, Defence Operators and Business and General Aviation Operators. This also defines three segments of MRO market viz. Air Transport MRO market, Military and Defence MRO market and Business & General Aviation MRO market.

Defence & Military MRO Challenges

The Defence operator's specific challenges include extended use of defence equipment typically ranging from 30 to 40 years, increased equipment complexity, shrinking defence budgets, increased demand for MoD process efficiency, better management of resources through integration of Finance and HR, major transformation in global defence forces with more flexible roles and increased tasking, increased need for high agility and operational readiness against unknown forces. This has led to a transformation and a much stronger relationship between the industry and MoD.

There is an ever increasing number of 'Performance Based Logistics' contracts between industry and the Defence forces. This allows a larger OEM involvement in maintaining the aircraft fleet and making it available for missions with capabilities,

while the MOD role has shifted more towards focusing on the operations and keeping the forces operationally ready for war situations. In India, the Air Force is also exploring the possibility of signing Performance Based Contracts. The success of this move depends on true partnership between industry and MoD. Sharing of information and data becomes vital in this scenario to understand risks and in the contracting and bidding process, to exploit benefits (i.e. improving availability & efficiency, cost savings and profit) and so to establish trust.

It is imperative to have a common view of the performance between industry and MoD, which needs an end to end information capability for success. Saab, the global military defence and security company uses IT solutions to manage and maximise the Performance Based Logistics contract awarded to them by the Swedish Armed Forces. GE Aircraft Engines has deployed maintenance enterprise software to support servicing of the US Navy F414 – powered F/A-18 E/F Super Hornet fighter. This is being used by the Government Industry Logistics Support (GILS) programme within GE Aircraft Engines.



We also witness another trend leading to convergence of the civil and military market. More commercial MRO suppliers are pursuing military markets. For example, Herc Solutions teamed with Marshall Aerospace, Standard Aero and Derco, Cascade Aerospace, to win the Canadian contract to support their C-130 fleet.

The Airlines Market

The Airlines MRO market is estimated to be around \$ 58.1 billion by the year 2016 and that 62% of the estimated market value would be outsourced by 2016. While in philosophy the trends are quite similar to Defence market leading to increased partnership between the OEM and the fleet operators, there are few specifics including increased usage of PMA parts (Parts Manufacturer Approval). PMA-holding manufacturers are permitted to make replacement parts for aircraft, even though they may not have been the original manufacturer. This has potential to reshape the MRO landscape and OEM economics. There also exists a supplier owned inventory, and growing involvement of third party logistics suppliers has also been observed. A case in point is of Boeing acquiring Aviall, which enables Boeing to participate in service parts consumption and integrated materials management business. The Airline Market has shown trends of continued MRO Globalisation over the years.

Business & General Aviation

A large proportion of new aircraft are in the warranty stage but the fleet demographics are changing. The non-warranty fleets are expected to grow at more than 5% per annum globally. Meanwhile, there has been supplier consolidation, (for example Dubai Aerospace acquired Standard Aero and Landmark Aviation) leading to development of global networks with MRO, charter and aircraft management services. This segment was primarily dominant in North America but the trend is changing and new aircraft OEMs are also entering this space.

After the recent economic downturn, the maintenance, repair and overhaul sector is showing signs of recovery. A competitive arena is developing where MRO companies are rethinking their service offerings to compete in the MRO business space largely dominated by

OEMs, by providing more sophisticated and complex product support. The emerging differentiators include next generation investments including data management, advanced repair development, supply chain innovation, total care management; liquidity improvements. There are large scale pooling agreements and financing and supplier leverage by long term alignment between MRO company and the fleet operator.

In macro terms, the MRO business landscape which is estimated to be worth more than \$125 billion globally in the next five years has the potential to redefine and bring paradigm shift in the way the fleet operators, OEM and industry, MRO companies and software solution providers partner, collaborate and network.

Nilesh Kumar
IFS Solutions India Pvt. Ltd

Air Works marks its 60th anniversary

Air Works, has started a year-long celebration of its 60th anniversary leading to the actual incorporation date. Air Works India was founded on 16 April, 1951 by BG Menon and PS Menon, also recognised as two pioneers who contributed towards the development of the Indian aircraft MRO industry. From a family run start up, focused on providing maintenance services to business aircraft, Air Works has metamorphosed into a professionally managed organisation offering a full-suite of services for aircraft maintenance and aircraft painting to business as well as commercial aircraft in India, UK, the Middle East and South East Asia.

Air Works maintenance capability has grown from the DC-3s it maintained in the early 1950s, to approvals to maintain over 100 business aircraft in India across 14 locations. Air Works is now an Authorised Service Centre for AgustaWestland, Bell Helicopter, Bombardier, Embraer, Garmin, Gulfstream, Hawker Beechcraft, Honeywell, Rockwell Collins and Superjet International.

Air Works is India's only EASA, DGCA, GCAA and CAAS certified MRO with approvals for ATR42/72, Airbus A320, and Boeing B737. Through its Air Livery subsidiary, Air Works is one of Europe's largest providers of aircraft paint services servicing marquee clients.

Air Works has also become the first aviation organisation in India to have been awarded *Aviation Week's* 2011 MRO of the year award for "outstanding achievement and innovation in aviation maintenance, repair and overhaul (MRO)". These prestigious annual industry awards conceived more than 50 years ago honour the world's top MRO and aftermarket companies and were presented at a ceremony in Miami.





Missile Miscellany

The global missile market was worth \$10.27bn in 2010 alone, and development continues to move beyond established markets in the US and Europe. A number of countries and companies are now developing missiles with advanced capabilities. A number of these countries will be investing billions of dollars into missile programmes over the next decade and would be looking to procure increasingly sophisticated technology or collaborate on new ranges of missiles.

Some of these are focussed upon:

Successful launch of two MBDA Aster missiles from the 'Cavour' carrier

MBD A has carried out two successful launches to demonstrate the effectiveness of its Aster missiles. Both launches were from the Italian Navy's *Cavour* carrier in the *Poligono Interforze di Salto di Quirra* (PISQ) and were made with the assistance of MBDA.

Two launches to test effectiveness of the SAAM/IT system were carried out, one in 'autonomous' (self-controlled) mode and the other in 'integrated' mode (controlled by the combat system). The autonomous mode launch was intended to test the SAAM/IT system's ability to search, identify and intercept an attacking sea-skimmer missile as a direct threat to the ship herself. The purpose of the integrated trial was to demonstrate the combat management system's ability to target threats and to designate the SAAM/IT system to neutralise a threat similar to a sea-skimmer missile. In both trials, the threat was simulated using a MIRACH aerial target, configured as a missile. Both launches were "entirely successful" and the Aster missiles completed their tasks as determined.

Thales's LMM to enter production

Subsequent to three years of development, Thales UK's Lightweight Multirole Missile (LMM) will move forward into full development, qualification and initial production following contract awarded by the UK Ministry of Defence (MoD). Qualification testing will take place during 2012, with production starting at the end of the year and deliveries scheduled to commence in 2013. LMM will first enter service with the UK Armed Forces aboard the new Wildcat Lynx helicopter. Specific activities covered under the MoD contract include the design, development and qualification of the laser beam rider version of LMM, together with production of an initial quantity of 1,000 missiles.

LMM is a low-cost, lightweight missile, the development of which began in 2008, and is designed to be launched from a variety of air, sea and land platforms against a wide range of threats. The LMM programme has made significant progress since its launch and Thales has conducted successful



guidance control firings in recent months, including a semi-active laser (SAL) version for the first time.

Thales has had long association with air defence missiles, such as the Javelin, Starburst and Starstreak, and the LMM is part of the company's plan to enter into other lightweight missile sectors.

Sea Viper support contract awarded to MBDA

MBDA has been awarded a £165 million contract to provide the support for Sea Viper, the Royal Navy's area air defence missile system that equips the Type 45 Destroyer. It was successfully fired from HMS *Dauntless* in September 2010 and most recently in April 2011 from HMS *Daring*. MBDA will ensure the availability of the complete Sea Viper system for the T45 Class for a period of six years. The Project Availability Support Service – Sea Viper (PASS-SV) contract is the first support contract under the 'Through Life Enabling Contract' signed in April 2010 between the MoD and MBDA that established a new partnering approach on Complex Weapons between both the parties.

MBDA is working closely with its subcontractors BAE Systems Maritime (Mission Systems) and DM Gosport on supporting the Sea Viper. BAE Systems is providing the support services for the Multi Function Radar. DM Gosport is responsible for the out-loading of munitions to the Type 45 Class and for processing those at a new Munition Maintenance Facility (MMF) located in Gosport.



Sea Viper firing from HMS Daring

Eurofighter completes first phase of Meteor missile tests

Eurofighter has completed a range of air-carriage trials for the MBDA Meteor Beyond Visual Range Air-to-Air Missile (BVRAAM), which forms a part of the process of integrating the missile onto the Typhoon swing-role combat aircraft. The first of a series of trials to ensure the safe separation of the missile across the flight envelope were carried out by Eurofighter Partner Company BAE Systems with Instrumented Production Aircraft IPA 1 on the Aberporth range in the UK. The introduction of the Meteor missile will ensure that the Typhoon continues as "the world's most advanced swing-role combat aircraft well into the future",

keeping ahead of developing air-to-air threats.

Meteor is a ramjet-powered next generation Beyond Visual Range Air-to-Air Missile system (BVRAAM), with the largest No Escape Zone of any air-to-air

weapon resulting in a long stand-off range and high kill probability to ensure air superiority and pilot survivability. This is being developed on behalf of France, Germany, Italy, Spain, Sweden and the UK by MBDA.





Diehl demonstrates successful IRIS-T SL firing campaign

With two further IRIS-T SL test firings, Diehl Defence demonstrated the scheduled progress in development of the surface-to-air guided missile IRIS-T SL (Surface Launched). The firing campaign took place at the OTB Firing Range in South Africa on 19 and 26 May 2011. All test objectives were achieved in the presence of representatives of the national customer including safe missile launch from a carrier vehicle, demonstration of the missile's flight-mechanical and aerodynamic characteristics, operational performance of the newly developed rocket motor as well as target data transmission via data link during the flight.

Particularly, the missile's outstanding manoeuvring capability was proved in an impressive manner by approaching the aerodynamical limits in flight. Moreover, the operational

principle of guiding the missile with external radar data by transmitting virtual target data to the missile during flight was demonstrated.

For the export market, Diehl is offering a flexible solution for modern air defence on basis of the IRIS-T SL surface-to-air guided missile. The plug and fight capability of IRIS-T SL enables easy integration in existing and future air defence systems. The export system is denoted as IRIS-T SLM. IRIS-T SL is a refinement of the IRIS-T air-to-air missile, in series production within a European cooperation programme, with regard to the surface-to-air role. It encompasses a rocket motor upgrade as well as a data link and GPS-aided navigation. Thus, the requirements for a modern guided missile for ground-based air defence have been implemented with a distinct increase in range.

Kongsberg signs contract on continued development of JSM

Kongsberg has signed a contract for the continued development phase II (until 2013) of the JSM (Joint Strike Missile) with the Norwegian Defence Logistics Organisation (NDLO). The value is MNOK 543. The Norwegian Parliament Stortinget voted on 16 June 2011 in favour of starting JSM phase II and the acquisition of four F-35s in 2016. "It is of great importance that both the government and the Parliament have endorsed the continued development of the JSM. This shows strong political support for JSM, which meets Norway's and its international F-35 partners operational needs, while the development and its production are important contributions to the industrial content of the F-35 programme," says Walter Qvam, CEO of Kongsberg.

The JSM is a new missile designed to fill an identified operational requirement on the F-35. JSM is the only missile under development that meets the operational requirements and can be internally carried on the F-35 but can also be integrated on other platforms.



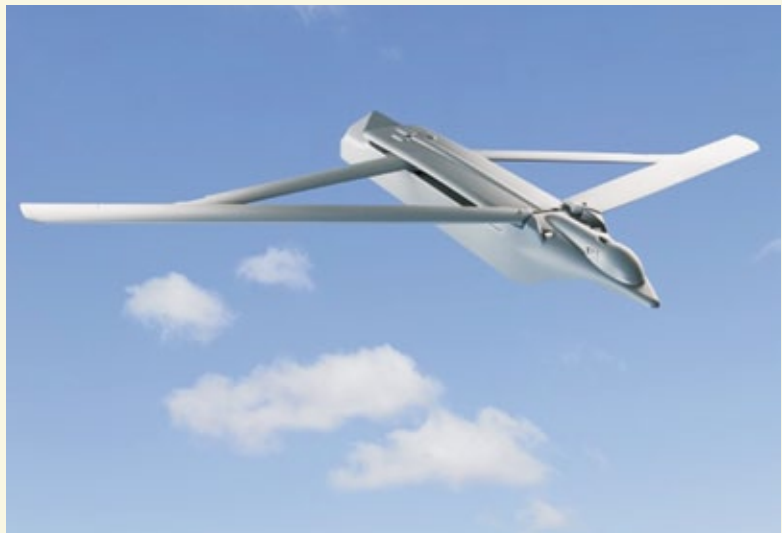
LM submits proposal for Joint Air-to-Ground Missile (JAGM)

Lockheed Martin have responded to the US government's Request for Proposal (RFP) for the next phases of the Joint Air-to-Ground Missile (JAGM) programme. The U.S. Army Aviation and Missile Command issued the RFP for engineering and manufacturing and low-rate initial production for the JAGM programme on 13 April and work on the JAGM programme will be performed in Orlando and Ocala. JAGM is the next-generation air-to-surface guided missile that will replace the aging airborne TOW, Maverick and Hellfire family of missiles for the U.S. Army, Navy and Marine Corps.



10,000th Diamond Back Wing for SDB programme

MBDA Missile Systems celebrated a milestone in the company's U.S. operations during a ceremonial rollout of the 10,000th Diamond Back wing assembly at their Westlake Village, California Division. The Diamond Back Wing assembly is used by the US Air Force's Small Diameter Bomb (SDB Increment 1) programme, with Boeing Company as the prime contractor. The fully integrated Diamond Back Wing for SDB is in full rate production and has been combat proven in Operation *Iraqi Freedom* and Operation *Enduring Freedom*. Future variants of the Diamond Back Wing are in development for other applications, including MBDA's SABER (Small Air Bomb Extended Range) weapon.



