

VAYU

VI/2011

Aerospace & Defence Review



**Transformation of
Indian Naval Aviation**

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The Rising Sun

21st Century Great Game

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Cover : The first Boeing P-8I for the Indian Navy (IN 320) in flight over the extensive waters near Seattle in Washington State (photo Boeing).

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VI/2011

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Premjit Singh

GENERAL MANAGER (UK)

Avi S. Sodhi

e-mail: avi@vayu-aerospace.com



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THE SOCIETY FOR AEROSPACE STUDIES

D-43, Sujan Singh Park,

New Delhi 110 003 India

Tel: +91 11 24617234

Fax: +91 11 24628615

e-mail: vayuaerospace@lycos.com

e-mail: vayu@vayuaerospace.in

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The Rising Sun

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74 There are clear objectives for multilateral and bilateral exercises with other friendly navies, writes Brigadier Gurmeet S Kanwal, Director CLAWS. Defence diplomacy and maritime cooperation are potent instruments for promoting national interests.

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A Constellation of Missiles

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124 Vayu's editor in the UK, Richard Gardner reports on some of the key air-related developments at the Defence & Security Equipment International Exhibition 2011. Also, Vayu's review with Gerald Howarth, Minister for International Security Strategy, UK MoD who looked at the "long history of Anglo-Indian partnerships".

Beginning a new series 'From the Cockpit' by Cdr Bill S Hothi ('Marut Memories')

Also:

The USS Bush sails out (by Joris van Boven) : Stepping up of Indo-Russian Defence Relationships : The 'Blue-Green' Navy (by Carlo Kuit and Paul Kievit) : Next Generation Electronic Warfare Systems (Electronica).

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Standing up to China

Not bothering about China's unjustifiable claims over the South China Sea waters, Vietnam has asked India to go ahead with the arrangement between the two countries for hydrocarbons exploration in two Vietnamese blocks in the area. China had told India to avoid executing any project in the disputed waters, keeping in view Beijing's sensibilities. India and Vietnam have, however, refused to buy the Chinese argument, citing the 1982 UN Convention on the Law of the Sea. Yet it is not easy for India's ONGC Videsh and the Vietnam National Oil and Gas Group to continue their cooperation in implementing the oil and gas exploration project. The US, too, has entered the scene, describing the disputed waters as being a matter of its national interest. Interestingly, the US and the Philippines have sided with Vietnam, creating more difficulties for China. The situation may take a turn for the worse in the times to come, as the disputed sea waters, having some strategically located islands, are believed to have precious natural resources.

India must use the opportunity to expose Chinese expansionist designs with the help of other Asian nations. The Chinese claims over the entire South China Sea-Vietnam calls it the East Sea and the Philippines the West Philippines Sea-have never been accepted by the entire international community. Some time ago China tried to gain UN recognition of its rights over the disputed sea waters by presenting a map to the UN Secretary-General. But it had to cut a sorry figure as four of the 10 ASEAN (Association of South-East Asian Nations) members, including Vietnam, falsified the Chinese claims. The issue also came up for discussion at the Asian Security Summit in Singapore in June when China failed to get adequate support.

Most countries in East Asia have been feeling uneasy because of the Chinese bullying behaviour for some time. This is the time for aggressive Indian diplomacy to make China realise that it cannot subjugate the smaller nations in the region despite the massive economic and military might it has acquired. Today's multipolar world calls for a cooperative approach, respecting the sentiments of one and all.

From: The Tribune

Forging shining paths

India is hosting the leaders of Myanmar and Vietnam underscoring once again the seriousness with which it is pursuing its 'Look East' policy, as it forges close economic and security ties with two significant nations

in South East Asia and counters China's penetration of its own neighbourhood. The 'Look East' policy, initiated by PV Narasimha Rao, is now the cornerstone of India's engagement with the world's most economically dynamic region. Prime Minister Manmohan Singh has made it clear that his government's foreign-policy priority will be East and South East Asia, poised for sustained growth in the 21st century.

India's 'Look East' Policy was explicitly designed to initiate New Delhi's re-engagement with East Asia after years of neglect. Over the years, India has come to have extensive economic and trade linkages with the region even as there has also been a gradual strengthening of security ties.

This is a time of great turmoil in the Asian strategic landscape and India is trying to make itself relevant. With its political and economic rise, Beijing has started dictating the boundaries of acceptable behaviour to its neighbours. Tensions are rising between China and smaller states in East and Southeast Asia over territorial issues. The US and its allies are already re-assessing their strategies and a loose anti-China balancing coalition is emerging.

Myanmar's President Thein Sein was in India from 12 October. India's strategic interests have been winning out in its relations with Myanmar in recent years. Myanmar's reclusive military leader, General Than Shwe, was in India last year. But Delhi is now watching closely as the new civilian government moves ahead with democratic reforms. The US President, while endorsing India's candidacy for a permanent seat in the UN Security Council, had said he expected Delhi to speak up on human rights abuses in Myanmar. Previously a harsh critic of the junta, since the mid-1990s, India has muted its criticism and dropped its vocal support for Aung San Suu Kyi. More important to Delhi has been China's rapidly growing profile in Myanmar. As India realised that Myanmar — one of its closest neighbours and a major source of natural gas — was increasingly in China's orbit, it reversed its decades-old policy and began dealing directly with the junta.

India has found it difficult to toe the Western line on Myanmar. It is stuck between its role as the world's largest democracy and the imperatives of its strategic interests. Indian elites have long admired the struggle led by Suu Kyi. Even today, India's official policy is the eventual restoration of democracy in Myanmar. But its strategic interests have become significant in recent years, especially as China's trade, energy and defence ties with Myanmar have surged.

AD Dassault

Strategic interests have led Delhi to only gently nudge the junta on democracy. India has gained a sense of trust at the highest echelons of Myanmar's ruling elite and it would be loath to lose this. As such, India remains opposed to Western sanctions. Suu Kyi has indicated she would be talking to the junta to find the best alternative for her nation and that should give India a larger strategic space to manoeuvre.

India is also hosting Vietnamese President Truong Tan Sang. Delhi-Hanoi ties have raised a lot of eyebrows, after India snubbed China and made it clear ONGC Videsh Ltd will continue to explore oil and natural gas in two Vietnamese blocks in the South China Sea. India has an interest in protecting the sea lanes of communication that cross the South China Sea to North East Asia and the US. As India's profile rises in East and South East Asia, it is asserting its legitimate interests in East Asian waters. As China expands its presence in South Asia and the Indian Ocean region, India is staking its own claims in East Asia. India has now decided to work with Vietnam to establish a regular Indian presence in the region as part of a larger security partnership. Delhi and Hanoi have significant stakes in ensuring sea-lane security and preventing piracy, while sharing concerns about Chinese access to the Indian Ocean and South China Sea. Indian strategic interests demand that Vietnam emerge as a major regional player, and India is well-placed to help Hanoi achieve that. It has been argued that just as China has used states in India's periphery to contain India, Delhi should build states like Vietnam as strategic pressure points against China. A common approach on the emerging balance of power is surfacing with India and Vietnam both keen on reorienting their ties with the US as their concerns about China rise.

Indeed, India is pursuing an ambitious policy in East and South East Asia — joining forces with smaller states in the region to offset China's growing dominance and America's likely retrenchment from the region. It remains to be seen, however, if India can live up to its full potential in the region.

From: The Indian Express

Small steps to big success

Indian grand strategy, broadly defined as its relations with the great powers, may be hard to discern right now. However, Indian lesser strategic policy — its relations with those countries with which it shares a border — is moving forward quite nicely. The arrival of the new military ruler of Myanmar, General Thein Sein, takes place at a propitious time.