Raytheon-Boeing team proposal for Joint Air-To-Ground Missile

Raytheon has submitted its proposal for the U.S. Army and Navy's Joint Air-to-Ground Missile competition and responded as a prime contractor. Raytheon is teamed with The Boeing Company for the JAGM programme. Both the companies have "proven capabilities" that were showcased in the JAGM technology demonstration phase. The team enters the competition with an unmatched 3-for-3 record of success in the contractually required

guided test vehicle flights, attributed to the proven, tri-mode seeker incorporating semi active laser, uncooled imaging infrared and millimeter wave guidance. JAGM is scheduled for integration on the Boeing F/A-18 E/F Super Hornet, the Boeing AH-64D Apache Longbow, the MH-60R Seahawk, the AH-1Z Super Cobra, the MQ-1C Gray Eagle and the OH-58 CASUP Armed Reconnaissance Helicopter.



ASMP-A – the ‘Pocket’ Nuclear Deterrent

Air-launched nuclear missiles offer much required flexibility for any nation’s nuclear doctrine especially in relation to deployment and operation. On 1 July 2010, Admiral Edouard Guillard, France’s Chief of Defence Staff announced formal service entry of the MBDA ASMP-A (*Air-Sol Moyenne Portée-Améliore*) nuclear missile on the Rafale F3 strike fighter at an official ceremony held at Base Aérienne (BA 113) St Dizier-Robinson in north-eastern France, where the Rafale’s nuclear strike role with the missile was allocated to Escadron de Chasse 1/91 ‘Gascogne’.

This is the second *Armée de l’Air* unit to be equipped with the ASMP-A for strategic strike, the first being the Mirage 2000N K3 equipped EC.3/4 ‘Limousin’ at BA125 Istres where ASMP-A missiles attained operational capability in October 2009 in the presence of General Jean-Paul Palomeros, Chief of Staff of *Armée de l’Air*. EC.3/4 ‘Limousin’ also holds the distinction of successful completion of test *Topaze*, the first evaluation firing of ASMP-A on 23 November, 2010 after a long duration (about 5 hours) mission involving multiple flight trajectories/profiles notably terrain following low-level manoeuvring penetration at the terminal phase of strike. Air-to-Air Refuelling

(AAR) support was provided by a C-135 tanker belonging to the 2/91 *Bretagne* AAR Group.

The concept of ASMP-A was derived from ASMP utilising the air vehicle pre-developed for the Vesta activity (ramjet air vehicle) in conjunction with the ANF future anti-ship programme, which was suspended at the end of 1999. The ramjet/stratoreacteur mode of propulsion, compared to a traditional rocket propulsion system, allows for significant reduction of both the required space within the missile as well as missile weight in relation to the required range and warhead charge, additionally allowing the missile to cover a large part of the flight envelope at high supersonic speeds. The compactness of the ASMP-A can be judged by the fact that the formidable nuclear missile measures just over 5-metres in length with a mass of only about 850lb.

ASMP-A has a range of about 500km at a speed of up to Mach 3. The extended range ensures survivability of the launch platform from enemy Integrated Air Defence (IAD) network. The missile still retains a speed of Mach 2 during low-level advanced and complex penetration mode with a high (yet undisclosed) degree of accuracy. The missile in turn is nuclear-attack hardened. The pristine 300-kt TNA (*tête nucléaire aéroporté*) warheads developed by *Commissariat à l’Energie Atomique* (CEA) represent medium energy thermo-nuclear charge, first to be developed in France without recourse to separate nuclear tests, using intensive computer calculations and simulations that proved their effective operation. However, all necessary physical data was generated to validate the concept during the last nuclear testing campaign.

Sayan Majumdar



Rafale with the ASMP-A.

RAF Typhoons in action

Typhoons of the Royal Air Force were deployed at Gioia del Colle within 72 hours of the initial UN Security Council Resolution with the first mission *Operation Odyssey Dawn* flown 12 hours later. In just over three months, the Typhoons have flown over 1300 hours with rapid change in role from air-to-air to an air-to-ground mode. The sorties involve a 650 mile roundtrip with a war load of 4 Enhanced Paveway II 1000 lb bombs, a Litening III Targeting POD, AMRAAM and ASRAAM missiles.



Gripens over Libya

Sweden has deployed eight Saab Gripen fighters, drawn from the F17 Wing as contribution to the NATO-led *Operation United Protector*, as part of the UN-mandated no-fly zone over Libya. The Gripens are operating from Sigonella in Sicily, with ten pilots and 120 support personnel.

Their main role is for providing digital reconnaissance imagery. While the Gripens also carry laser designator pods, they have not dropped weapons nor provided targeting services for other nations' aircraft during the campaign.



The 100th Rafale Built

Seen below taxiing for take-off from Bordeaux on 27 April is Dassault Rafale (C 130), which is the 100th Rafale to be built. The total comprises three development aircraft (B301, B302 and C101), ten F1 standard Rafales (M1 to M10), 48 to F2 standard (B303 to B327, C102 to C108 and M11 to M26) and 39 F3 standard examples (B328 to B338, C109 to C130 and M27 to M32). The Rafale is shortlisted to meet India's 126 + M-MRCA requirements.



Grob Tutors to be upgraded

The Grob 115E Tutor primary training aircraft of the Royal Air Force are to be upgraded by Lee Avionics, to include installation of a Traffic Advisory System and an Electronic Horizontal Situation Indicator (HSI) to improve situational awareness and collision avoidance. Work is already underway, having commenced in mid-January at Farnborough. A total of 122 Tutors were delivered to the RAF to provide elementary flying training and air experience flights for Air Cadets via the University Air Squadrons.



Eurocopter delivers 1,000th EC135

Eurocopter has delivered the 1,000th EC135 to its new owner. Fifteen years after the first of these helicopters rolled off the production line at the Eurocopter plant in Donauwörth, the group's President and CEO Lutz Bertling handed the keys of the new aircraft on this landmark occasion to Peter Meyer, the President of ADAC, Germany's largest automobile club and one of Eurocopter's longest-standing major customers.



This latest purchase brings the Organisation's air rescue fleet up to a total of 51 aircraft, including the BK117 and EC145 in addition to the EC135.

Boeing P-8A Poseidon production aircraft first flight

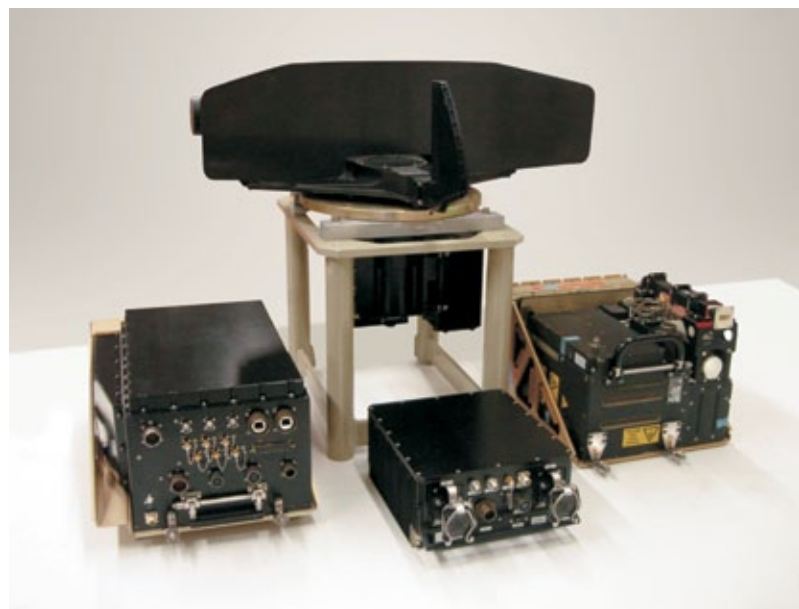
The first Boeing P-8A Poseidon production aircraft made its first flight on 7 July, taking off from Renton Field and landing three hours later at Boeing Field in Seattle. The P-8A is the first of six low-rate initial production (LRIP) aircraft Boeing is building for the U.S. Navy as part of a \$1.6 billion contract awarded in January. The successful flight marked LRIP-1's completion of final assembly in the company's



Renton factory and transition to mission system installation and checkout in Seattle. Boeing will deliver LRIP-1 to the Navy next year in preparation for initial operational capability, which is planned for 2013. This is the first P-8A to include a new CFM56-7BE engine configuration that is now standard on all delivered Next-Generation 737s. The configuration is an improved design that includes high and low pressure turbine modifications.

Gabbiano Radars for Elbit Systems' UAS

SLEX Galileo has been selected by Elbit Systems to supply its Gabbiano radar family for installation aboard Elbit Systems' Unmanned Aerial Systems (UAS). The Gabbiano T20



radar will be installed aboard the Hermes 450 while the most powerful version of the Gabbiano family, the T200, has been chosen for the Hermes 900.

Thales contracted for Mirage 2000Ds with GPS SAASM

Thales has been awarded a contract to supply more than 100 of its GNSS 1000-S GPS receivers to upgrade France's fleet of Mirage 2000D aircraft within the framework of the French Army's Global Navigation Satellite System equipment renovation programme.

Thales GNSS 1000-S draws on SAASM (Selective Availability Anti-Spoofing Module) technology, which enables access to the military GPS encrypted signals. This technology also uses state-of-the-art signal processing, offering extended satellite-tracking capabilities in terms of precision, integrity, availability and jamming robustness in severe operational conditions.

Indian Aviation HYD airshow repeat 3/2011

New RAF Reaper Squadron

A new Royal Air Force MQ-9A Reaper unmanned air vehicle (UAV) squadron will be formed at RAF Waddington, Lincolnshire and will take the numberplated XIII Squadron. Defence Secretary Liam Fox said, "The formation of this new squadron follows our doubling of the Reaper capability to ten aircraft, which represents an increased investment of £ 135 million".



The decision to make No.13 Squadron the next Reaper unit was in line with Ministry of Defence policy to attempt to retain old and historic squadron numbers. Originally formed in 1915, the unit has had a long and distinguished record through both World Wars and on operations in Iraq and Afghanistan, notably undertaking the last Tornado sortie over Iraq in support of *Operation Telic*. Just weeks from its disbandment, the unit was at the forefront of operations over Libya, performing deep strike missions with Storm Shadow missiles.

Turkey joins Talarion UAS programme

A Memorandum of Understanding was signed on 11 May between Cassidian and Turkish Aerospace Industries Inc (TAI) to establish co-operation on the Talarion next-generation unmanned aerial system (UAS).

Turkey has long been an advocate for participation in this major European UAS programme and the country's *Savunma Sanayii Müsteşarlığı* (SSM-Undersecretariat for Defence Industries) has approved significant investment and integration in the Talarion prototype development team by major Turkish aerospace companies, led by TAI.

Talarion is a European programme aimed at developing a new, advanced medium-altitude long-endurance (MALE) UAS to fulfill requirements initially put forward by France, Germany and Spain for their future unmanned long-endurance surveillance and reconnaissance missions. The UAS will have a modular design with the UAV integrated into network enabled operations. First flight of a prototype is scheduled for 2014.

RUAG offer Reaper to Germany

General Atomics Aeronautical Systems Inc have signed a Memorandum of Understanding (MOU) with RUAG Aerospace Services GmbH to offer the Predator B (MQ-9 Reaper) to meet *Bundeswehr* (German Armed Forces) surveillance requirements. GA-ASI and RUAG will offer the Reaper to meet the *Bundeswehr's System zur abbildenden Aufklärung in der Tiefe des Einsatzgebietes* (SAATEG) requirement for in-theatre reconnaissance and airborne Intelligence, Surveillance and Reconnaissance (ISR) using an unmanned aircraft.

The SAATEG requirement is for an unmanned intelligence, surveillance and reconnaissance (ISR) system that can be deployed in Afghanistan from 2013, with an initial need for five UAVs and two ground control stations. The Reapers will replace the leased IAI Heron UAVs presently in service.

Special Ops Dornier 328 for USAF

A second Dornier 328-100 has been acquired by the US Air Force Special Operations Command (AFSOC), this aircraft previously with 328 Support Service GmbH at Oberpfaffenhofen, Germany. It was ferried to Sierra Nevada's facility at Denver-Centennial Airport, Colorado and will be operated by the 524th Special Operations Squadron which is part of the 27th Special Operations Wing.



UAE's first C-17A delivered

The United Arab Emirates Air Force and Air Defence's (UAEAF&AD) received its first C-17A Globemaster III airlifter (1223) at a ceremony at Long Beach, California, on 10 May. A contract for purchase of six C-17As by the UAE under a direct commercial sale had been announced in January 2010.

A further three C-17As will be delivered to the UAEAF&AD this year and the remaining two in 2012. Boeing was awarded a \$7.28 million contract on 28 April to give Fiscal Year 2011 support for the six UAE aircraft through the C-17 *Globemaster III Sustainment Partnership*.



Qatar's first C-130J-30

Deliveries of the first of four C-130J-30 Super Hercules on order for the Qatar Emiri Air force (QEAF) will commence later this year. The aircraft will be used for "humanitarian relief and military missions for the defence of the State of Qatar".

Lockheed Martin will provide an extensive support package as part of the contract, including aircrew and maintenance personnel training, spares, ground support and test equipment, cargo pallets and servicing carts. A team of technical specialists will be based in Qatar during the initial support period.

Qatar and Saudi Arabia order PC-21

Swiss Parliamentary approval was granted on 20 April for the sale of 12 Pilatus PC-21 turboprop trainers to the Qatar Emiri Air Force (EAF). At the same time, the lease of two PC-21s to the Royal Saudi Air Force (RSAF) for evaluation purposes was also given the go-ahead. Because of its neutrality, Switzerland will not sell any military equipment to overseas customers that might use it for offensive purposes. As the PC-21 is capable of carrying weapons on its underwing and centerline pylons, approval for export is dependent on the recipient providing guarantees that the aircraft will not be armed.

Botswana orders PC-7 Mk IIs

Botswana Defence Force (BDF) is purchasing five Pilatus PC-7 Mk II turboprop trainers to replace its current PC-7 fleet, which has been in service since 1990. The contract, worth approximately 40 million Swiss Francs (\$44.7 million), was signed in Gabarone on 13 April and also includes a ground-based training system incorporating computer-based training. Delivery of the aircraft, ground-based training system and logistic support package is scheduled to be completed in early 2013.

The BDF Air Wing originally took delivery of seven PC-7s. The type is based at Thebephatshwa Air Base (Molepolole) and operated by No. 27 Squadron.

Pakistan ISR King Air 350s

Two Beechcraft 350 King Airs in an Intelligence, Surveillance and Reconnaissance (ISR) configuration have been delivered to the Pakistan Army. Both aircraft were previously registered with US Air Force Material Command's 645th Aeronautical Systems Group. On 26 April both US civil registrations were officially cancelled as "exported to Pakistan".

At present there are three military King Airs operated in Pakistan, all with the Pakistan Army's No 13 Squadron, at Qasim Army Air Base, Rawalpindi.

BAE Systems pull out of Polish AJT competition

BAE Systems has pulled out of the competition for a \$530.5 million contract to supply Poland with 16 combat-training aircraft. Korean Aerospace Industries' (KAI) T-50, the only supersonic aircraft in the RFP reportedly met all technical requirements, with Italian Alenia Aermacchi's M-346 Master its only potential rival.

Poland is to replace its ageing jet trainers and BAE Systems was competing against companies from Italy, Finland, the Czech Republic and South Korea in the initial stage of the process.

Mexico orders four C-27J aircraft

Finmeccanica has signed a contract with the Mexican government for the supply of four C-27J tactical transport aircraft. The first aircraft will be delivered end of 2011 and the remaining by the end of 2012. The contract includes logistics support for the entire fleet through the supply of spare parts and GSE (Ground Support Equipment).

Airbus A330 MRTT FSTA refuels RAF Tornado

An Airbus Military A330 MRTT Future Strategic Transport Aircraft (FSTA) for the Royal Air Force has successfully completed its first contacts with a Tornado fighter. The two aircraft performed a series of dry contacts, by day and night, in late June and early July during a programme to formally qualify the Tornado to refuel from the FSTA in operational service. Wet contacts, in which fuel is actually passed from the tanker to the receiver, will commence shortly. During sorties conducted from RAF Boscombe Down with the support of Qinetiq, the Tornado executed contacts with the A330 MRTT's underwing hose-and-drogue pods at altitudes between 10,000ft and 30,000ft and speeds of 250-325kt.



Gripen operational in the RTAF

On 8 July 2011 the Royal Thai Air Force (RTAF) officially declared its new air defence system consisting of the Gripen fighter and Saab 340 Erieye AEW “as operational”, the ceremony taking place at the Wing 7 airbase in Surat Thani. In 2008 an agreement was signed between FMV, Sweden’s Defence Materiel Administration and the RTAF, for the delivery of six



Gripen C/D multi-role fighter aircraft to replace the F-5 fighters. The order also included one Saab 340 Erieye AEW, a single Saab 340 for transport purposes and a ground based Command-and-Control system. A further batch of six Gripen C fighters and another Saab 340 Erieye AEW was ordered in 2010. Deliveries of the second RTAF order will be completed in 2013.

AgustaWestland AW139s for Egyptian Air Force

AgustaWestland has been awarded a \$37.8 million contract with the US Army Aviation and Missile Command (AMCOM) Contracting Centre for Foreign Military Sales to the Egyptian Air Force. AgustaWestland will configure two Pennsylvania-built AW139s for search and rescue missions, support the US Army in training aircrews and provide a spare parts package to ensure successful fielding of the aircraft.



Sikorsky S-92 helicopters for Royal Thai Air Force

Sikorsky Aircraft Corp. has delivered three VVIP S-92 helicopters to the Royal Thai Air Force, introducing the first high-end LifePort medical system into an S-92 aircraft. Sikorsky helicopters have been in use by Thailand military forces since



1996 including those being flown by the Royal Thai Navy, which flies Seahawk helicopters and S-76 helicopters. In addition, the Royal Thai Army flies UH-60L Black Hawk helicopters. The latest delivery of S-92 helicopters marks the first Sikorsky products for the Royal Thai Air Force.

Sikorsky UH-60Ms for Sweden

Fifteen Sikorsky UH-60M Black Hawk helicopters have been ordered by the Swedish Armed forces which will use the aircraft for medical evacuation, utility, and search and rescue missions. Sikorsky is slated to deliver six of the helicopters in 2011 and the remaining nine in 2012 under an accelerated production schedule.



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First Airbus Military A330 MRTT for Royal Australian Air Force

The first Airbus Military A330 MRTT new generation tanker-transport was formally delivered to the Australian Defence Materiel Organisation (DMO) at the Royal Australian Air Force (RAAF) base Amberley (Queensland, Australia) on 1 June 2011.



The aircraft, which had left Madrid on 27 May, was ferried to Amberley. On its ferry flight, the A330 MRTT was flown by Airbus Military and RAAF crews, and transited via McCarran (Nevada) and Hickam (Hawaii) in the USA.

First LM Advanced Block 50 F-16s for Turkish AF

Turkish Aerospace Industries (TAI) and Lockheed Martin have presented the first of 30 new Turkish-built F-16s at TAI's facility near Ankara. The F-16 programme has provided extensive industrial development and employment in Turkey over the past 25 years. The Turkish Air Force has more than 200 F-16 aircraft in its inventory presently and will take delivery of the 30 new, advanced Block 50 models between May 2011 and December 2012.



Elbit to Upgrade Romanian AF C-130s

Elbit Systems have been awarded a contract valued at approximately \$18.6 million to upgrade the Romanian Air Forces' C-130 transport aircraft. The C-130 aircraft will be equipped with various types of advanced electronic systems, including those produced by Elbit Systems' wholly owned subsidiary, Elisra Electronic Systems Ltd. The project, to be performed over four years, will be executed in cooperation with local companies in Romania, led by the Romanian Aeronautical Industry.

IAI/Tamam MINIPOP on Rafael's RCWS delivered

Israel Aerospace Industries (IAI) have delivered the new MiniPOP lightweight EO/IR sights for Rafael's Samson 30 RCWS (Remote Controlled Weapons Station). The new systems are installed on the GDELS-Steyr KBVP Pandur 8x8 CZ infantry fighting vehicles, which are currently operated by the Czech Army in Afghanistan. The MiniPOP features a thermal imager, a CCD camera, a laser rangefinder and a laser pointer. Two MiniPOP systems are installed on each turret; one is used



as the commander sight, and the other as the gunner sight. The MiniPOP is part of IAI/Tamam's ever-expanding POP family of advanced, lightweight, observation and targeting payloads for airborne, land and maritime applications.

Australia selects the MH-60R Seahawk

Australia has selected the MH-60R Seahawk helicopter to fulfill the Australian Defence Force's AIR 9000 Phase 8 requirement for a fleet of 24 new-generation, multi-role naval helicopters. Australia will acquire the helicopters with associated training and logistical support via the US Government's Foreign Military Sales programme. The Royal Australian Navy is expected to take delivery of the first two MH-60R helicopters in 2014.

Elbit payloads for an 'Asian' MPA operator

Elbit Systems Ltd will supply 'an Asian country' with dozens of CoMPASS (Compact Multi Purpose Advanced Stabilised System) payloads for maritime patrol aircraft. The Asian country, which operates one of the largest maritime patrol fleets in the world, has selected the CoMPASS payload as a solution to protect its coastlines.

The contract, valued at approximately \$20 million, is scheduled to be completed within two years.

The CoMPASS payload, developed and manufactured by Elbit Systems Electro-optics Elop Ltd. (Elop), is already installed onboard hundreds of platforms including Unmanned Aircraft Systems (UAS). Belonging to the 15-inch payload family, the CoMPASS includes an advanced thermal imaging system, laser range designator and a day channel, allowing optimal ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance) capabilities even in adverse weather conditions.



Italian Navy takes delivery of first NH90 NFH

The Italian Navy have taken delivery of its first NH90 NFH helicopter, having ordered a total of 56 NH90s (46 NFH and 10 TTH units) which will replace old helicopters for a variety of roles including anti-submarine warfare, anti-surface warfare and utility. The Italian Navy is the second customer to receive the NH90 in Italy, following the Italian Army which has a total of 60 NH90 TTH helicopters on order.

The NH90 NFH variant is primarily designed for autonomous and joint Anti-Submarine Warfare (ASW) and Anti Surface Warfare (ASuW) missions.



Malaysia orders 12 EC725 helicopters

Eurocopter and the Malaysian Ministry of Defence have signed a cooperation contract related to the supply of 12 EC725 helicopters, to be operated by the Royal Malaysian Air Force in Search and Rescue (SAR) and utility missions.



AirAsia orders 200 A320neo aircraft

AirAsia, the largest low cost carrier in the Asia-Pacific region, has placed firm orders with Airbus for 200 A320neo aircraft. The contract, announced at the Paris Air Show, is the largest order ever placed for the A320 Family and makes AirAsia the biggest airline customer for the Airbus single aisle product line in the world. AirAsia announced that its A320neo aircraft will be powered by CFM International's new LEAP-X engines.

Altogether, AirAsia has now placed firm orders for 375 A320 Family aircraft, with 89 already in service on the carrier's fast-growing pan-Asian network. In addition, the carrier's long haul affiliate AirAsia X is also an all-Airbus customer having placed orders for 38 widebody aircraft.



American Airlines order 260 Airbus A320 Family Aircraft

Airbus and American Airlines, a wholly-owned subsidiary of AMR Corporation, have signed a firm contract to acquire 260 Airbus A320 Family aircraft. The contract calls for flexibility for the airline to take delivery of A319s, A320s and A321s, with 130 featuring Airbus' New Engine Option (neo). All 260 aircraft will feature large, fuel-saving wingtip devices known as Sharklets. The A320neo, launched in late 2010, is the latest product innovation at Airbus. These new A319, A320 and A321 models feature a choice of two new engines - the PurePower



PW1100G from Pratt & Whitney or the LEAP-X from CFM International. Together, the Sharklets and new engine choices result in a 15 percent fuel burn reduction, corresponding to an annual carbon dioxide reduction of 3,600 metric tons per aircraft.

American Airlines to order 300 B-737s

American Airlines has selected Boeing to provide 200 narrowbody airplanes, with options for 100 more, to accelerate its single-aisle fleet replacement. The agreement includes 100 Next-Generation 737s, with options for an additional 40 aircraft. In addition, American Airlines has committed to order a variant of the 737 featuring new more fuel-efficient engines, pending final airplane configuration and launch approval of the programme by the Boeing board of directors. This commitment for 100 aircraft, with options for 60 more, is the first of many anticipated for this variant. The aircraft would be powered by CFM International's LEAP-X engine.

American Airlines' current fleet of more than 600 Boeing aircraft includes 156 Next-Generation 737-800s delivered to date.

17 Boeing 747-8 Intercontinentals sold

Boeing have announced orders and commitments for seventeen 747-8 Intercontinentals, but customers remain undisclosed. One carrier has committed for fifteen of the

new passenger version of the 747-8, another carrier placed an order for two. The orders bring the 747-8 Intercontinental total backlog to 50 firm aircraft, plus five from a commitment from Air China contingent on Chinese Government approval. The new 747-8 Intercontinental carries 467 passengers in a three-class configuration, also featuring a new wing design and an upgraded flight deck. The airplane interior incorporates features from the 787 Dreamliner including a new curved, upswept architecture that will give passengers a greater sense of space and comfort.

Nordic Aviation Capital orders 10 ATR 72-600s plus 10 options

ATR and Danish regional aircraft leasing specialist Nordic Aviation Capital (NAC) have contracted for the purchase of 10 ATR 72-600s, plus options for 10 additional aircraft. The deal, including options, is valued at some 450 US\$ million. Privately-owned NAC is the world's largest turboprop leasing company with a current portfolio of 160 aircraft, including 91 ATRs. The deal will bring NAC's ATR portfolio up to more than 100 aircraft.

SIA order 15 more A330s with R-R Trent engines

Singapore Airlines (SIA) has finalised an agreement with Airbus to expand its fleet with 15 more A330-300s, which will join an existing fleet of 19 A330-300s with the carrier, flying from Singapore to destinations across the Asia-Pacific region and to the Middle East. Rolls-Royce has won a \$1bn order to supply Trent 700 engines along with TotalCare services support. Singapore Airlines already operates 19 Trent 700-powered A330s, the first of which was delivered in 2009.



Orders for 10 Bombardier CSeries Jetliners

Bombardier Aerospace have announced that “a European customer”, who wishes to remain unidentified at this time, has placed a firm order for 10 Bombardier CS100 jetliners. A first-time buyer of Bombardier aircraft, this customer will take advantage of the inherent flexibility and performance that only the all-new CSeries aircraft can provide. “This order tops off a very successful Paris Air Show and a strong wave of order activity in June, when we added five new customers,” said Gary R. Scott, President, Bombardier Commercial Aircraft.



First ATR 72-500 for UTair of Russia

Russian air carrier UTair has taken delivery of its first ATR 72-500 aircraft, also the first one of this type to be operating in Russia. UTair and ATR have announced an order for 20 aircraft, estimated at US \$ 426 million. The remaining ATR 72-500 aircraft will be delivered in 2011 and 2012. The delivery of these new 70-seater aircraft will bring the number of ATR aircraft operated by UTair up to 37, making UTair the largest operator of ATR aircraft in Europe. Currently the UTair fleet consists of nearly 200 aircraft, most of which operate on domestic routes to some 300 destinations. UTair has been operating ATR aircraft since 2006, when the company brought the first ATR aircraft into operation in Russia.



Grupo INAER order 7 AgustaWestland helicopters

INAER, the leading European helicopter services provider, has signed contracts with AgustaWestland for two EMS-configured GrandNew light twin helicopters and four GrandNew light twin and one AW139 medium twin helicopters for offshore transport.



GECAS order 60 Airbus 320neo aircraft and 15 ATR 72-600s

GE Capital Aviation Services (GECAS), the commercial aircraft leasing and financing arm of General Electric, announced a firm order for 60 Airbus 320neo Family aircraft at the 49th Le Bourget Air Show. GECAS has selected CFM's LEAP-X engine for all 60 A320neo aircraft.

GE Capital Aviation Services also announced a new order for 15 ATR 72-600s, plus 15 options. The deal is valued at approximately US\$680 million at list prices, including options. This is a first-time ATR order for GECAS.

Russian Helicopters and AgustaWestland in JV

Russian Helicopters and AgustaWestland have established *HeliVert*, a Russian Helicopters and AgustaWestland “equal” joint venture. *HeliVert* is intended to set up and run a final assembly line plant for the civil AW139 medium twin helicopter in Russia.

The assembly line is being built within the industrial area in Tomilino, Moscow region and is expected to be opened within summer with assembly activities to start in the fourth quarter of 2011. The plant is planned to assemble up to 15 AW139s per year to meet requirements of the civil markets in Russia and CIS countries. *HeliVert's* management will be expressed equally by Russian Helicopters and AgustaWestland, appointing the General Director and Deputy Director respectively.