The release of opposition leader Aung San Suu Kyi and the progress in negotiations between her and the country's military rulers indicates that Myanmar is closer to a political settlement than anyone could have expected even a year ago. While New Delhi has resisted the West's attempts to sanction and isolate Myanmar, this has not been because India would not prefer an elected civilian ruler to the brutal uniformed junta that reigns today. The difference is one of tactics and nuance, not of objectives.

Pushing the Myanmar policy is the latest in a series of Indian foreign policy successes on its periphery. The end of the Sri Lankan civil war, the nearly-complete grand bargain with Bangladesh, the gentle co-option of countries like Mauritius and the Maldives, have all placed India well on the path to creating what its officials have referred to as a "peaceful periphery". Even in Afghanistan, New Delhi has recently begun being seen as a player rather than a passive bystander. India has sought relationships in which its security interests are taken care of. It has complemented this with greater trade and investment. Finally, but one in which it has preferred to serve as an example rather than be overtly prescriptive, is the promotion of liberal democratic values. Myanmar is an interesting challenge. It is economically far more isolated and politically far more repressive than most South Asian nations. It is also a bridge between India's neighbourhood policy and its 'Look East' policy. Which is why the recent events in Myanmar are so remarkable: Yangon is in effect moving on all these fronts simultaneously, and in leaps and bounds.

Not all the reasons for these successes are India's doing. The sweeping electoral victory of Sheikh Hasina Wajed in Bangladesh's last election, for example. It is not completely clear why the Myanmar military has become so flexible. And New Delhi can privately thank China whose overbearing behaviour over the past two years has made many countries suddenly more enthusiastic about India — evident in the recent visit of the Vietnamese President to India. But half the success of a foreign policy is to recognise and grab opportunities when fate provides them. Myanmar is a particularly important and difficult opportunity. If it is convinced that the military is genuinely looking for change, India should begin looking at carrots it can dangle before Yangon. A phased loosening of international economics sanctions is one such that India should consider lobbying for. Small scale strategy is not the stuff of page one headlines. But India's ability to promote its interests in the global arena will be possible once it can do so at the local stage.

From: Hindustan Times

Eurojet

Opinion

The Perils of Strategic Overreach

Down the ages, history is replete with examples of nations and conquerors failing to stem their unquenchable thirst for further annexations and greater glory, then ultimately fall to their unbridled ambitions, more often than not owing to a strategic over-reach. Lessons of history are normally scoffed at in the quest of perennial victories even when enough should be enough! Alexander the Great, Hannibal, Chengis Khan, Napoleon Bonaparte, Adolf Hitler (before and during World War II). There is now the sole and fraying superpower of the world, the USA whose over-reach embraced Korea in the 50s, Vietnam in the 60s, Iraq and Afghanistan in recent years, having faltered at the altar of prudence in comprehending the perils and limits of power. The list of those nations whose lust for unrestrained power, beyond logic or national aspirations is now joined by another nation: the People's Republic of China. To most international strategic analysts, China represents "the world's quintessential practitioner of realpolitik."

China boasts, for at least two decades now, a galloping economy enjoying unique double-digit growth with over a trillion dollars in foreign exchange reserves. China is currently the largest growing economy in the world and likely to surpass the financially weary and economic depression-afflicted USA by 2020. According to International Monetary Fund estimates, China's economy was worth 5.4 trillion dollars in 2010 although the US is still well ahead with 14.8 trillion though the US growth was down to 3.8 percent compared to China's 9.3 last year.

China's economic explosion has caused it to become increasingly aggressive, assertive and arrogant in its conduct on the world stage: militarily, politically and also in its economic forays around the globe. China appears not to heed the advice of the architect of its economic growth, the veteran Chinese statesman Deng Xiaoping who had earlier cautioned that "Hide your brightness – bide your time." Some Chinese watchers have opined that although the world marvels at the astronomically growing Chinese economy, this is not above diverse dangers. Some have opined that the Chinese economic miracle might even implode (somewhat similar to Japan's a decade back) to runaway inflation and social unrest in the face of growing inequality in its society. Still, driven by financial interests, China is well within its right to take economic initiatives as it is aggressively now doing in Africa and the South American Continents, while being on a buying spree for oil exploration blocks around the world outbidding many competitors - including those from India. However, this financial muscle has not motivated China to correspondingly assume certain global responsibilities like in climate change or to stop favouring its exporters with artificially weak currency at the cost of other nations.

In its foreign policy endeavours, China has been assiduously making efforts to portray itself as a responsible and mature world player although its record is anything but that. Its propensity of maintaining close links with dictatorial and totalitarian regimes does not portray it as a lofty global player but as one which continues to pursue its partisan interests, unmindful of any morality in international dealings. For example, China maintained its support for Slobodan Milosevic's regime till the very end of this dictator's rule. In Africa, China stuck by Zimbabwe's Robert Mugabe and Hugo Chavez in Venezuela even when both dictators had been deemed as international pariahs. China's links with dictators was visible during the 'Arab Spring' too. In Egypt and Libya, till the last, China kept criticising anti-Mubarak and anti-Gaddafi pro-democratic forces as "mere unruly mobs". In Libya, despite strictures by the UN Security Council, Chinese arms manufacturers endeavoured to sell \$ 200 million worth of weapons to Gaddafi's forces. Then, China's very intimate and all encompassing relationship with Pakistan is based primarily for promoting instability in the Indian subcontinent, using Pakistan as its proxy for containing India which it sees as its competitor.

China's burgeoning financial resources have, unlike India's, been optimally utilised for gigantic growth in war making machinery and space exploration, in pursuit of its unabashed super-power status ambitions. China, which has upped the ante in the South China and East China Seas even while increasing its maritime activities in the Indian Ocean, however dismisses corresponding Indian trade and energy interests in the Pacific. The Chinese news agency Xinhua had the temerity to criticise the possible Indian exploration venture "in the highly sensitive sea over which China enjoys indisputable sovereignty." Both in the South China and East China Seas, Chinese

maritime assertiveness is causing much discomfiture to other Asian nations like Japan, South Korea, the Philippines, Indonesia, Vietnam and Taiwan. Most of these nations thus look to the USA to maintain a sizeable naval presence in these 'choppy waters' with the US Navy's Pacific Fleet. That the Indian government, though uncharacteristically, has given a befitting diplomatic reply to the Chinese on the INS *Airavat* incident is encouraging!

As the Chinese determinedly pursue their plans of encircling India by its 'string of pearls' stratagem, both by land and sea, the Government of India and defence planners have much to be concerned about. As India engages China in increasing mutual trade - over \$ 65 billion dollars this year - and endeavours to settle the many vexed problems with them, one must not lose sight of the myriad and multiple long-term strategic threats and challenges that India faces from its machiavellian northerly neighbour and accordingly, be adequately prepared for peace and progress - by being strong.



Lt Gen (R) Kamal Davar

(The writer retired as the first Director General of the Defence Intelligence Agency in 2004 and is known for his passionate espousal of enhancing jointness among the three Services. The General writes and lectures regularly on diverse security matters)

Safran (Snecma)

The Greater Game

Kabul-New Delhi : ‘a great friendship’

Visiting New Delhi in early October 2011 Afghanistan President Hamid Karzai, in a clever balancing act, called India a “great friend”, while he reached out to “twin brother” Pakistan.

He named nobody, blamed nobody. There was only a hint, however, when he urged an end to the “culture of suicide bombing” that has killed many Afghans, including former president and peacemaker Burhanuddin Rabbani.