Israir receives first ATR 72-500

The Israeli airline *Israir* has taken delivery of its first ATR 72-500, of two ordered. The aircraft, equipped with PW 127M engines, is configured to transport 72 passengers and will be used to enhance the airline's domestic network, adding to its current fleet of three ATR 42-320 and two Airbus A320 aircraft. The second ATR 72-500 is scheduled for delivery at the end of July 2011.



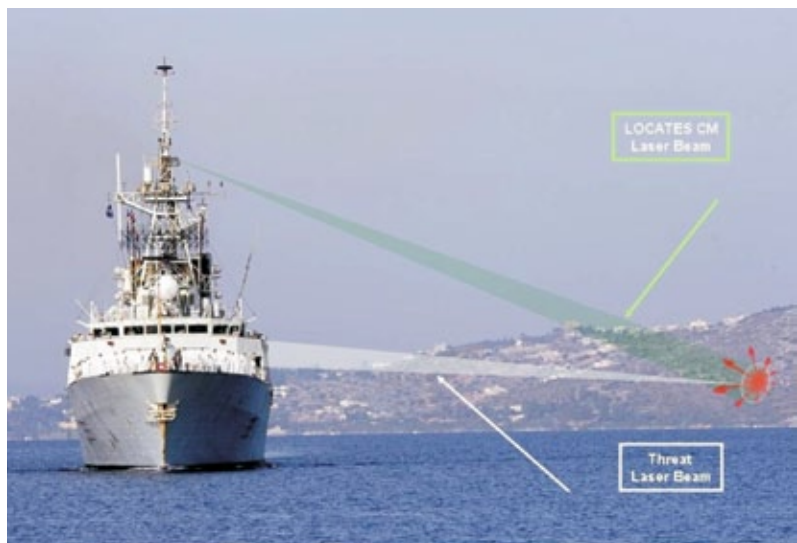
Second Mesma AIP for Pakistan

DCNS is supplying the second of three Mesma air-independent propulsion modules ordered by the Pakistan Navy for its DCNS-designed Agosta 90B submarines. This module will be installed as part of a scheduled major refit for one of two Agosta 90Bs in active service. The self-contained hull module will be integrated with the host submarine over the next few months, with a 'cut-and-plug' operation to insert the 8.7-metre-long 'plug' into the boat's hull. The first Mesma module was integrated directly during the construction of third-of-class Agosta 90B submarine PNS *Hamza* which entered active service in 2008.



CASSIDIAN to protect Canadian Naval Vessels against laser-based Attacks

Cassidian will develop innovative solutions to protect ships of the Canadian Navy against new types of asymmetric threats. Under the designation LOCATES (Laser Optical Countermeasures and Surveillance Against Threat Environment Scenarios), the Defence Research Development Canada (DRDC), Valcartier, Quebec, awarded Cassidian a contract to apply new technologies to detect and counter laser-based threats in harbours and littoral waters. This is in response to increasing threats by laser designators and laser-guided weapons which are widely distributed and easy to operate. Navy ships are particularly vulnerable in a littoral environment where attacks are difficult to be detected without sufficient pre-warning time.



ITT lightweight countermeasures system

ITT Corporation has developed a new countermeasures system to protect helicopters from shoulder-fired, heat-seeking missiles. This system, recently submitted as a candidate for the US military's Common Infrared Countermeasures (CIRCM) programme, employs an innovative open-system architecture and rugged fibre optic technology to reduce weight while maintaining system reliability. As helicopters are increasingly employed in humanitarian, relief and military operations in remote and potentially dangerous locations around the world, the requirement for effective, lightweight defences against ground-based threats has also increased. ITT's solution results from a multi-year investment to design, develop and mature infrared countermeasures technology that will meet future needs while addressing the known deficiencies of legacy systems.

France and Russia in “unprecedented” warship deal

On 26 May 2011, France finalised an “unprecedented” deal to sell four new generation warships to Russia. French President Nicolas Sarkozy and his Russian counterpart Dmitry Medvedev said the protracted contract negotiations were all but over. “All talks have been completed. The contract will be signed shortly,” a visibly pleased Medvedev said after bilateral talks with his host. “The elements of the signing have been resolved. The signature will take place within a fortnight,” Sarkozy confirmed.



Under the plan, two *Mistral*-class ships, which are helicopter carriers designed to act as command vessels, will be built in France and two in Russia to the French design, the two leaders said without giving further details. *Mistral*-class vessels are 30,000-tonne amphibious assault ships capable of carrying up to 16 helicopters, four landing craft, up to 59 armoured vehicles and a unit of 450 marine commandos.

Negotiations over the purchase began in 2009 but repeatedly stalled over price and technology transfer amid concerns among France’s NATO allies about arming Russia with modern Western weaponry.

Earlier this year, the two sides were reportedly unable to agree on the contract price, as Russia insisted on paying no more than \$980 million while France insisted on a contract of at least \$1.15 billion. The *Mistral* purchase from France is unprecedented both in terms of scale and in breaching the barrier imposed by post-war Russia’s insistence on producing all military hardware for its own use and export. The deal will also be seen as a major coup for both leaders and will likely boost their standings as political negotiators as Russia and France head into presidential elections next year.

Sri Lanka chooses secure TETRA network by Cassidian India

Airport & Aviation Services Limited (AASL) of Sri Lanka has chosen Cassidian, the Defence & Security division of EADS, to equip Bandaranaike International Airport near Colombo with a secure TETRA radio communication network.

The installation, commissioning and activation of the system will be done by a Sri Lanka-based company in co-operation with Sanchar Telesystems and the support of the Division’s Indian team. “We at Cassidian India welcome this award for the first TETRA system in Sri Lanka, as we believe more opportunities will come as part of the rapid infrastructure development and the Sri Lanka Police’s modernisation process,” said Ehud Weizman, Head of Marketing and Business Development in Public Safety, Cassidian India.

SELEX Galileo AESA radar for aerostats

SELEX Galileo has been awarded a contract by Worldwide Aeros Corporation, a US prime contractor for aerostat vehicles, to deliver its Seaspray 7500E Active Electronically Scanned Array (AESA) radar. The Seaspray radar will equip an Aeros ground-surveillance tethered aerostat balloon operated by the Republic of Korea Army, marking SELEX Galileo’s expansion into the rapidly growing aerostat market segment. The Seaspray 7500E will also provide a long range Ground Moving Target Indication (GMTI) capability for border surveillance.



Seaspray 7500E

FADEC International and GE to develop LEAP engine

GE has signed an agreement with FADEC International to form a 50-50 joint venture to develop and produce the Full-Authority Digital Electronic Control (FADEC) for CFM International’s next generation engine, the LEAP. The fuel efficient LEAP turbofan engine is designed to power future narrow body commercial aircraft and is designed by CFM International, a 50-50 partnership between GE and Snecma (Safran group), which has been selected for the Airbus A320neo and the Comac C919.

The FADEC governs engine fuel flow, controls variable engine geometries, interfaces with the engine thrust reverser, and performs advanced functions such as electronic engine overspeed protection. FADEC International and its heritage organisations have been the FADEC System supplier to GE since 1984.

Thales presents TopOwl HMSD

Thales has presented its high-performance TopOwl Helmet Mounted Sight Display (HMSD) featuring augmented reality, a new capability further enhancing helicopter pilots situational awareness in difficult visibility conditions. Representing an industry-first, TopOwl is now able to provide helicopter crews with augmented reality information, projected in front of the pilot's eyes, such as synthetic views of the environment, made possible through the use of TopOwl's unique fully overlapped 40-degree field of view. This synthetic view is generated in real time and superimposed on the actual terrain vision, drawing on information from integrated databases. TopOwl Helmet Mounted Sight & Display System has been deployed with the French and US Forces in Afghanistan onboard Tiger and Huey UH-1Y helicopters.



Airbus Military C295 with AEW&C rotodome in maiden flight

The first Airbus Military C295 development aircraft fitted with an Airbone Early Warnings and Command (AEW&C) rotodome successfully completed its first flight on 7 June 2011 at Airbus Military's site in Seville (Spain). The flight follows extensive research and development work, including wind



tunnel testing, leading to the conversion of a C295 to be fitted with the in-house developed rotodome. The six metre diameter rotodome fitted for the initial trials is a fixed dummy structure but on production aircraft the rotodome would be a fast-rotating device housing a state-of-the-art radar providing full 360 degree and continuous coverage of a selected area.

NGC displays Firebird and emerging ISR solutions

During US Joint Forces Command's *Empire Challenge 2011* exercise recently conducted in Arizona, Northrop Grumman integrated emerging mission solutions into a real-world environment to showcase new technologies. "Empire Challenge not only allows the warfighter to directly participate in various concepts of operations, but it also offers Northrop Grumman the chance to collect feedback from the user community on the introduction of a range of Information, Surveillance and Reconnaissance [ISR] collection and processing, exploitation and dissemination solutions," said Chris Frangos, chief architect of Northrop Grumman Aerospace Systems.



Textron Systems and Rheinmetall Canada on TAPV Programme

Textron Systems Canada Inc. and Rheinmetall Canada Inc. have announced an arrangement in pursuit of the Department of National Defence (DND) and Canadian Forces Tactical Armoured Patrol Vehicle (TAPV) programme. The DND is expected to award a contract to procure up to 500 vehicles with an option for up to 100 more.

Textron's proposed TAPV, specifically engineered to meet Canadian Forces requirements, draws on the company's more than 45 years of experience in the design and production of armoured vehicles. Building from the very successful Armoured Security Vehicle platform, Textron's TAPV is designed to deliver the best blend of survivability, mobility, versatility and lethality for a broad spectrum of operations in the world's most challenging environments.

Turbomeca's Arriel 2D engine certified by EASA

The Turbomeca (Safran group) Arriel 2D engine, with a take-off power of 950 shp, has been certified by the European Aviation Safety Agency (EASA). The Arriel 2D will power the Eurocopter AS350 B3e helicopter, the first engine's entry into service scheduled in the second half of 2011. The Arriel 2D benefits from new technology (new axial compressor, new blade material, etc.) in a proven engine. This new engine offers better performances with lower specific fuel consumption, resulting to lower operating costs.

"Outstanding" results in LEAP Fan Blade-Out Rig

Testing of CFM International's advanced 3-D Woven Resin Transfer Molding (3-DW RTM) fan is proceeding on schedule and the company is achieving "outstanding" results.

In May, CFM completed a full-scale fan blade out rig test, simulating certification requirements for the proprietary 3-DW RTM technology. The company has also completed extensive full-scale component tests, including bird ingestion testing with the same positive results. Endurance testing of 3-DW RTM fan is also proceeding on schedule, with 3,500 of the planned 5,000 cycles completed. The demanding test was designed to evaluate fan behavior within a real thermal and vibratory environment. The results have been "outstanding", meeting or exceeding all pre-test predictions. The LEAP engine is on track for certification in 2014 and entry into service in 2016.

ADS flight of AAS 72X Technical Demo Aircraft

EDS North America have conducted flight demonstrations of the company-funded Armed Aerial Scout 72X (AAS-72X) helicopter at Nashville International Airport. The company, and its industry team of American Eurocopter and Lockheed Martin have made significant investment in the development of three AAS-72X Technical Demonstrator Aircraft (TDA), which are being used to conduct parallel development and risk reduction activities, and to demonstrate the aircraft's increasing level of capability and technical maturity. The AAS-72X is based on the highly successful EC145 commercial helicopter platform.



MBDA's PARS 3 LR successfully tested

Test firings with live ordnance have been carried out using a Tiger helicopter of the German Army, with the guided missiles hitting their target "optimally". The PARS 3 LR is currently the most capable fire-and-forget guided missile system for combating mobile, armoured targets. The guided missile is manufactured by PARSYS, a joint venture of LFK GmbH (MBDA Deutschland) and Diehl BGT Defence. The German Army has already authorised series production of 680 PARS 3 LR guided missiles which is to be the future main armament of the Tiger support helicopter.



Space shuttle Atlantis makes its final landing

Space shuttle Atlantis returned to Earth on 20 July 2011 bringing to a close America's 30-year orbiter programme. The vehicle swept into the Kennedy Space Centre, its wheels touching the runway just before local sunrise. NASA's shuttles were instrumental in building the space station and were used to launch the Hubble telescope. The de-orbit track brought Atlantis across central Florida and the Titusville-Mims area before a hard bank to the left put the vehicle on a line to Runway 15 at Kennedy Space Centre.

Retirement of NASA's iconic shuttle fleet was ordered by the US government, in part due to the high cost of maintaining the craft but this decision leaves United States with no means of putting astronauts in orbit. In the interim, NASA will rely on the Russians to ferry its personnel to and from the International Space Station (ISS).



Honeywell HTF7250G turbofan engine certified

Honeywell's HTF7250G turbofan engine has been certified by the Federal Aviation Administration (FAA). The newest member of the most reliable turbofan engine in its class, the HTF7250G has been selected to power Gulfstream's new G250 super mid-size business jet. The HTF7250G engines provide 7,445 pounds of thrust each and deliver "extraordinary fuel efficiency", enabling the Gulfstream G250 to travel 3,400 nautical miles at 0.80 Mach with a maximum operation speed of 0.85 Mach. The new engine also incorporates new green technology such as Honeywell's Single Annular Combustor for Emissions Reduction (SABER) technology to reduce NOx, CO₂ and other unburned hydrocarbon emissions.

Sagem's 2nd-gen fire control computers for French artillery

Following competitive tenders, the new-generation ballistic computer offered by Sagem (Safran group) was chosen by French defence procurement agency DGA for all control stations in the French Army's Atlas artillery system. Sagem's computer will determine fire control solutions for 155mm artillery guns and mortars, as primary or backup control for the Atlas system, as well as during force projection missions. More than 100 of these computers will be delivered. CADET 2G will provide the following services: deployment of artillery pieces as a battery; management of technical and tactical firing data; determination of firing solutions; ballistic calculations (NATO methods or firing tables); fire control and adjustment.

MBDA unveils the Perseus

MBDA has unveiled the CVS 401 Perseus concept missile system, which represents the group's vision of a multi-role strike weapon system for 2030 and beyond. To replace the current generation of heavy anti-ship and cruise missiles, a new system will be required that is capable of launching anti-ship strikes, land attacks and engaging time-sensitive targets such as relocatable missile launchers in an ever more complex tactical environment and with the minimum risk of collateral damage. This new system will also have to be modular and deliverable from a maritime environment, namely from a surface vessel, a submarine, a carrier-based platform or a maritime patrol aircraft.

Perseus features multiple operating modes against wide land and maritime targets, set with the added capability of being able to overcome the most effective of enemy missile defences. Advanced dual-mode sensor package (comprising an Active Electronically-Scanned Array or AESA radar combined with a laser radar or LADAR) in the Perseus, allows for all-weather operations in all configurations of terminal engagement. Radar modes such as SAR (Synthetic Aperture Radar) and DBS (Doppler Beam Sharpening) allow for long range target detection and discrimination in complex land and naval tactical environments including those involving advanced counter measures.



Airbus Military and IAI to jointly develop C295 AEW&C

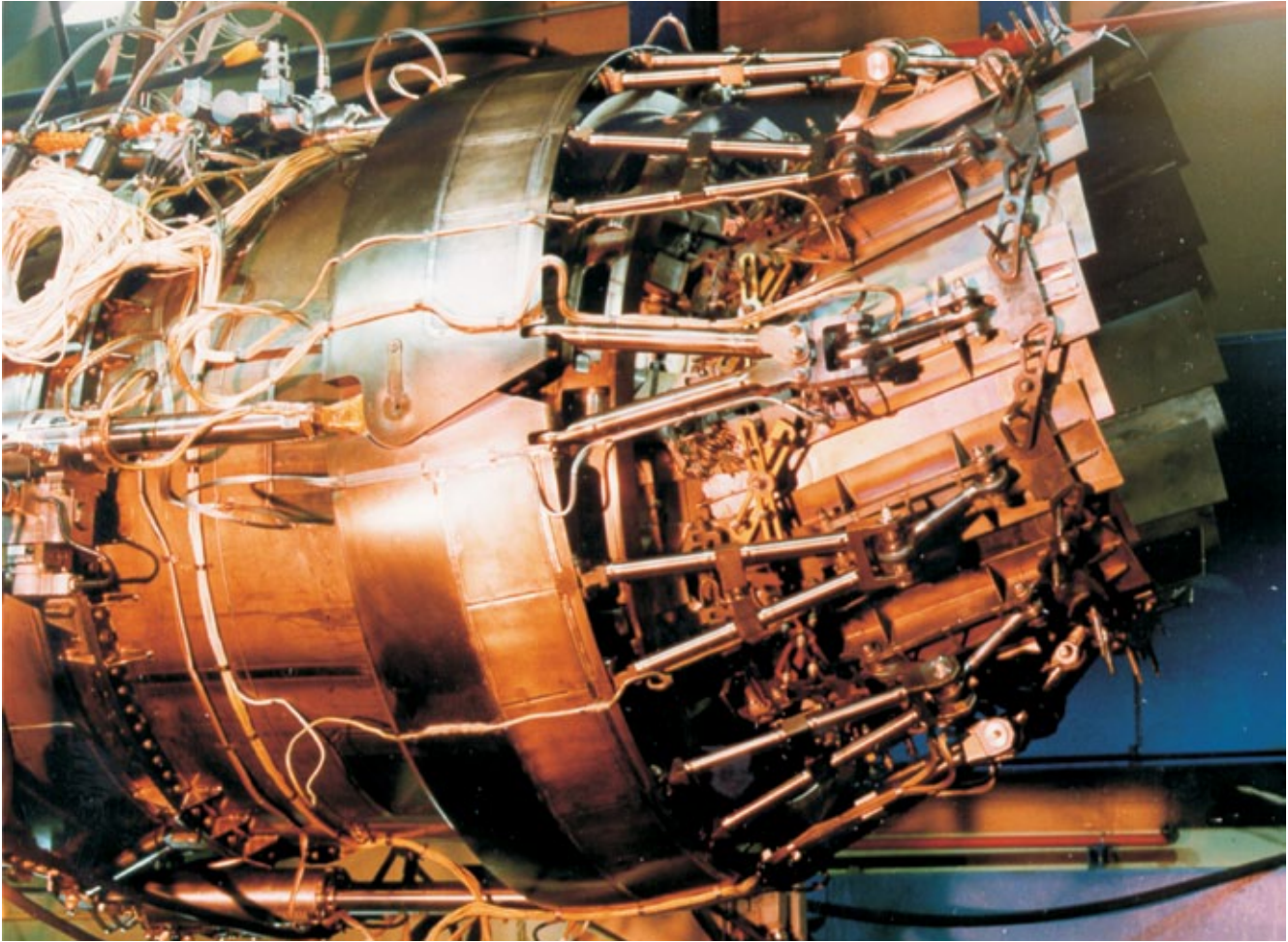
Airbus Military and Israel Aerospace Industries (IAI) are combining forces to jointly develop and market a new version of the Airbus Military C295 platform fitted with an Airborne Early Warning and Control (AEW&C) system produced by ELTA Systems, a wholly owned IAI subsidiary. The primary sensor of the AEW&C will be the IAI/ELTA 4th Generation Active Electronically Scanned Array (AESA) Radar with integrated IFF.

A Memorandum of Understanding (MOU) to this effect was signed at Le Bourget. The C295 AEW&C has been designed to provide high quality 360° surveillance, creating in real-time an integrated Air and Maritime Situation Picture and Electronic Order of Battle. The initial tests have shown that the aircraft is



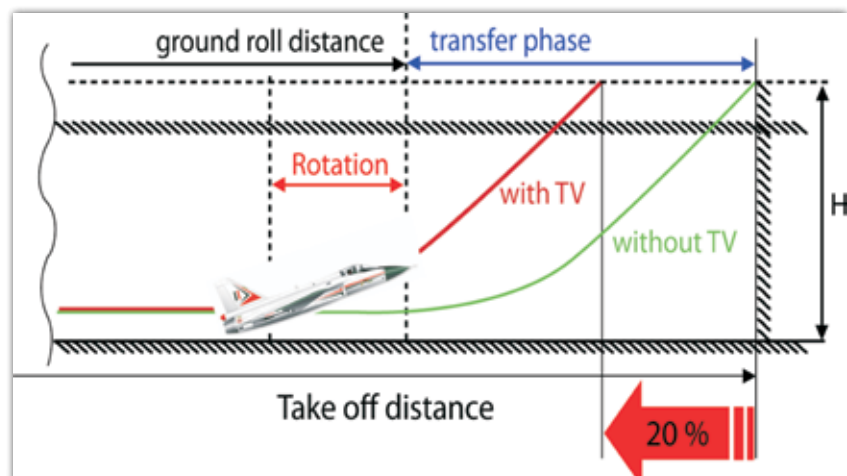
aerodynamically an excellent platform for this purpose. ELTA Systems and Airbus Military are now conducting engineering studies to integrate the mission suite, including AESA radar, among other sensors, into the aircraft. IAI/ELTA is a front-runner in the development of airborne radar systems and in particular AESA Radar for AEW&C aircraft. IAI/ELTA's current 3rd Generation AEW&C products, the Gulfstream G550 Conformal AEW&C and the Ilyushin IL-76 AWACS, are leaders in their respective categories, both in terms of performance and landmark design. The newest member of IAI/ELTA's family of AESA Radars is a rotating dome radar combining both true 360° AESA radar and IFF in a unique low weight 4th Generation design.

FLY (LCA) NAVY, FLY!



Enhancement through the EJ200 Thrust Vectoring Nozzle (TVN)

The initial TVN was designed to be fitted to and be compatible with the Eurojet EJ200 engine from the outset, with the Research and Development programme commencing in 1991 and progressing to the next phase of the Technology Demonstration Phase in 1995. This phase included the design, construction and test of a prototype Thrust Vectoring Nozzle. On satisfactory evaluation of the Sea Level Static (SLS) test results, an EJ200 engine with a full flight specification standard TVN undertook altitude tests for exploration of the flight envelope, vectoring efficiency, thermal validation, failure modes and high NPR vectoring.



Example LCA : improvement results mainly from the capability to rotate earlier.

The Thrust Vectoring Nozzle Baseline Concept includes

- Convergent-Divergent Axisymmetric Nozzle with multidirectional thrust vectoring.
- Thrust Vectoring through deflection of the divergent section and minimum engine distortion
- Four D.O.F.s: Throat Area (A8), Exit Area (A9), Pitch and Yaw Vectoring.
- Actuation System: Four Independent Actuators
- Basic Feature: Three Ring System
- Unique Strut Design for Smooth Movement of Petals: High deflection angles (20°+)

From the outset, the TVN can quickly be retrofitted to existing EJ200 engines and does not require a major modification programme.

Changes to be introduced to the EJ200 engine :

- 3D vectoring nozzle (pitch & yaw).
- Engine hydraulic system.
- DECMU SW (current DECMU has got already the HW provision to include TVN functionality).
- Some pipes and harnesses.
- Actuators (reducing the number and consequently the weight and better overall engine efficiency).
- No structural strengthening of

the engine is required with the current system to implement TVN reducing the impact onto the airframe.

- Engine mass increase about 40kg only.

The additional benefits of the EJ200 TVN are truly astounding and include :

- Superior Aircraft Performance & Handling Qualities at given Life Cycle Cost
 - 20% reduction in take-off distance
 - Increased AoA, pitch, yaw and roll authority
 - Increase Range / Weapon System Efficiency through trim drag reduction
- Additional Complementary Surface :
 - Control power independent of dynamic pressure and AoA and therefore good where aerodynamic efficiency is bad.
 - Support / replacement of the rudder in the yaw axis.
 - Support / replacement of the elevator in the pitch axis – this frees up the flap for roll application (aileron).
 - Support of the aileron by differential application of 2 nozzles and missing adversary rudder rolling moment.
 - Independent A8/A9 control (potential effects of optimum

divergence control on SFC, potential effects of optimum divergence control on max dry / max reheat thrust)

- Improved Agility:
 - AoA (including Poststall).
 - Roll rates / accelerations.
 - Maximum lift (especially in supersonic), minimum drag.
 - Increased pointing capability in the low speed regime.
- Increased operational envelope w.r.t. the low speed end.
- Improved departure resistance and improved safety figures.
- Increased control power margin for future configurations (especially A/S – heavy store configurations).
- Enhanced Safety / Survivability
 - Increase Redundancy – safety (peacetime) or war damage tolerance
 - Further risk reduction for low speed departure.

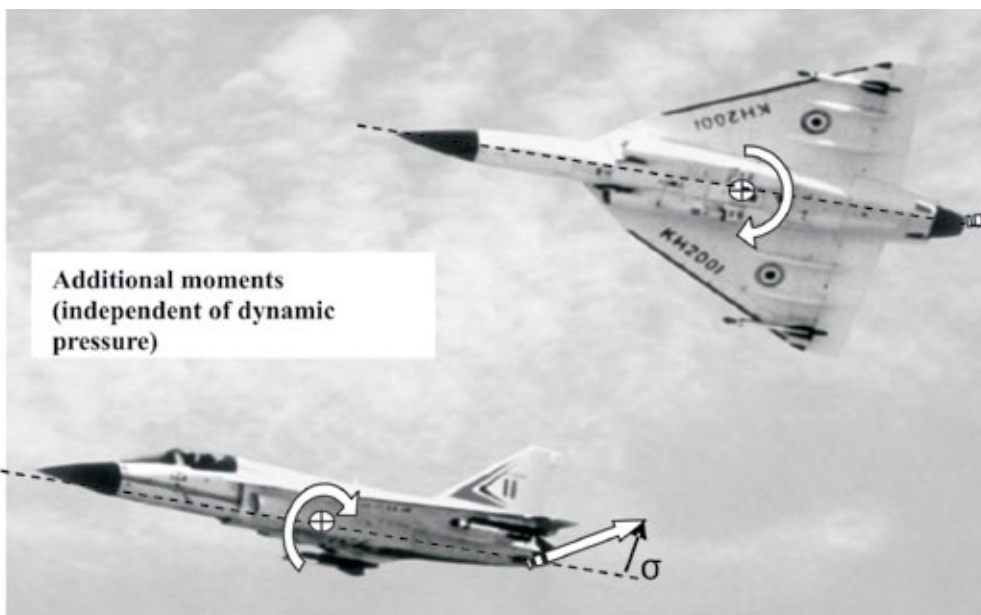
As a safety feature, the nozzle closes by internal forces for safe return.

- Reduced Life Cycle Cost at given AC performance
 - Fuel burn saving through SFC improvement
 - Increased component life through fully optimised propulsive efficiency (A8/A9)

The TVN will significantly improve take off and landing performance of the future LCA Navy, reducing the approach speed considerably, thereby lowering the landing loads while having a positive consequential impact on the future design of the marinised LCA airframe structure.

TVN provides an aircraft with control-power in the low dynamic pressure regime, where the control surfaces show reduced efficiency. This may be essential for the LCA Navy at take-off to optimise lift and free-up the aerodynamic control surfaces to maximum roll-control, with the benefit of providing a safer overall operation.

Eurojet are keen to share their futuristic technology with India and the special attributes of the Thrust Vectoring Nozzle (TVN) which would further enhance performance of the Tejas LCA, particularly the carrier-borne naval variant.



Thrust Vectoring Nozzle for the LCA Navy.

Yak-130 goes into service



The Russian Air Force training centre located in Borisoglebsk, in the Voronezh region received five of the new generation Yak-130 Combat Aircraft Trainers in April 2011, with a total of 62 aircraft on order. The first Yak-130 had completed its flight acceptance test in August 2009 and the first four of the 12 Yak-130s had been delivered to the Air Force Combat and Conversion Training Centre in Lipetsk in February 2010. A follow on agreement on major deliveries of the Yak-130 for the Russian Air Force is expected to be signed soon, the total demand estimated to be about 250-300 numbers.

The Yak-130 was designed to fulfill the Russian requirement for a new generation trainer supplanting the widely used Aero L-29/L-39s manufactured in the erstwhile Czechoslovakia. The Yak-130 is designed to provide appropriate lead-in experience for new generation of combat aircraft including the Su-30 and derivatives plus the MiG-29 and follow on variants.

The Yak-130's wing with high-lift devices, extensive root extensions and all-moveable stabiliser allows carefree handling and aerobatics in a wide angle-of-attack spectrum. The fly-by-wire flight control system permits changes in stability, simulating various aircraft types which is very useful for advance training purposes, while also being an active flight safety system.

The Irkut Corporation was responsible for the first foreign sale of the Yak-130, to the Algerian Air Force, whose first aircraft first flew in September 2009. Flying and technical personnel of the Algerian Air Force have been trained in Russia, Algeria set to receive the aircraft as well as type simulators by the end of 2011. In January 2010, the Libyan Air Force had ordered six of the Yak-130 aircraft and the Vietnamese Air Force has also ordered eight Yak-130s.