So, were Indians upset at being called “great friend” in comparison to “twin brother”? Hardly. Afghanistan is part of their history and of their psyche. But they know this is the geopolitical reality, born of their ethnicity, faith and much else.

On the contrary, Karzai’s message fully reflects a perception Afghanistan shares with India: you cannot choose a brother or a neighbour, but you can choose a friend. Left unstated in this civilisational discourse is that friends always help while brothers can cause great harm.

The strategic partnership agreement (SPA) that Karzai signed with Prime Minister Manmohan Singh is the first that Afghanistan has signed with any country, including the United States. It calls for India “to assist, as mutually determined, in the training, equipping and capacity-building programmes for Afghan national security forces”.

This represents a significant scaling up of India’s intention to enhance its presence in Afghanistan. It also takes bilateral ties beyond the economic reconstruction that India has carefully nurtured in the past decade. It is the sixth largest contributor with US\$2 billion (RM6 billion).

Pakistan’s official response was nuanced. It played down the SPA, although it has opposed with considerable success India training Afghan soldiers and policemen, even viewing with suspicion New Delhi’s economic presence in Afghanistan. Betraying unease, however, it warned against the “regional balance” being “disturbed”.

There is a definite shift on the Afghanistan-Pakistan front reflected in the changing stance of the US and its western allies. As they prepare to withdraw, they have scored significant hits on the ground, while talks among various players are not getting anywhere. For Kabul, Rabbani’s killing has proved the turning point.

Karzai’s New Delhi visit came a week after a statement expressing “frustration” at talking to the Taliban, the main adversaries,

with Pakistani mediation. Kabul would henceforth talk directly to Islamabad and collaborate with the USA, the European Union and India, the statement stressed.

Surely, the SPA could not have come about without a nod from Washington that is blowing hot and cold with Islamabad throughout this year. What US Secretary of State Hillary Clinton said about Pakistan “nurturing wild elements in its backyard”, America’s top military officer Admiral Mike Mullen said directly of the Haqqani network that attacked the US Embassy in Kabul being “a veritable arm” of the Inter-Services Intelligence, Pakistan’s military secret service.

Any doubts about the US’ mood were removed by President Barack Obama who said on 6 October “There is no doubt that there is some connection that Pakistan’s military and intelligence services have with certain individuals that we find troubling.”

All this may gladden some Indian hearts. But they would be naive to think that in seeking India’s wholehearted support, the US would, or could, forsake Pakistan. Hopefully, the Indians are only playing for advantage, fully conscious of this fact.

Also, there are many layers of decision-making in the US, and Pakistan has traditionally enjoyed strong links within the American system. There are strong voices even within the Obama administration cautioning against isolating Islamabad and destabilising its current domestic dispensation.

While this is the US-Pakistan situation, the Chinese interests and Sino-Pakistan strategic ties also need to be factored in any dispassionate assessment of what India will, and can, do in Afghanistan. A Sino-Pakistan collusion to counter any Indo-US arrangement in Afghanistan is almost certain.

India’s strategic hawks see the Kabul-New Delhi pact as indicative of a new pro-active stance, coming shortly after the exploration of hydrocarbons in South China Sea in collaboration with Vietnam. They say this marks a definite expansion of India’s strategic presence beyond its national borders.

But others caution that this is fraught with risks. Such a presence would need long-term sustaining and being a player also means being seen as a partisan.

There is also a perception that India may end up taking a part of the task that the US has left unfinished due to obvious risks and limitations. The doubters feel that India has

neither the clout, military or economic, nor the stomach to undertake risky politico-military operations well beyond its borders.

Details of the Kabul-New Delhi pact have yet to be worked out. Hence, it is not clear whether, and how far, the training of the Afghan armed forces and the police would entail enhanced Indian presence on Afghan soil. However, there is no question of India deploying its forces for any combat role, say New Delhi officials.

But Pakistan views Afghanistan as a zero-sum game with India. It is unlikely to accept the new arrangement and can be expected to make things more difficult for New Delhi.

The Times of India editorially warned of more attacks on Indian offices in Afghanistan, where at least 35 Indians have been killed in the past three years. And worse, of Mumbai-style attacks on Indian soil.

Karzai also signed a memorandum of understanding inviting Indians to explore minerals and natural gas that are estimated to be worth US\$1 trillion. This would mean stationing more and more Indians who would need protection. A rivalry with China that is already into mining copper is a possibility.

What seems clear is that India is back as a full-fledged player endorsed by the world community that had ignored its legitimate role in Berlin a decade ago, and had reinforced its disdain in its London conclave in January last year. This endorsement is an unacknowledged admission of the failure of the futile search for “good” and “bad” Taliban by those in a hurry to quit, after declaring a victory of sorts, using their cheque books.

The global concerns about future prospects of Kabul sliding back to an isolationist regime that oppresses its women and children require the US and its allies to ensure that their second departure in three decades does not create trigger conditions.

But they can alter the Afghanistan-Pakistan geo-political realities only partially. Equally doubtful, thus, is the extent of their withdrawal from Afghanistan, given their own geo-political needs. There is no reason why the US would completely give up this foothold-plus – right in the middle of an adversarial Iran, a competitive China, a simmering Arab world and an energy-rich central Asia.

The Kabul-New Delhi pact and what follows may be a paragraph in bold letters, hopefully extendable to a chapter, in these new annals of the “Great Game”.

Mahendra Ved



(Then) Air Chief Fali Major with (then) Chairman HAL Ashok Baweja at Hawk handing over ceremony
—“together forever”

Shackles of the Mind

Without in any way reflecting on the personalities involved in the recent race for Chairmanship of Hindustan Aeronautics Ltd, the best that can be said for the recent announcement of the new Chairman to replace the present incumbent on retirement is that a needless controversy has finally been put to rest.

A deeper reflection on the larger issues that the controversy raises however, tells a tale that would gladden the hearts of our potential adversaries at one end and both gladden and sadden the hearts of international aerospace companies on the other. Gladden, because competitors see the burgeoning Indian military aviation market remaining forever dependent on their technology and products. And sadden, because even they recognise that in today's technology driven and fiercely competitive world of international aerospace, HAL has the potential to bring major strengths and value addition to joint collaborations. More so in an environment where the IAF has plenty of modernisation to catch up on while air force budgets in many major markets are shrinking. There is, however, a caveat. This potential will remain invisible as long as the management model adopted

in respect of HAL by the Ministry of Defence remains unchanged and bureaucratically driven.

HAL which was set up in 1940 as a private aeronautics company to service allied warplanes during the Second World War is in many ways synonymous with the history of Indian military aviation and the growth of the Indian Air Force. When the HF-24 designed by Dr. Kurt Tank and his team of designers in HAL first flew in early 1961, India was amongst a handful of nations to have indigenously designed jet combat aircraft. Over the years as military aviation in the country has grown with the other services also establishing air arms, HAL's embrace of the armed forces has become tighter. But it is the relationship between the IAF and HAL which has been long standing and umbilical for the simple reason that major chunk of the IAF's budget goes into this one navratna PSU.

Today HAL boasts of 19 production or overhaul divisions and 10 research centres spread across India with a workforce of around 40,000 and is one of the largest aerospace company in Asia. It's Annual Report for 2010-11 pegs its domestic sales for the year at

Rs.12,878.12 crores and export sales at Rs. 237.39 crores with an annual expenditure on R&D at Rs.987 crores. Whilst it lists as its customers 32 international and 27 domestic ones, it is the IAF's budget that bears the largest single element of work and revenue for HAL - by a very wide margin!