The Yak-130 has been developed by the Yakovlev Design Bureau which is a key part of the Irkut Corporation. Further development of the Yak-130 aircraft continues and "training spin" tests with automatic pull-out mode were recently carried out. Simulations of

both guided and conventional weaponry have been conducted and the aircraft has proved its capability to employ a whole range of weaponry including precision guided weapons. The Yak-130 is equipped with a 23 mm gun in a pod as also 500 kg bombs and the R-73 close combat missile. Range of the Yak-130 can be extended by an in-flight refuelling system.

Irkut have highlighted the growing interest in the Yak-130 from various international countries including those in the CIS, South and South-East Asia, Middle East and Latin America. The new generation combat trainer Yak-130 could well replicate the success of its Sukhoi Su-30 family of 4th Generation Combat Aircraft.



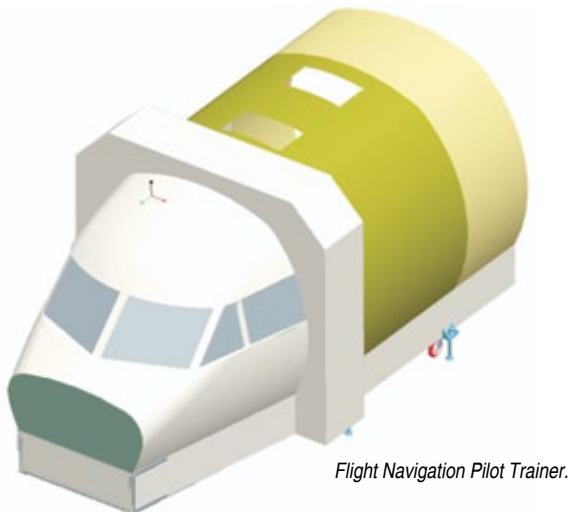
Company Profile

Taneja Aerospace and Aviation Ltd (TAAL)

Taneja Aerospace and Aviation Limited (TAAL), located at Hosur in Tamil Nadu, are aspiring to emerge as a leading player in the regime of design, development and manufacture of aero-structures, assemblies and even complete aircraft. Salil Taneja, Chairman TAAL is an engineer and entrepreneur himself and Chief Executive Officer SM Kapoor heads the Aircraft Manufacturing Complex which employs 403 aeronautical engineers and skilled workmen. The employees are encouraged to contribute towards the development of new processes and technologies to meet the customer requirements.

Over the years, TAAL has made sizeable investments to expand the infrastructure at Hosur. Today, the well-developed and elaborate infrastructure at the Aircraft Manufacturing Complex is duly supported by sound knowledge base. The factory at Hosur has a fully functional airfield with a 2287 metre runway (long enough for the Boeing 737 and A320 class of aircraft) and there are hangars, apron, air traffic control, emergency/firefighting vehicles and night landing facilities at the airfield.

A part from manufacturing complete aircraft for civilian use, the factory also produces aero-structures, conducts repair and modification functions. The product range of the company includes the six-seat twin-engine P68C Business Aircraft, Thorp T-211 Light Sport Aircraft, Nishant Unmanned Aerial Vehicle (UAV), NAL-designed all composite Hansa trainer aircraft, structures for the NAL-designed Saras aircraft, structural assemblies for Satellite Launch Vehicles for ISRO's Vikram Sarabhai Space Centre and assemblies for the advanced light helicopter (ALH), Light Combat aircraft (LCA) and HJT-36 intermediate jet trainer (IJT) built by Hindustan Aeronautics Limited (HAL). TAAL is the sole distributor and authorised maintenance agency in India for Cessna Business Jets.



Flight Navigation Pilot Trainer.

TAAL has recently completed the design, manufacture, qualification, trials and supply of CEMILAC-certified transmitter and receiver coils for heli-borne Time Domain Electromagnetic (TDEM) system including the tow mechanism. The transmitter and receiver coils are meant for detection of conductive deposits (minerals), 300 to 400 meters below the surface of the earth. The Antenna Housing made out of composite materials, is developed in two sizes of 16 meters and 22 meters diameter. This system is to be installed on the ALH. On 23 March 2010, the 16-meter diameter TDEM system was subjected to tests on the ground to ascertain its load bearing capability before its maiden flight, the first time that such an advanced system has been developed in the country by private sector.



MiG-21 simulator

TAAL is also working closely with CAE to fabricate mechanical & electrical parts of simulators including its Flight Navigation Pilot Trainer.

The company has established itself as one of the main subcontractors for the supply of components, assemblies and sub-assemblies for ALH and IJT. During 2009, the company was awarded the contract to manufacture the bottom structure for the ALH, the first completed in February 2010 and cleared by HAL and DGAQA. The Company has bulk orders for the manufacture of tail plane & elevator for the IJT. TAAL will also compete to manufacture assemblies for Su-30MKI, LCA, IJT and ALH in the future.

TAAL fabricated the mock-up of the Light Utility Helicopter (LUH), the latest helicopter in development at HAL, which was



LUH mock-up.

unveiled on 23 May 2010. The LUH mock-up was refurbished to newer requirements and then displayed at Aero India 2011.

TAAL has had long association with Aeronautical Development Establishment and has produced more than 20



The Rustom UAV.

airframes of the Nishant UAV. TAAL is looking to be selected as one of the key supplier for manufacturing new UAVs currently under development at ADE. With resources in place, TAAL has the capability and the wherewithal to manufacture 48 UAVs of the same class as Nishant. TAAL fabricated the engineering model of Rustom within 10 weeks from the date of order.

The company has the necessary resources and skills to carry out mechanical, electrical and avionics modifications on fixed and rotary wing aircraft. A number of avionic modifications have been developed and incorporated on defence and civil aircraft / helicopters. Products involving new technologies such as manufacturing complex titanium components, extruded section forming and many more have been successfully developed by TAAL.

Rear Admiral Sudhir Pillai, Flag Officer Naval Aviation (FONA) who visited TAAL on 11 August 2010 stated that, "Your skills are of great value to us and we look to cement greater partnerships." He, along with other senior officials went through all the work centres and appreciated the nature of work and number of innovative technologies being carried out by TAAL.



S.M. Kapoor, CEO explaining extruded section technology to Rear Admiral Sudhir Pillai, FONA.



C. Vijayakumar, Head of Composites with Rear Admiral Sudhir Pillai, showing fabrication of ALH armour panels.

TAAL has signed Memorandum of Understandings (MoU) with major global aerospace companies like Israel Aerospace Industries Limited, LAHAV Division, Israel Aerospace Industries Limited, Bedek Aviation Group, Eurocopter, Elta System Limited, Spirit Aerosystems (Europe) Limited, IRKUT Corporation.

The most recent MoU was signed with the IRKUT Corporation of Russia for the development and manufacture of micro and mini UAVs in India.

To meet with challenges in the future, TAAL is continually upgrading its infrastructure and adding new technologies. Some of the recent changes in the Aircraft Manufacturing Complex



P68C.



Throp T-211.

include the addition of a new autoclave, clean room and walk in chamber in the existing wet lay up facility, installation of stretch forming machine in the sheet metal shop, induction of drop type furnace in the heat treatment shop and the introduction of Sulphuric acid anodising.

Over the past two years TAAL has achieved an annual increase of 25 per cent in its turnover and with increasing number of customers and projects underway, the company expects continued growth rate in the coming years.

INDESEC 2011

Showcasing India's growing homeland security industry



Much evidence that the homeland security industry is growing rapidly was to be seen at INDESEC 2011, as thousands of government officials and industry professionals gathered to source new products and listen to leading figures in the homeland security sector.

Organised by *Informa India* in association with ASSOCHAM, and supported by the Ministry of Home Affairs and the Ministry of Micro, Small & Medium Enterprises, the three-day event brought together a mix of high-quality speakers and key exhibitors, providing visitors with an invaluable industry forum. *Vayu* was the supporting media.

There was great buzz surrounding the ASSOCHAM conference as speakers and visitors discussed issues shaping the future of homeland security. Chairman, Parliamentary Standing Committee on Home Affairs M.Venkaiah Naidu said "The government and industry should collaborate to upgrade and modernise security systems and communication

networks". The INDESEC was inaugurated by him, who also launched the 'Sherpa' light armoured vehicle from Shri Lakshmi Defence Solutions Limited. Also on display was the Drona MPV – and both vehicles attracted large crowds including senior government officials that visited the show.

During the second day, a panel of experts gave delegates a unique look into 'Effective Border Management' and 'Cyber Warfare'. KPS Gill spent time visiting the exhibitors at INDESEC and inaugurated Streit Groups vehicle.

KS Sham Kumar, General Manager of Advanced Micronics Devices Ltd stated, "We participated in INDESEC 2011 to display our skills and services in homeland security. I am pleased to advise that we experienced increased activity this year which has generated much interest in our services. We believe that participating in the exhibition will be beneficial to our exposure in the marketplace as INDESEC drew targeted, quality clientele."

India's security market is expected to double to \$16 billion (Rs 73,000 crore) by 2018, opening up vast opportunities for the private sector. INDESEC was attended by senior officials from the Ministry of Home Affairs, Ministry of Defence, Indian Coast Guard, Paramilitary Forces, State Home and Police departments, Armed Forces, Security Experts and Industry, apart from others.

Leading suppliers from across the homeland security industry presented their latest innovations at this event, which allowed visitors to source equipment, operation and security systems, new technology and services. Guru Prasath, Executive Director of *Informa India*, commented, "We are very happy with the quality of visitors and high ranking government officials who had spent considerable time with the participants, which underscores the importance of our event to the homeland security industry"

INDESEC 2012 will take place between 3–5 December 2012 at the Pragati Maidan, New Delhi.



KPS Gill, Former DG Punjab is briefed on new technologies and equipment





Arrowhead formation of HF-24 Maruts trailing national colours in smoke over Rajpath during Republic Day flypast.

On wings of the Wind Spirit

In June 2011, on 50th anniversary of the HF-24's first flight, there remain a number of senior air officers still in service whose log books record their service with the Marut. Senior most is Air Marshal 'Max' Mathews, presently C-in-C Strategic Forces Command, as also Air Marshal LK Malhotra with the IDS, Air Marshal Rakesh Jolly, SASO South Western Air Command, Air Marshal R Singh, SASO Training Command and Air Vice Marshal Ravi Burli, now Director LCA Induction with the Aeronautical Development Agency (ADA).

Air Marshal 'Max' Mathews joined No.10 Squadron equipped with the Marut in June 1974 at Jodhpur, which was then commanded by Wing Commander KK 'Joe' Bakshi, VrC, of 1971 Ops fame. As 'Max' recalls, Joe was an inspirational leader, a confident and true professional, with impeccable credentials. He set for me a path from which I never looked back. The Marut trainer was yet to be operationalised and so the initial dual checks were flown on the Hunter trainer, which I was familiar and comfortable with and it was not till 21 December 1974 that I made my first flight in the HF-24, as a junior Pilot Officer at that. The 30 minutes I spent with the Marut were exhilarating, exciting and tremendously satisfying. The aircraft handled beautifully, controls were responsive, something I was accustomed to from my Hunter flying days.

Regular flying of Maruts with No.10 Squadron sharpened my flying skills and soon I was progressing into other phases like low level flying, close formation and tactical flying. I progressed through the syllabus rather quickly and achieved my fully ops status in only six months, owing to the singular minded concentration of flying with the 'Daggers'. The cockpit visibility of the Marut was excellent as were the low flying characteristics. Even in the sizzling summers of Thar desert, the Marut handled like a gazelle at low level and over the bombing ranges. There was always healthy competitors spirit amongst the other Marut Squadrons at Jodhpur which propelled us to push the envelope even further specially in air to ground exercises.

On 20 April 1976 I was awarded the 'W' instrument rating which was a special achievement but after having flown all possible missions on the HF-24 and with 332 hours logged on this beautiful machine, time had come to move on and I was posted out for conversion on the MiG-21, but I will always be proud of having flown the Marut.

Air Vice Marshal Ravi Burli recalls that: Ours was the 117 Pilots Course and the class of '77 at the OCU. At the end of our training at Kalaikunda, six of us were assigned to HF-24s, the rest went on to MiG-21s, Gnats and a few to Su-7s. We too had

aspired to fly the MiG-21, but denied, felt like walls coming crashing down on our aviation dreams. But as my compatriots and I rode the train to Jodhpur, then home of all three HF-24 squadrons (Nos.10, 31 and 220), there was nothing to even remotely suggest the falsehood of our perceptions as events unfolding over the next three years amply testified.

At No.32 Wing Jodhpur, the initial welcome was no different to the experiences of young pilots in any Air Force. It was terse, brusque and dismissive. No.1 Ops Group's 'Exercise Winter Desert' was on. Most of us were promptly banished to the nether world of Base Operations. The luckiest were assigned paltry jobs within the Squadron (Tea Club, Author Book etc), but that was only for a short while before much more salutary events began to unfold, and with speed. Aircraft familiarisation and ground school lectures got underway and by the middle of January 1978, less than a month after our arrival in Jodhpur, we were in cockpits of the HF-24 and underway with conversion flying and all the rest of it thereafter. I did my first flight in Marut (D-1214) on 23 January 1978.

The HF-24 Marut not only looked angelic, she felt good in the air. Light of control, highly responsive, she was a mean dervish at low level and just as

well, for that was her home turf. All disgruntlement vanished, here were the trappings of true beauty, of looks and feel, and we felt privileged. The Marut had a life and character of her own which was revered and respected.

The Marut had a fine operational track record which was inspiring. Flying from desert FBSUs, HF-24s had participated in the 1971 war with distinction. Senior colleagues who had flown her through operations in the western theatre, told us how the Marut had been put through its paces in close air support and interdiction missions, at which it had performed exceedingly well. With tasks that took them to as far as Hyderabad Sind and Nawabshah, Maruts bombed the runways and strafed installations with cannon, such counter air missions denying usage to the PAF. It was inspirational stuff.

'In the weeds' flying was literally what we were taught and learnt as Marut pilots. The C2A compass was old world stuff, lifted straight off the Kiran cockpit as it were. Despite enthusiastic and often sweaty compass swings at the RW ends on hot summer afternoons, the compass still came away with considerable errors as one could only



Portrait of a classic : HAL HF-24 Marut Mk.I (D-1225) at Jodhpur.

expect. Microscopic 2 degree compass markings did not make life any better in the air. Yet there was simply no quarter given nor asked, not for making even turning points, leave alone TsOT, outside +/- 2 seconds of planned time. That the Marut packed sizeable punch with weaponry comprising cannon, rockets and bombs, aimed through the exceptionally good ISIS sight, was the stuff legends were made of and which we grew up respecting. Bad weapon scores were openly scorned and just not considered acceptable.