Except for exports, these are impressive figures. Considering that this Company, under one roof, is involved in every facet of aerospace design, development, production, repair, overhaul of aircraft and aero engines, materials and aerospace systems, makes it the behemoth of the Indian aerospace scene. This writer has both served and worked closely with HAL for nearly two decades. With this insight one can say with confidence that there are many strengths that HAL can truly boast of. Chief amongst them is the technical quality and dedication of its design, engineering and production work force where HAL can stand its ground amongst the best in the world.

Notwithstanding the above achievements, HAL is presently ranked a lowly 38th in the world's defence aerospace sector as per the information given in HAL's Annual Report 2010-11. If a company that has, as its captive customer, the fourth largest air force in the world with an overriding hold on its aerospace product needs and corresponding budget (not to mention the lesser needs of its army and navy), but is ranked so lowly in the international aerospace company ranking, this must tell its own grim story.

It was in June 2011 that media reports first indicated that the IAF had proposed the name of a soon to be promoted Air Vice Marshal to replace the present Chairman HAL when the latter retired. Reportedly, the justification was IAF's dissatisfaction with the bureaucratic culture pervading HAL and its contention that only someone that understood aerospace concepts could transform HAL into a cutting edge company capable of delivering on time. With many current programmes running behind schedule adding to the woes of the IAF's dwindling combat force strength and with an order book reportedly of nearly Rs 70,000 crores and major new programmes like the

MMRCA, FGFA and the MTA on the anvil, the IAF's concerns should have sent alarm bells ringing in the corridors of South Block.

Possibly because such concern and anxiety has become the norm rather than an exception over the decades, it now genders little anxiety within South Block. This is also a legacy that neither any IAF Chief nor indeed any Defence Minister has been able to redress. In parallel, as the aerospace scene has expanded both in technological and quantitative terms, HAL has continued to grow. Today, it is no exaggeration to say that the IAF and HAL are locked in an embrace from which neither can disengage without delivering a mortal blow to the other. It is this complex reality that must have been at the heart of the IAF's desperate appeal to put one of its own at the helm of HAL, an appeal put forth by the outgoing Chief and repeated by the present Chief when he reportedly justified: "We spend more than 70 per cent of our budget on this defence PSU and we are in the process of signing deals worth over \$20 billion in the next few years, most of which would be undertaken by HAL."

Having similarly been at the Air Force end of this 'love-hate' relationship, this writer fully sympathises with the concern being felt at Air Headquarters. Yet one has a contrarian view of the proffered solution. Putting a serving IAF officer at the helm of affairs at HAL will not necessarily mitigate IAF's concerns. The reason is that the problem is not one of individuals, but of a deeply flawed management structure. No aerospace manufacturer in the world follows HAL's management model, which shorn of some corporate jargon, works as a subordinate agency to the Department of Defence Production under the MOD.

That is why historically, in spite of senior IAF officers having headed HAL many a time, some serving and others post-retirement, all being of impeccable professional credentials, the script remains unchanged. Surprisingly, there was even a brief period when the Chairman HAL and IAF Chief was one and the same person!

There is yet another reason why this writer differs with the IAF solution. As challenges to national security

take on wider dimensions, air power by virtue of being technology driven is expanding the frontiers of meeting these security challenges and having to evolve accordingly. Modern air forces can ill afford to stretch their expertise into domains of aerospace industries that have dissimilar though equally profound challenges on the industrial front. The simplistic notion that one of their own at the helm will resolve HAL's structural problems is to underestimate the challenging nature of the animal that is a modern aerospace industry.

So the problem is not something that can be addressed by a cosmetic change of leadership at the top - irrespective of the background or competence of the individual involved - it is fundamental to what management model is needed for a modern high technology-high cost aerospace industry to compete successfully in an internationally competitive environment.

There is of course a further issue that follows. For all practical purposes, HAL works as a subordinate organisation under the Department of Defence Production in the MOD. The Joint Secretary and Financial Adviser are both Government Directors on the HAL Board. Major decisions taken by the Board are still subject to review at the ministry where the same government directors can now sit in judgment on the proposal wearing a different ministerial hat. When this writer was DCAS and a member of the Board, there was at least an opportunity to discuss issues both within the Board and within the MOD. By removing the DCAS from the Board, even this constructive window of opportunity now stands denied to the IAF as the largest customer of HAL.

If the IAF is mistaken in its perception of the solution to the problem, the MOD remains sanguine. It holds complete sway over HAL without in any way being accountable for its weaknesses and relishes the role of arbiter when relations turn sour between HAL and the IAF - on any number of issues. It will have been party to the DCAS, who has traditionally been a member of the HAL Board, being relegated to the ceremonial role of becoming a 'permanent invitee' along with representatives from the other two services, not for a minute

considering the negative impact of this one fatal move to the health of military aviation in the country. One sometimes wonders if the IAF has noticed this deliberate side lining of the 'prime captive customer' on the HAL Board? If it has, one wonders if it strongly objected to this mindless corporate fiddle, ignoring the negative operational and technological consequences?

When the suggestion of nominating a senior Air Marshal to the post of Chairman HAL was first mooted by the IAF, perhaps in early June, rather than the matter be discussed with the then CAS and the issue resolved internally, the matter was allowed to spill over into the public domain. The question that arises is why did the MOD not resolve the issue internally rather than have both the outgoing and incoming Chiefs make a public bid - only to be snubbed? Surely, the issue of whether a serving officer can or cannot apply for such posts is one of policy and could have been nipped in the bud. Instead there was media speculation of "shifting of goal posts" in terms of qualifications to eliminate the IAF candidate. Whether or not such speculation was valid or not is not really of substance. Allowing this debate in the public domain speaks volumes of the indifferent state of civil - military relations within our national security management structure.

We have clearly seen what happens to this management model as applied to another industry in the aeronautics sector. Air India, which was once one of the world's finest airlines, today lies in tatters. And there is reason to believe that the Board of Air India has considerably greater autonomy than is the case with the HAL Board. One could well argue that HAL continues to show healthy profits. Indeed the annual report for 2010-11 states "The Company has been consistently declaring dividends. Since its inception, a total amount of Rs 2933 Cr has been remitted to the GOI towards dividend including dividend tax of Rs 364 crore". The answer to this contradiction lies in the fact since the buyer and the seller is the same, namely MOD, there are many ways to bell the 'audit and accounting cat'.

Once upon a time, it was the principle of 'cost plus'. It later became a question

of fixing labour rates based on costs already incurred! There is also the final fix of periodically sanctioning revised programme costs as these escalate, with the IAF's budget silently bearing the brunt.

Another feather in HAL's cap, quoted in the annual report, is this PSU continued achieving of an 'excellent' rating from the MOD under the MOU criterion of performance evaluation for the year 2009-10 and anticipation of the same for 2010-11 thus making ten years of such excellent performance. With constant reports of delayed programmes and escalation in costs, it would be interesting to see what constitutes this criterion. More pertinently, does the IAF (as the prime buyer) have any say in contributing to such an award of excellence to HAL? Or is it merely a case of one arm of the MOD giving a 'shabash' to the other?

These and many such contradictions are a pointer not to individual shortcomings, but to a far deeper malaise: that of an archaic management model for a modern aerospace industry.

The LCA programme best exemplifies this malaise. As earlier mentioned, HAL has 10 Design Centres, which includes one for aircraft and the other for aero engines. But the design task for the LCA was not entrusted to HAL's Aircraft Research & Design Centre, but to a newly formed Aeronautical Development Agency under the DRDO. The ADA itself was structured as a 'Society' with multi layered committees overseeing the LCA programme! Similarly the Kaveri engine programme for the LCA was entrusted not to HAL's Engine Test Bed Research and Design Centre but to GTRE, again under the DRDO.

As per HAL's ARDC website, the "LCA programme is managed by the Aeronautical Development Agency with HAL as Prime Contractor accounting for an overwhelming majority of design and manufacturing tasks". The ADA website states "ADA is the nodal agency for design and development of the LCA. HAL is the principal partner in LCA programme with participation of DRDO, CSIR laboratories, public and private sector industries and academic institutions". Simply put, a challenging modern combat aircraft design and development programme

was launched not under the leadership of HAL, but the DRDO! Yet it is HAL that ultimately bears the responsibility for production, supply and product support to the IAF! Diffused accountability best sums up this management model for which the IAF (and the country) will continue to pay dearly even when the LCA is in operational service, decades behind schedule.

According to the MoD website, the process of reforms in management of defence was initiated in 2001 after the review carried out by a Group of Ministers. It will be recalled that origin of this review was the Kargil Committee Report and the subsequent Task Forces that followed.

In the field of defence production, subsequent reforms have resulted in a Defence Acquisition Council headed by the Defence Minister whose decisions are to be implemented by three Boards on Defence Procurement, Defence Production and Defence R & D headed respectively by Secretaries Defence, Defence Production and Defence R&D. In reality the implementation comes back to the original departments! There is an added Defence Technology Council under the Defence Minister to guide and supervise growth and production related to defence technologies. It will be apparent to those familiar with modern aerospace challenges and industries that whilst the government recognises the need to make changes to elevate Indian defence R&D and production to internationally competitive standards, it lacks the will to deviate from a largely bureaucratic model.

Emerging challenges offer opportunities to those at the helm of affairs to look at change. Instead there is a belief that paying lip service to the policy of 'self-reliance' and cosmetic changes to the management model which basically remains bureaucracy-driven will somehow bring Indian aerospace industry to take its place amongst the best in the world. As events indicate, this is not happening. That in this day and age, we are forced to look to the outside world for a basic turboprop trainer for the IAF's training needs, speaks for itself.

In the early eighties Jacques Gansler had this to say: "In order to understand the economic operation of the US

defence industry, it is first absolutely essential to recognise that there is no free market at work in this area and that there cannot be one because of the dominant role played by the federal government. The combination of a single buyer, a few large firms in each segment of the industry, and a small number of extremely expensive weapons programmes constitute a unique structure for doing business."

It is significant that Gansler later became Under Secretary of Defence for Acquisition and Technology in the Bill Clinton Administration and oversaw consolidation and rationalisation of the US aerospace industry which at the time had an over abundance of world class private aerospace giants competing for US and world defence contracts.

The problem in India is somewhat different. We have relatively large aerospace research and production facilities and assets and talented human resource - all in the public sector, with no competition and managed in a model more akin to government departmental functioning. In parallel the private sector that has traditionally been debarred from defence production certainly has great capacity and potential to make a significant contribution to military aviation and is already doing so in civil aviation and fields of repair and overhaul. International aerospace companies recognise the potential benefits of investing in joint ventures, but await clarity of policy. It is now time to determine what unique structure we must adopt to enable India's aerospace industry to take on international competitors.

In the high technology fields of Space and Atomic Energy, the Government of India has followed unique models, the results of which are for all to see. Aeronautics in India deserves to be elevated to the same pedestal of technological recognition to enable it to achieve its full potential. Only when this is done will we stop worrying about individuals and begin to respect and revamp the aerospace industry in a different light. This writer continues to believe that the nation has all the pre requisites for a dynamic aerospace industry. It now awaits its own unique model to turn such potential into reality.

Air Marshal (R) Brijesh Jayal

M-MRCA: 'the last lap'

At 1600 hours on 4 November 2011, the 'last lap' in the marathon race for selection of the Indian Air Force's medium-multi role combat aircraft was initiated when commercial offers of the down-selected companies, Cassidian and Dassault, were formally opened. This took place at the Ministry of Defence in South Block, New Delhi presided over by the concerned bureaucrats and Indian Air Force officers in the presence of invited executives from the two companies. Although absolute secrecy on the prices was maintained,



for the purpose of 'harmonisation' between the competing bids MoD officially announced the exchange rate between the Indian Rupee and the Euro, Dollar and Pounds Sterling as also the kilo-tonne price of aviation turbine fuel on that date, these being duly noted and accepted. The MoD spokesman announced that after detailed scrutiny of the commercial offers (submitted over 4 years back) with life cycle costs calculated and other such factors (including offsets) taken into consideration, the selected aircraft type would be announced in "four-to-six weeks". Should the schedule be maintained, the M-MRCA 'winner' would be known by the second half of December 2011.

'No political tilt in \$20 billion M-MRCA deal'

Indian Defence Minister AK Antony, speaking on the sidelines of a conference in New Delhi on 11 November 2011 emphasised that "no external factor or geo-political consideration would play a role in selection of winner of the medium multi-role combat aircraft project", which at \$20 billion will be the biggest arms deal inked by the UPA-II government.

US offers F-35 to India?

As per speculative news reports from New Delhi, the US has offered India partnership in "development of the 'world's most advanced flying machine', the F-35 Joint Strike Fighter". According to these, the Pentagon is still interested in selling its top notch fighters to India: "despite this setback (MMRCA), we believe US aircraft, such as the Joint Strike Fighter (JSF), to be

the best in the world," the Pentagon stated in a nine-page report to the Congress. "Should India indicate interest in the JSF, the United States would be prepared to provide information on the JSF and its requirements (infrastructure, security, etc) to support India's future planning," the Pentagon said in a one-of-its kind report on India submitted to the US Congress.

Indian Air Force's flying training situation

Speaking on occasion of the 79th anniversary of the Indian Air Force Chief of Air Staff Air Chief Marshal NAK Browne answered questions on recent accidents of MiG-21s, progress in acquisition of basic trainer aircraft and plans to reform the Suryakiran aerobatic team (SKAT).



Air Chief Marshal NAK Browne (on right) with Air Marshal DC Kumaria (AOC-in-C WAC) at the Air Force Day parade on 8 October 2011 (photo by: Wg Cdr RS Chauhan)

Of the three MiG-21s lost, the CAS said, "Unfortunately, except for one case, the other cases point towards the inexperience of young pilots who were not able to handle the landing and approach." According to reports, the IAF have decided that no more 'inexperienced pilots' would be trained on the MiG-21s which are being phased out gradually. The current batch of pilots undergoing training would be the last course on this aircraft.

On the matter of a new basic turboprop trainer, the CAS confirmed that the IAF was expecting to sign a Rs 1850-crore deal with the Swiss firm to procure PC-7s for its stage-I flying syllabus by the end of this November. "The Pilatus aircraft is at the final stages of procurement and the case is with the Finance

Boeing

Ministry. I think by the end of November, the contract for this trainer aircraft would be signed.” Observing that pilot training has been an area of concern for the IAF, he said, “In the last few months, this has been the area of main focus for us. If we sign the contract by the end of this month, the Pilatus basic trainer would join the IAF by July 2013.”

Replying to another query on flying training in absence of basic trainers, Browne said, “We have introduced changes in the syllabus. By 2013-14, when we would get the additional Hawks and the Pilatus, we would be able to fulfill all the key requirements for training of our pilots.” He said the gap in the basic flying training of pilots occurred because of the grounding of HPT-32 aircraft in 2009.

The Air Chief also said that the disbanded *Suryakiran* aerobatic team would take to the sky again: “this year, we had to take the painful decision of disbanding the nine aircraft SKAT. But we owe it to the nation to resurrect the team again and I assure you that in three years, the team will rise again in national colours on the Hawk AJT.”