The HF-24's twin Orpheus 703 engines were smooth and even though clearly underpowered (enough is said about the depressing powerplant story of the Marut), when beyond 250 knots following take-off, the aircraft was wonderful even with external stores. And despite all the tales about its laborious "have a cup of tea" long take-off roll, there would perhaps have only been that rare occasion during her entire operational tour of duty when she let her pilot down in critical phases of flight. In tactical manoeuvres, the HF-24 bled airspeed all right but literally 'turned on its tail'.

At tactical speeds, the Marut could easily leave behind an even mildly erring MiG-21 as she flashed to 550 knots in a blink on the getaway. To make matters worse for air defenders (and some air defenders still vouch for that!) her desert camouflage made her all but impossible to spot, especially against the golden desert sands of Rajasthan. There were instances when AD aircraft wove wildly above her shadow against the desert sands, unable to pick up the real aircraft. So in deference to her grace and abilities, there was always a caress under her 'chin' that preceded pre-flight externals by her doting pilots. Our engineers, we know, also loved her equally, perhaps somewhat more because she gave them something substantial to exercise their engineering skills on. Keeping the Marut airworthy was no simple task! So for them it was always earlier than the earliest mornings and the latest of the late evenings.

But it was not just about the peripatetic existence. There were the fleet fun moments and as many as one could reasonably expect to keep the soul ticking in the most demanding of life's adversities. No night flying and hot desert afternoons meant time for camaraderie, bonding, blaring music, the incessant bounces on the hapless married lot, and motor bike borne night forays to a cringing Kashmiri Dhaba usually after closing time. All three squadrons conspired for high levels of unity at and away from work.

Then the rib-ticklers! Who can forget the instance of a young Marut pilot straining against the throttles to keep close tactical position with his leader oblivious that one of his engines had been inadvertently switched off in the air, and the stern supervisory remonstrations hopelessly unhelpful till the beginning of the "relax" phase when the self-induced malady was detected and set right through a prompt relight. We also know of a certain young, big, dark and burly instructor who was always at hand to offer services of trainer captaincy for mandatory sorties to be flown by squadron rookies prior to periods of leave of absence etc. Of course that came at a small price - that of their motorcycles left behind in his care. The motor cycle would then generally end up missing on the 'keen' pilot's return. An alarmed and desperate search for the only prized possession by the poor soul customarily ended in it being traced, desolate and derelict, at some God forsaken place, usually as far removed as Kailana, and generally where the rookie's own precious fuel ran out on the certain trainer captain!

Flying and maintaining was not all what the Marut was about. For me personally, and I feel sure I speak for the others too, it was also so much about the 'HF-24 culture' that held sway during the 3 years spent in the fleet divided in tenure equally between No.10 Squadron (Daggers) and then No. 31 Squadron (Lions), which set the tone for the long after-life in the IAF. Impeccable squadron commanders - true role models who drive one's service life to this day - able and fastidious flight commanders and the group of excellent professionals as well as fun loving seniors and colleagues, all made for that extraordinary cocktail of experiences and early service life that not just merely existed in the flight extraordinaire that the Marut afforded, but on terra firma, as it permeated and reinforced the myriad inexplicable nooks and crannies of Squadron and Service existence.

Three years on, my last HF-24 Marut flight was in D-1205 on 26 December 1980. At end of that day, the Marut experience contributed well for a nicely rounded exposure of the IAF at its best, everything that it has always stood for since its inception.

When the Maruts were phased out

The first Squadron with the HF-24 Marut, No.10 was also the first to phase out the type from its inventory after some 14 years of service. The first Indian-designed and built combat aircraft had a steady, if not spectacular, career and was much liked by its pilots for its aerodynamic attractiveness and handling qualities. The *Daggers* had honed the Marut into a fine weapon system, taking part in various air exercises and gunnery meets, winning trophies for the 'Best Marut Squadron' in 1977 and being declared 'Squadron of the Year' in 1978 in the transonic fighter group for maximum flying with a zero accident record. The first two-seat Marut operational trainers were received in January 1975, supplanting the faithful Hunter trainer. A third Marut squadron, No. 31, had been formed in early 1974. In May 1975, No.10 Squadron took on the additional responsibility of becoming a type-training squadron for the HF-24, continuing this dual role until 1 August 1980, when its Maruts were allocated to the other squadrons in preparation for No.10's conversion to a new, third-generation tactical strike aircraft, the variable-sweep MiG-23BN fighter from the Soviet Union.

Earlier, Wing Commander KK 'Joe' Bakshi had taken the reins of the *Daggers* on 1 February 1974, in turn being succeeded by Wing Commander CKK 'Mini' Menon on 8 January 1977 and then Wing Commander DS 'Dinky' Jatar on 11 December 1979. The squadron lineup in 1976 had Wing Commander KK Bakshi as CO, Squadron Leaders Iqbal Singh Bindra (who had shot down a F-104 in 1971 while flying MiG-21s in escort to Maruts) and CS Dhillon as flight commanders, with a total of 27 officers on strength including the 'spanners'.

The *Daggers* bade farewell to Maruts in August 1980 and remained in suspended animation for the next four months, even as eight pilots, nine engineering officers and 55 airmen left for the Soviet Union for conversion training on the MiG-23 swing-wing fighter and its advanced nav-attack systems. Arriving at Moscow on 1 September 1980, the teams flew on to

Frunze and then by train to Lugovaya in the Kazakhstan Republic on begin training, which was completed by the end of December 1980.

No.10 Squadron was reformed on 1 January 1981 at Jodhpur, commanded by Wing Commander RL Bamzai, and the first MiG-23BN aircraft was handed over at Ozar (Nasik) on 20 January. True to tradition, the top brass wanted the IAF's latest acquisition to be publicly displayed on Republic Day (only six days later), so the first of the 'swingers' was flown over the capital as required. The first MiG-23BN was flown to Jodhpur on 11 March, ceremoniously escorted in by four Maruts. By August, enough MiG-23BNs, and its trainer variants, were available for the *Daggers* to start converting their old comrades-in-flight, the *Desert Tigers* (No.220 Squadron), to the swing-wing fighters as well.



Wg Cdr Jimmy Bhatia, CO No.220 Squadron taxiing in D-1262 at Jaisalmer during Exercise 'Hifazat II' in the summer of 1981.

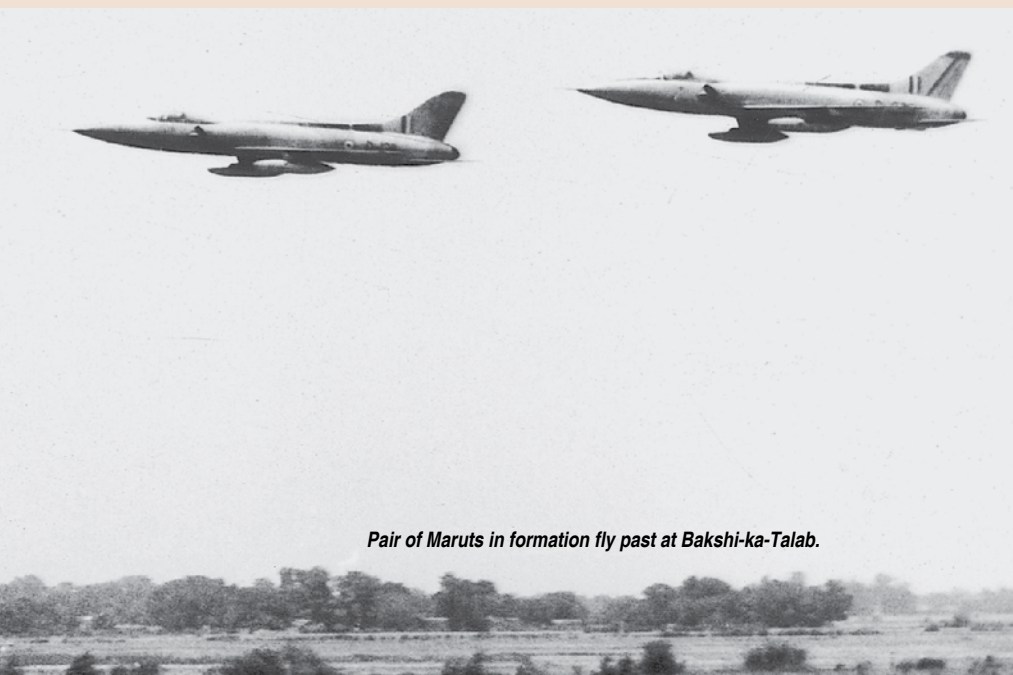


Marut Trainer D-1604 before delivery to Jodhpur.

The CO of No.220 Squadron at this time was Wing Commander VK 'Jimmy' Bhatia VrC who after flying Sukhoi Su-7s in the December 1971 war and awarded the Vir Chakra, was posted to Jodhpur in January 1981. The 'Desert Tigers' were still equipped with the HF-24 Marut at the time. As Jimmy writes : *In truth, I did not feel exactly elated as it was not under the best of circumstances that I was asked to take over No. 220 Squadron in January 1981. Firstly, it was equipped with the indigenous and so-called trouble-prone HF-24 Marut aircraft on which I had no previous experience and secondly, the Squadron had gone through a bad patch having suffered two fatal accidents in a short span of time. But the way events unfolded in the next few months not only gave me immense satisfaction in commanding the unit but in also being fortunate enough to fly (with all its limitations) this most 'lovable' fighter, the HF-24 Marut.*



D-1208 which was the first and the last HF-24 Marut flown by Wg Cdr Jimmy Bhatia when No.220 Squadron was operating the type.



Pair of Maruts in formation fly past at Bakshi-ka-Talab.

When I assumed command of No. 220 Squadron, the 'Desert Tigers' were going through a somewhat difficult period of low morale and poor serviceability, but I could see all the inherent qualities and potential for the unit to emerge as a capable and competent fighting force. This could be achieved by improving aircraft availability and generating more flying hours, for the squadron pilots, especially the younger lot. I also set about gaining the necessary experience on the aircraft as soon as possible. Two duals with Sqn. Ldr. Bajwa, the younger but more experienced of the two Flight Commanders, and I was airborne on my first solo trip which my log book reveals to be on D-1208 on 5 February 1981.

Following an abridged syllabus after my initial conversion, I fast-tracked the operational flying training to attain the 'Fully Ops' status within a period of four months. Under normal circumstances, it would have taken between 1½ and 2 years to do the same. Flying had generally picked up in the Squadron due to appreciable improvement in the serviceability and greater availability of aircraft to rotate maintenance/rectification activities. Creation of a homogeneous atmosphere also helped a great deal to achieve a focussed approach which led to the Squadron regaining its robust morale, not to speak of the operational preparedness endorsed by the DASI on their re-inspection visit.

I began to love this fabulous flying machine despite its eccentricities and some serious shortcomings. It's long area-ruled fuselage and swept back saw-toothed

thin wings made the airframe sleek that once airborne, it could not only achieve formidable speed exceeding 550 kts, but even with one engine on idle power, it could happily maintain 420 kts or so at low level. Its main problem was getting airborne with sufficient safety margins. In the desert summer of Jodhpur, where all the Marut squadrons were based, with close to all up weights, the HF-24 virtually ate up the entire 9,000 ft runway before it could attain the desired unstick speed, practically leaving no safety margins. Even after take-off, the initial acceleration was quite sluggish, with pilots dreading having to cope with a single engine situation. But once the aircraft attained a respectable speed in excess of 200 kts, it suddenly came into its own and could match most contemporary jet fighters of the era. Highly manoeuvrable with full hydraulic-powered controls, it could also be flown in manual for a safe recovery in an emergent situation. The other outstanding attribute of the aircraft was its ergonomically designed cockpit and excellent airconditioning system.

After taxiing out on a hot day, one waited to get airborne as quickly as possible to be able to switch on the air conditioning and enjoy the cool air flowing out of the louvers. The cockpit environment was quite a contrast to the Russian fighters such as MiG-21s and Su-7s where with the almost non-existent cockpit cooling, one could lose up to 2 kg of weight after a 45-minute low level sortie due to severe dehydration. It was little wonder that Marut, especially its two-seat trainer version, earned the most deserving sobriquet 'The Flying Cadillac.'

There were times when the demonic powers of the desert rose to spoil the party. I vividly recall the fury of a sand-storm forcing our 4-aircraft strike formation to divert to Jaisalmer in the nick of time before the base was hit by a wall of sand with tsunamic ferocity, bringing visibility down to zero within a matter of minutes. Fortunately, it was a passing phenomenon and after about an hour weather began to improve. The tarmac at Jaisalmer was baking in the post-noon sun in May with temperature shooting past 50 deg Celsius. So hot were

the cockpits that some CBs were popping out of their sockets. For instance, when cleared to return to home base Jodhpur, I discovered that the fuel pump CB in the cockpit was refusing to go in even after repeated attempts to coax it down. Luckily, the Orpheus 703 had reasonably good capability for the aircraft to get airborne on gravity feed. Rest of the work was done by the legendary air-conditioning system with the CB happily deciding to stay home by the time we crossed 5,000 ft.

My tryst with the exotic Marut however was short-lived as the 'Desert Tigers' had been earmarked to be the second squadron to equip with the newly acquired MiG-23BN swing-wing strike aircraft, after the 'Daggers' (No.10 Squadron). My last flight was again, on D-1208 on 13 June 1981 and I had my first flight in a MiG-23BN on 26 August 1981. The tarmac at Jodhpur began to change colours from the gleaming natural silver of the HF-24s to the desert camouflage of the BNs. By July end, the last Marut (ironically a brand new trainer, with just the ferry hours from Bangalore) flew out to the storage depot at Kanpur, never to fly again.

The last of the Marut Squadrons, No.31 (Lions) continued to operate the type over the next two years, the last Commanding Officer being Wing Commander DS 'Dinky' Jatar, younger brother of 'Micky' Jatar who had commanded No.220 Squadron *Desert Tigers*.

No.31 Squadron then followed the lead of the earlier two HF-24 squadrons and also converted to the MiG-23BN in March 1983, at Air Force Station Halwara, the first Commanding Officer with the swing-wing fighter being Wing Commander MS Grewal, VrC.

However, the HF-24 served with yet another Indian Air Force unit, which was the 'Marut Flight' of the Air Defence College at Bakshi-ka-Talab (near Lucknow). A short backgrounder is in order.

When air defence radars were inducted in the Indian Air Force during the mid-1950s it was necessary to train a new cadre of fighter controllers, the first officers for which were trained in the UK, including GK John, Randhir Singh and SV Gole (some of whom rose to be Air Marshals). On 15 September 1958, Wg Cdr (later Air Marshal) Jafar Zaheer



The AD Flight had a large number of HF-24 Maruts in its inventory, most of them retaining Squadron markings from the past.