Asserting that the Indian Air Force was looking towards the future, Air Chief Marshal NAK Browne said that “no other Air Force has attempted to modernise at such a fast pace in such a short span of 15 years”.

“IAF firmly on the path to enhance operational potential”

At the recent three-day Air Force Commanders’ Conference which was attended by the Air Force Commanders of all Operational Commands as well as the Training and Maintenance Commands besides the Principal Staff Officers at the Air Head Quarters, the CAS, Air Chief Marshal NAK Browne urged



The CAS, NAK Browne (seated, 6th from left) with IAF Commanders at the Conference

all Commanders to uphold the ‘People First Mission Always’ vision of the IAF.

“The IAF is witnessing an unprecedented phase of modernisation and capability enhancement and can effectively respond to any attempts at undermining India’s national security. The transformational change can be witnessed in all facets of capability building that include not only combat platforms, but also induction of force multipliers and air mobility platforms to provide strategic reach and operational flexibility”.

The key focus was on strategising various aspects related to training and development of personnel with special emphasis on consolidating flying training and their development to cope with the depletion in trainer aircraft resources. An emphasis would be laid on the infrastructural development in the North and North Eastern areas to improve response time through forward basing of armed forces’ assets and supporting the Indian Army in challenging conditions.

Amongst other issues, discussions ranged from pace of progress in platform and weapon inductions and various processes to the effective integration of modern air defence radars and weapon systems to maintain requisite combat potential. Various maintenance issues like the life cycle philosophies and modernisation of maintenance practices to enable a more inclusive role for the Base Repair Depots in maintaining legacy systems were deliberated upon.

First batch of Mi-17V-5s delivered to IAF

The first batch of Mi-17V-5s under the contract signed by Rosoboronexport, JSC in December 2008 have been delivered to the Indian Air Force, No.155 Helicopter Unit becoming the first with this variant. The helicopters are manufactured by Kazan Helicopters, a subsidiary of the Russian Helicopters holding company. The Indian Air Force presently operates over 200 Mi-8/17 type medium helicopters.

The Mi-17V-5 is an upgraded version of the Mi-17, being equipped with a KNEI-8 avionics suite. This has replaced a number of systems indicators, resulting in a ‘very clear and intuitive cockpit’ with four large multi-functional displays that are ‘easy to read’ and help ‘reduce pilot fatigue’.



Saab Gripen

Additional C-130Js for IAF

On 26 October 2011, the US Defence Security Cooperation Agency notified the US Congress of a possible Foreign Military Sale to the Government of India for six new Lockheed Martin C-130Js and associated equipment, parts, training and logistical support for an estimated cost of \$1.2 billion. The USAF baseline equipment includes 6 Rolls Royce AE 2100D3 spare engines, 8 AN/AAR-47 Missile Warning Systems (two of them spares), 8 AN/ALR-56M Advanced Radar Warning Receivers (two of them spares), 8 AN/ALE-47 Counter-Measures Dispensing Systems (two of them spares), 8 AAQ-22 Star SAFIRE III Special Operations Suites (two of them spares), 8 ARC-210 Radios (Non-COMSEC), and 3200 Flare Cartridges.



Also included are spare and repair parts, configuration updates, communications security equipment and radios, integration studies, support equipment, publications and technical documentation, technical services, personnel training and training equipment, foreign liaison office support, Field Service Representatives' services, US Government and contractor engineering and logistics personnel services, and other related elements of logistics support. This deal is estimated to be worth \$1.2 billion.

An-32 inaugurates Vijaynagar ALG

Governor of Arunachal Pradesh, General (Retd) JJ Singh accompanied by Air Marshal S Varthaman, Air Officer



Air Marshal S Varthaman along with aircrew of the inaugural flight

Commanding-in-Chief, Eastern Air Command inaugurated the Advanced Landing Ground (ALG) at Vijaynagar on 18 November 2011. The inaugural An-32 flight landed at Vijaynagar ALG bringing the local populace of this region on the "air connectivity map of the country."

Lieutenant General Rameshwar Roy Director General Assam Rifles, Air Vice Marshal KS Gill, Senior Officer-in-Charge Administration, Eastern Air Command, senior officials from Arunachal Pradesh, Assam Rifles and the Indian Air Force were also present on this occasion.

"The IAF has been entrusted with the responsibility of developing ALGs in Arunachal Pradesh with the dual purpose of giving a boost to local area development and enhancing military capabilities" stated Air Marshal S Varthaman. He also added that since Vijaynagar is only accessible by air, revival of this ALG will provide immense support to the local population.

Indo-Oman Air Exercise 'Eastern Bridge 2011'

The four day joint exercise between the Indian Air Force (IAF) and the Royal Air Force of Oman (RAFO) took place at Air Force Station Jamnagar in the third week of October. Exercise *Eastern Bridge* 2011 is the second of the series, the first being held in October 2009 wherein six IAF Jaguars had operated from RAFO Thumrait, Oman. In this 'return match', the RAFO contingent comprised six Jaguar aircraft and 115 personnel. IAF's Jaguars and MiG-29s based at Jamnagar participated in the exercise.

The exercise commenced on 17 October 2011 after familiarisation of RAFO contingent with local flying areas and operational procedures at the base. The four day long exercise involved a variety of flying missions from "each other's best practices in terms of operational, maintenance and administrative procedures". The exercise gave an exposure to the RAFO and IAF aircrew, towards missions involving long duration sorties with inflight refueling, large force strike packages, air to ground bombing and maritime strike roles routinely performed by the IAF, both independently and in mixed operations.



'The united colours of ...' Jaguars of two Air Forces in Exercise Eastern Bridge

Unit Citations to Nos.8 and 12 Squadrons and 119 HU

During the IAF's 79th anniversary parade at Hindon, the Chief of Air Staff announced the award of Unit Citations to select fighter, transport and helicopter squadrons. No.8 Squadron (*Eighth Pursuits*) flying the Sukhoi Su-30MKI were also honoured for their having undertaken the longest endurance fighter operational sortie of 6500 kilometres in 9 hours 55 minutes which included bombing of a target in Little Nicobar Island.



Sukhoi Su-30MKI on take off.



Antonov An-32 of the IAF at Leh.



No.12 Squadron (*Fighting Yaks*), with the Antonov An-32 have the dual role of air maintenance at high altitude areas as also the nocturnal bombing role (10x1000 lb bombs). The squadron is affiliated with the 1st Sikhs which battalion they flew into Srinagar in the last week of October 1947 in defence of the Kashmir Valley. In late 2010 an An-32 of No.12 Squadron made the first landing at the Dharasu ALG in Uttarakhand.



Mi-8 of No.119 HU at Guwahati.



No.119 Helicopter Unit, based at Guwahati, have been flying Mi-8s since 1972 and have distinguished themselves in support of the Army and Civil Administration in the Assam Valley, Arunachal Pradesh and Nagaland.

President's Standards presented to five Armoured Regiments

President Pratibha Patil conferred the *Presidents Standards* on five Armoured Regiments, the 5th, 6th, 70th, 73rd and 74th Armoured Regiments, equipped with T-90 main battle tanks at an impressive ceremony at Patiala where there were a total of 132 tanks on parade.

Ms. Patil recalled that the history of the regiments spanning over 44 years "was replete with examples of heroism, professionalism and devotion to duty". She said the "honour bestowed on the regiments also carried additional responsibilities as the officers and personnel would be expected to carry out their duties more professionally and be prepared for more sacrifices".

To commemorate the event, the President also released a first day cover on all the five regiments, issued by the Army Postal Service.

The event had the presence of Punjab Governor Shivraj Patil and Chief of the Army Staff Gen. VK Singh and other senior officers of the Western Command.



Army Commanders' Conference

The biennial Army Commanders' Conference was held in New Delhi on 12 October 2011. 'Professional Military Education' for Scholar Warriors of the Indian Army and 'Life Cycle Sustainment of Equipment' were amongst the topics discussed.

It was felt that the current professional development philosophy for officers was focused mainly on structured and institutionalised training, aimed at enhancing war fighting skills. The ARTRAC proposal aimed at ensuring that officers "gained adequate understanding of issues of national, strategic and technical importance, in their formative years also, through professional military education."

2/5 Gorkha Rifles (FF) mark 125th anniversary

One of the most highly decorated battalions of the Indian Army, the 2/5 Gorkha Rifles (Frontier Force) celebrated the 125th anniversary of their raising on 10 November 2011 at their present location in Almora. Known as the 'VC Paltan', the battalion was raised at Abbotabad (NWFP) in 1886 and saw extensive service on the Punjab frontiers and the NWFP. They fought at



At Almora on the parade ground are seated (left to right) Col Prashant Kandpal, CO 2/5 GR (FF), Lt Gen VK Ahluwalia (GOC-in-C Central Command), Lt Gen Dalbir Singh (GOC III Corps and Colonel Commandant of the 5th Gorkha Rifles (FF)) and Major General Rajesh Arya (GOC 6 Mountain Division) amongst numerous serving and retired officers

Gallipoli and Mesopotamia in the Great War and then in the Burma Campaign 1942-44. During the latter action, three Victoria Crosses were earned in quick succession.

Post independence, the 2/5GR (FF) took part in the Hyderabad Police action, were with the UNPKF in the Congo in 1961, into battle during 1965 and 1971 wars. Thereafter the battalion spent many years in various sectors, particularly in Keran (Kachhal) on the LOC and later in the Tawang sector of Arunachal Pradesh.

21 R&O Flight awarded Flight Safety Trophy

The Indian Army's 21 R&O Flight located at Misamari (near Tezpur, headquarters IV Corps) has been awarded the Annual Flight Safety Trophy for the year 2010-11. This trophy is awarded annually to the Army Aviation Flight achieving the best flight safety record while at the same time meeting its operational task during the year.



The COAS General VK Singh awarding the trophy to 21 R&O Flight

Army Aviation helicopters have been operating extensively from the high altitude Siachen Glacier and in counter terrorist operations in Jammu and Kashmir to the North East of India. With over 200 helicopters, AA helicopters fly some 50,000 hours every year. Army Aviation Corps, the youngest Corps of the Indian Army celebrated its Silver Jubilee on 1 November 2011 (see *Vayu* Issue IV/2011).

Army inducts new regiment of BrahMos

On 9 November 2011, the Indian Army raised a new regiment of BrahMos supersonic cruise missiles. The new regiment comprises Block-II version of the BrahMos, with capability of destroying a specific small target with a low radar cross-section in cluttered environment. In 2007, the Army had first inducted a regiment of BrahMos-I, consisting of 67 missiles, five mobile autonomous launchers on 12x12 Tatra vehicles and two mobile command posts, among other equipment.

Handing over the missiles to Director General Artillery Lt Gen Vinod Nayanar, MoS Defence M M Pallam Raju said



“BrahMos is a versatile system and now available in multiple versions. I am glad to know this regiment is being delivered ahead of schedule.” BrahMos CEO & MD Dr. A S Pillai said that “BrahMos, which flies at the speed of Mach 2.8 all through its 290-km range, has devastating power with nine times more kinetic energy than sub-sonic cruise missiles.

The Indian Army, having placed orders worth Rs 9,484 crore, is looking to induct all three versions of the multi-role BrahMos in sufficient numbers over the next couple of years. The Navy and IAF have ordered BrahMos missiles worth Rs 3,568 crore and Rs 1,295 crore respectively.

“India sees China as de facto competitor”

“Recent bold moves regarding India’s armed forces have political rather than military objectives” according to the *People’s Liberation Army (PLA) Daily*. India’s repositioning of its national security strategy has led to the country “starting to treat China as a de facto competitor”, particularly referring to the Indian Air Chief’s statement on moving assets to the Nyoma ALG in Ladakh and positioning of BrahMos missiles.

“China has always adhered to the principle of ‘peaceful development...’ but this has been misinterpreted by some countries as a ‘rising threat.’” Further, within five years, the Indian plan is to deploy 90,000 more soldiers and raise four new Divisions along India’s border with China, which (is the) largest mobilisation since the Sino-Indian border clashes of 1962.

These moves have followed the Indian government’s decision in October to deploy BrahMos cruise missiles against China, the first time it has taken such a step with offensive tactical missiles. India is also pushing for its first joint air force and naval exercises with Japan a move clearly noted by China.

Agni-4 missile launched

India’s advanced long range missile system Agni-4 was launched on 15 November 2011 from a Road Mobile System from Wheelers’ Island off the coast of Odisha. The missile followed its trajectory in text book fashion, attained a height of about 900kms and impacted the pre-designated target in the international waters of Bay of Bengal. “All mission objectives were fully met”, the systems functioned perfectly till the end encountering the re-entry temperatures of more than 3000°C.



The Agni-4 is lighter in weight and has two stages of solid propulsion and a payload with re-entry heat shield. The composite rocket motor which has been used for the first time performed ‘excellently’. The missile system is equipped with modern and compact avionics with redundancy to provide high level of reliability. The indigenous Ring Laser Gyros-based high accuracy INS (RINS) and Micro Navigation System (MINGS) complementing each other in redundant mode were ‘successfully’ flown in guidance mode for the first time. The high performance onboard computer with distributed avionics architecture, high speed reliable communication bus and a full Digital Control System controlled and guided the missile to the target. The missile reached the target with very high level of accuracy. Radars and electro-optical systems along the Coast of Odisha tracked and monitored all the parameters of the Missile. Two Indian Naval ships located near the target witnessed the final event.

Defence Ministry AK Antony and DG DRDO VK Saraswat congratulated the DRDO team on their achievement while Avinash Chander, Distinguished Scientist, Chief Controller (Missiles & Strategic Systems), DRDO and Programme Director, Agni called it as “a new era in the modern long range navigation system in India”. Further, “this test has paved the way ahead for the success of Agni-5 Mission, which will be launched shortly”.

Lt. Gen. SK Singh is new VCOAS

Lt. Gen. Krishna Singh took over as the new vice chief on 1 November 2011 and succeeds Lt. Gen. Avtar Singh Lamba, who has retired after 40 years of service.



Lt. Gen. SK Singh was earlier GOC-in-C South Western Command before taking up his new assignment. He was commissioned in December 1972 in the 8 Gorkha Rifles and took part in a number of operations, including with the IPKF in Sri Lanka, Operation Rakshak in Punjab as well as in Jammu and Kashmir, apart from commanding an infantry division on the LOC with Pakistan and of a Corps in Ladakh. He is presently Colonel Commandant of the 8 Gorkha Rifles.

“Indian Navy is net security provider to Island Nations in IOR”: Antony

The Defence Minister AK Antony assured India’s maritime neighbours of the country’s “unstinted support for their security and economic prosperity”. Addressing the top brass of the Indian Navy and MoD as a part of the Naval Commanders Conference held on 12 October 2011, Antony said the Indian Navy has been “mandated to be a net security provider to island nations in the Indian Ocean Region”. He said “most of the major international shipping lanes are located along our island territories. This bestows on us the ability to be a potent and stabilising force in the region”.