Included in the Marut Flight inventory were several Mk.II trainers, including D-1704.



Two HF-24 Maruts line up for take off at Bakshi-ka-Talab: note 'Lion' insignia and tail slash of No.31 Squadron.

became the first CO of the newly established control and reporting (C&R) School at Jodhpur which in turn had a flying element of six Vampire fighters as part of the School. The C & R School was designated as No.121 Squadron during the December 1971 operations and operated with distinction under the command of then Flt Lt Manjit Singh Sekhon (later Air Marshal).

In October 1972, the C&R School moved from Jodhpur to Air Force Station Memaura, south of the city of Lucknow while the Vampires were phased out in 1975, and replaced by HF-24 Maruts operating from Bakshi-ka-Talab (8 C&MU) which is north of Lucknow. The C&R School was upgraded and re-designated as the Air Defence College (ADC) on 15 March 1980 which has continued to conduct various courses including the Fighter Controllers' Course, Senior Sector Controllers' Course, Naval Officers' Orientation Course and others.

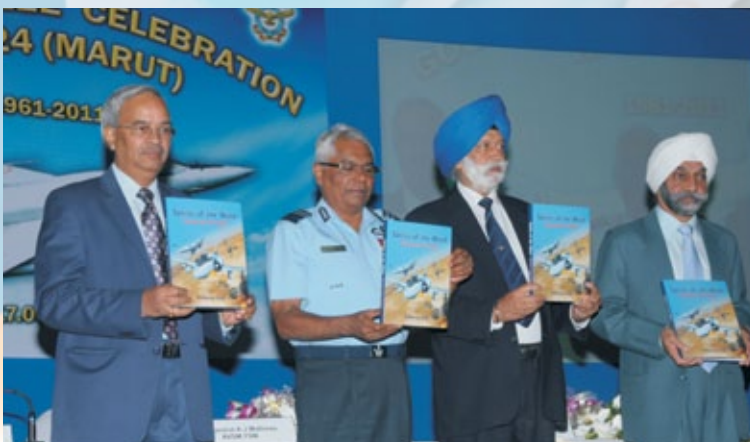
With the frontline HF-24 Marut squadrons being re-equipped with MiG-23BNs, an increasing number of aircraft were made available to the ADC at Bakshi-ka-Talab, whose last CO, while still equipped with the HF-24, was Gp Capt Aditya Vikram Pethia who is on record as having made the last 'official' flight of a Marut in IAF inventory on 31 March 1983. This was D-1205 which Pethia thereafter ferried to Palam for permanent display at the Air Force Museum there. (In fact he flew D-1205 one last time on 8 October 1983, at the Air Force Day parade).

[Extract from 'Spirits of the Wind' by Pushpinder Singh]

Marking 50 years of the HF-24 Marut



Lighting the ceremonial lamp are (right to left) Air Marshal KJ Mathews, Sqn Ldr (retd) Baldev Singh and NC Agarwal.



Over 100 veterans ('Marutians') gathered at Bangalore during the weekend 16-18 June 2011 following the invitation from Hindustan Aeronautics Limited to mark the Golden Jubilee of the first flight of HAL's first indigenously designed and built combat aircraft.

First flight of the prototype HF-24 (BR-462) took place at Bangalore on 17 June 1961 and the programme continued thereafter with exactly 147 fighters and tandem-seating trainers built, which served with three frontline squadrons (Nos 10, 31, 220) of the IAF in war and peace. The HF-24 was phased out, most feel prematurely, in 1983, the last IAF unit to operate the Marut being the AD Flight of the Air Defence College at Bakshi ka Talab.

Apart from the formal functions and festivities that marked this special event, the definitive book on the HF-24 Marut (*Spirits of the Wind*) by Pushpinder Singh was ceremoniously released by the Chief Guest, Air Marshal KJ Mathews on the morning of 17 June at the HAL Convention Hall, Bangalore. The significant event was hosted by Mr NC Agarwal, then Director Design & Development and Sqn Ldr (retd) Baldev Singh CTP and Offg. Managing Director, Bangalore Complex, HAL. Air Vice Marshal Ajit Singh Lamba was the master of ceremonies on the morning of 17 June when many legendary Marut pioneers spoke to an enchanted and specially receptive audience.

Releasing the book 'Spirits of the Wind': (left to right) NC Agarwal, Air Marshal KJ Mathews, Pushpinder Singh and Sqn Ldr (retd) Baldev Singh.



Marutians in front of Marut Mk IT (D-1695) at the HAL Heritage Centre, Bangalore.

25 Years back

From Vayu Aerospace Review Issue II/1986

First HAL-built Dornier 228s for Vayudoot

On 22 March 1986 at Chakeri airfield, HAL Kanpur Division handed over the first of five HAL-built Dornier 228 light transport aircraft (VS-EJN) to Vayudoot, the regional airline. These first five HAL-Dornier 228s for Vayudoot are to be followed by HAL-Dornier 228s for the Indian Air Force, Coast Guard and other operators in India and abroad.

Rajiv Gandhi compliments IAF

The Prime Minister Rajiv Gandhi complimented the Indian Air Force on its "improved performance" commending the improvement in flight safety since the last Commanders' Conference. The Prime Minister called for a long-term defence plan which could be dovetailed into the country's foreign policy and development programmes. "The country today was turning the corner in its development and there was need for bold and imaginative defence research, looking well ahead into the next 15 or 20 years". He praised the Light Combat Aircraft (LCA) project and emphasised the need for many more such projects to enable India to stand on its own legs in the coming decades. A strong push was needed in the direction of greater indigenisation.

HAL Korwa inaugurated

HAL's Korwa Division was formally inaugurated by Prime Minister Rajiv Gandhi on 3 April 1986. The Korwa Division is part of HAL's Accessories Complex and situated in Amethi district to manufacture advanced navigational and other systems and avionics under a series of licences from France and Britain and include laser-based ranger and target seekers, Head Up Displays (HUD), Weapon Aiming Computers (WAC), moving map and electronic displays, inertial navigation and attack systems, Flight Data Recorders and auto stabilising systems.

HMS 'Hermes' for India

A formal agreement for the sale of HMS 'Hermes' is expected to be signed during April 1986, and the aircraft carrier delivered to the Indian Navy in spring next year. The 'Hermes' will be bought at the base price of £ 15 million and extensively refurbished at £60 million, so as to make the carrier ride through to the 21st century.

Built in 1959, the HMS 'Hermes' actively participated in the 1982 Falkland crisis and has still got nearly 30 years of operational life. 'Hermes' has a displacement of 28,700 tonnes when operational, and has a complement of 150 officers and 1,300 sailors, the equipment which the Indian Navy is probably going to put on the 'Hermes' will include Sea Harrier VTOL fighters and Sea King helicopters for anti-submarine warfare.

Tata Committee Report by June 1986

The various Committees set up by the GOI to study transport needs of the country at the turn of the century will be submitting their reports beginning June 1986. In this context the Tata Committee will cover the Aviation industry. The Airlines and HAL are represented on the Tata committee through their Chief Executives and the Planning Commission through their Advisor Transport. The Planning Commission have also

retained the services of an aviation consultant to assist them in their deliberation and preparation of the report.

HCI to get Dauphin helicopters

The Helicopter Corporation of India has purchased 27 Aerospatiale SA365 Dauphin helicopters. The deal was signed on 31 March 1986 between HCI and France, the purchase financed out of French government credit, worth Rs 82 crores. India will get 6 helicopters 'free' and the rest under a special price of Rs 1.99 crores per helicopter. The supply of helicopters along with related spares, engines and support equipment is under soft credit terms by the French and is considered to be an attractive techno-economic package.

A320s for Indian Airlines

Indian Airlines have signed an agreement with Airbus Industrie for 19 A320 aircraft. The deal, worth Rs 1,238 crores, brings India the modern fuel efficient 160 seater shorthaul jet aircraft capable of operating from most current airports in India. The agreement of purchase was signed by Capt K Chadha, MD Indian Airlines, and Ranjit Jayarathanam, Vice President of Airbus Industrie. The A320 will enter the IA fleet by mid-1989 and the total delivery of aircraft will be over by March 1990. Till the time A320s are inducted, the IA will fulfil its traffic demands by leasing Boeing 737s and A300s from Airbus Industrie. Rolls-Royce, one of the major partners in IAE, said in London on 4 April that, in addition to supplying 38 of its V2500 jet engines for the 19 Indian Airbuses, the consortium had signed a support and maintenance contract that would involve delivery of nine spare engines, help in training airline personnel and provision of initial spare parts, equipment and tooling. The airline also has options on a further 12 aircraft.

F-404 engines for LCA ?

In an attempt to improve Indo-American relations, the United States has reportedly granted licence to India for the General Electric F-404 engines for the Indian Light Combat Aircraft (LCA). The deal envisages a further transfer of high-tech equipment to India. Meanwhile, work on the indigenous GTX-14U engine is continuing at the Gas Turbine Research Establishment (GTRE), Bangalore. This flat-rated turbojet has been run at 75% rpm for 50 hours on a testbed. About 10 prototypes are estimated to be developed by 1990 and delivery of production engines by 1993-94. The fully developed version (GTX-35) is envisaged to have a thrust of 10,000 lbs and in this context, GTRE personnel have already tested an afterburner which provides an additional thrust of 5,000 lbs.

Britain's new basic trainer aircraft

The Short Tucano, Garrett-powered version of the Brazilian Tucano, is going to be the new-generation basic trainer aircraft for the RAF. The RAF has ordered 130 of these aircraft, costing about £ 120 million, to replace its ageing fleet of Jet Provosts. The Short Tucano will have its own special cockpit features, such as single-lever engine propeller control, staggered tandem seating, ejection-seats and advanced avionics. The cockpit environment is similar to that of the RAF's Hawk advanced jet trainer, to which the Tucano-trained pilots will graduate. Short Brothers will build the Tucano at their Belfast plant under a partnership deal with Embraer. Aircraft deliveries will start early in 1987.

GEC Avionics for China

GEC Avionics (UK), manufacturers of electronic equipment for aircraft have been awarded a £ 30 million contract to supply equipment for China's J-7 fighter. The order, placed by China's National Aerotechnology Import and Export Corporation, is for specially designed instrumentation for the aircraft and includes radar, head-up display, VHF/UHF communications equipment, and air data computers. GEC had received orders worth more than £ 1 billion during the first two weeks of 1986. These include a £ 250 million contract placed with GEC Turbine Generators for power generation equipment in China, a £ 400 million order from the British Ministry of Defence for lightweight torpedoes, and a £ 130 million command and control defence system for "a Middle East country."

Planets on the loose

When were you last bewildered driving in Delhi's traffic rush hour? You would feel much better to learn that this is 'written in the stars'! Astronomers have found a clutch of planets that wander without direction through interstellar space. The discovery of the objects, which do not orbit any star, could help scientists to better understand how planetary systems form and evolve. The many free-floating planets are thousands of light years moving in the direction of the central bulge of the Milky Way, towards the constellation of Sagittarius.

Down to earth at any time, there are thousands of free moving vehicles heading towards Connaught Place.



Tiger, Tiger

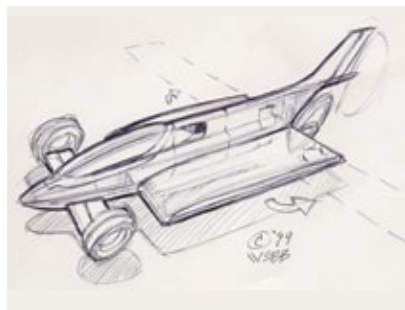
It was summer madness: a life size toy tiger in Hampshire in England sparked a major operation involving armed officers and a helicopter which was scrambled and a golf course cleared for its landing after police arrived at the site. Armed police then came in just in case the tiger got too close even as animal handlers from the nearby Zoo arrived with tranquilisers. As the police spokeswoman said: "After a brief stalk through the savannah, we realized the tiger was not moving... the tiger then rolled over owing to a breeze and it became obvious this was a stuffed life-size toy."

Meow!

Non Scheduled Air Car

Incensed by not being allowed to board a scheduled flight from Delhi to Ahmedabad, inspite of having a valid ticket, an NRI businessman not only sued the airline for Rs 21 crores, but also swore that he would find a way to ensure this never happened again. He then investigated and invested in the world's first commercial flying car, built in Massachusetts, USA. The car with foldable wings, had made its first flight on 5 March 2009 and has recently got clearance from the US Federal Aviation Administration. The two-seater vehicle falls in the category of 'light aircraft', fits into a home garage and runs on unleaded petrol, flying at 115 mph for up to 450 miles.

The NRI now has his flying car but still needs permissions from various aviation and security agencies. Meanwhile, he has started taking flying lessons and hopes to be the first Indian to make such breakthrough.



Not the real thing (Drawn by Robert Webb)

Quit Me Not!

Travails of the Maharaja continue, with the debt-ridden national carrier now delaying payment of salaries. Pilots are quitting since they have not received their dues for many months and banks could well freeze accounts to start selling off assets pledged for securing earlier loans. Despite this, Air India plan to start a low cost carrier in the domestic sector



with emphasis on on-time performance and lower fares. However, as an ex-Air India Captain said "you can't keep spending taxpayers' money to bail out a completely mismanaged show".

Yes, we can!

Beat the Heat

Inspired by the spectre of global warming, a Japanese company has developed a jacket with an inbuilt air-conditioning system. This contains two electric fans powered by a lithium-ion battery pack which lasts for 11 hours on a single charge, requiring significantly less energy than conventional air-conditioning.

President of the Japanese company said that "personal air-conditioning came about as an idea as we don't need to cool the entire room, just as long as people in it feel cool".

The air conditioning industry better watch it!

Hello and Good Bye

Very nice, but what is the picture of Wapitis at Miranshah in the North West Frontier Province doing in the Indian Defence Minister's Secretariat? True,



The Defence Minister, A. K. Antony presenting a memento to the outgoing Defence Secretary, Pradeep Kumar, in New Delhi on 13 July 2011. (Press Information Bureau)

the NWFP was once part of undivided India and the Wapitis were of the Indian Air Force's No.1 Squadron, but the painting is replicated from that done by the famous Pakistan Air Force artist Gp Capt Hussaini. In fact Hussaini's paintings of Wapitis (amongst others) also hang in the office of the PAF Air Chief.

Very nice, of course!

Afterburner

Saab Gripen

Dassault