While acknowledging the benefits of conducting several exercises in the South China Sea, East China Sea and the Western Pacific, Antony also brought out the need to maintain a balance between the various responsibilities of the Indian Navy saying “although reaching out to our extended neighbourhood is important, you must always be mindful of the core area of your responsibility that mainly includes preserving and strengthening our shore lines and coastal security”.

Talking about coastal security, Antony said “We have taken several measures to strengthen our coastal security; our maritime forces are capable of protecting our maritime frontiers. However, this should not lead into a feeling of complacency”. He went on to say that ‘isolated incidents’, which though directly did not pose a challenge to maritime security, highlighted the need to further strengthen our coastlines and maritime security”. Saying so, he emphasised the need to replicate coastal security exercises with all stakeholders “as frequently as possible”.

He observed that modernisation of the Navy was going apace but however, pointed out that indigenous shipyards must “develop and expand rapidly, as well as adopt the latest best practices”. Even though the Navy has been making satisfactory progress in its indigenisation efforts, Antony said that such efforts must not only be continued but also accelerated. Talking about infrastructure development, Antony said that the development of infrastructure in the island territories must be pursued in synergy with other stakeholders. He also stated that Phase II of the Karwar project must be “pursued vigorously.”

Development of Navy’s Infrastructure

Admiral Nirmal Verma, Chief of the Naval Staff addressing naval commanders has said that “the primary challenge

confronting the Navy was to balance its resources in building human capital and a requisite strategy so as to be responsive to the full spectrum of operations”. The CNS also highlighted the progress made in various plans and programmes for modernisation of the Navy, alongside initiatives and new schemes introduced for promotion and welfare of sailors and their families.

“The aviation arm of the Navy is set to grow in the years ahead. The first lot of MiG-29K aircraft for INS *Vikramaditya* had been inducted this year and the balance is expected to be delivered in phases. A major milestone was the first flight of the P-8I Maritime Patrol Aircraft in September this year. This aircraft is on schedule for its induction in 2013.

Progress has also been made in the last few months for induction of new ships with contracts for five Offshore Patrol Vessels, two Cadet Training Ships, eight Amphibious Landing Craft and Fast Interceptor Craft having been concluded.

The Navy continues to maintain focus on development of operational and technical infrastructure, as the force levels increase. Cases for developing Forward Operating Bases (FOB), Operational Turn Around (OTR) bases and Naval Air Enclaves (NAE), on the mainland and in the islands are being progressed. Developing such infrastructure especially in Karwar and the far flung island territories has been accorded priority”.

Vice Admiral Anil Chopra is FOC-in-C, Eastern Naval Command

Vice Admiral Anil Chopra took over as the new Flag Officer Commanding in Chief, Eastern Naval Command on 31 Oct 2011 on the retirement of VAdm Anup Singh.

He has been appointed to various gunnery billets onboard INS *Vijaydurg* (1978-79), INS *Rajput* (1981-83) and INS *Gomati* (1987-89), has commanded the missile corvette INS *Kuthar* (1993-94), the destroyer INS *Rajput* (2000-2001) and the aircraft carrier, INS *Viraat* (2003-2004).

His appointments ashore have included Principal Director Naval Plans at Naval Headquarters, Chief Staff Officer (Operations) at Headquarters, Eastern Naval Command, Naval Assistant to the Chief of the Naval Staff and Senior Instructor (Navy) at the DSSC.

After a short assignment as the Assistant Controller of Carrier Projects, he was appointed as Assistant Chief of Naval Staff (Policy & Plans) at Naval Headquarters in early 2007. Prior to taking over as DGICG on 1 December 2008, Admiral Chopra was the Flag Officer Commanding, Western Fleet.



Pawan hans

Indian Navy orders eight Amphibious Assault Vessels

Indian Navy has signed a contract with GRSE, Kolkata for the construction of eight Landing Craft Utility (LCU) valued at Rs 2100 crore. The first ship is scheduled to be delivered in 35 months. The 800 ton LCU is propelled by two diesel engines and can carry Main Battle Tanks, BMPs, and personnel in various combinations. Another naval project to acquire four huge amphibious warfare ships or Landing Platform Docks (LPDs), for around Rs 16,000 crore, is also on the verge of being finalised by the MoD. The LCUs and LPDs will help in “swiftly transporting thousands of troops, tanks, infantry combat vehicles and other weapon systems over long distances to take the battle right to the enemy mainland”. The armed forces have been augmenting their amphibious warfare skills with a series of exercises over the last few years to practice blitzkrieg assaults on enemy territory from the sea.

RK Tyagi selected as new Chairman of HAL

The current Chairman and Managing Director of Pawan Hans Helicopters Ltd, RK Tyagi is to be the next Chairman of Hindustan Aeronautics Ltd. The Public Enterprises Selection Board recommended Mr Tyagi’s name as Chairman HAL after interviewing three other persons including SK Tripathi, Chairman and Managing Director, MSTC, and SN Mishra from the Ministry of Defence.



With a Bachelor of Engineering degree from IIT Roorkee and an MBA with specialisation in Marketing, he took over as Chairman of Pawan Hans Helicopters Limited in May 2007 earlier to which he was head of Air Logistics in the organisation.

HAL given Raksha Mantri’s ‘Award for Excellence’

Hindustan Aeronautics Limited (HAL) have been given the Raksha Mantri’s award for excellence in performance (2009-10). The officiating Chairman of HAL PV Deshmukh, received the award and citation from Defence Minister AK Antony on 14 November 2011. This was in recognition for achieving



HAL’s Offg. Chairman PV Deshmukh receives the award from Defence Minister AK Antony in New Delhi as VM Chamola, Director (HR) of HAL (left) looks on

“improved organisational performance excellence through research & development, improved production and financial performance, export promotions, technology upgradation, lean manufacturing practices, focus on customer service, adoption of quality management systems and human resources management initiatives, *Excellence in Performance* award in the Institutional Category, for year 2009-10 was conferred on HAL”.

5th successful flight of Rustom-1

The indigenously designed and developed Rustom-1 made its 5th successful flight on 14 November 2011, flying at an altitude of 2300 ft at a speed 100 knots during its 25 minute flight near Hosur.

This medium altitude long endurance unmanned aerial vehicle (Male UAV) is being developed by DRDO with the Aeronautical Development Establishment (ADE) Bangalore as the nodal laboratory and had its maiden flight in 2010. Specifically, the objective of testing “modified lift off scheme, modified altitude and speed hold logics” worked excellently well.



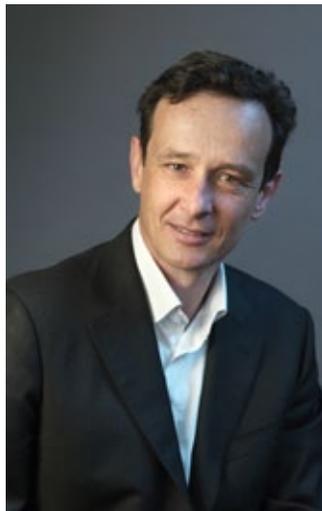
Avi - Oil

Collaboration on CBRN protection devices development

As a sequel to the recently signed Letter of Arrangement between India and the UK for collaboration in Defence technologies, a high level delegation led by Dr. W Selvamurthy, DS and Chief Controller Research and Development, DRDO visited the UK to interact with counterparts both in Defence as well as Chemical, Biological, Radiological and Nuclear (CBRN) Unit of the Office of Security and Counter Terrorism (OSCT). Seamus Tucker of the OSCT and his team of experts presented CBRN capability in technology, civil-military interactions and interoperability. The CBRN Defence technologies developed by DRDO were presented along with their applications in major international sporting events for protection of the sports personnel and the spectators.

Eric Lenseigne is Country Director, Thales India

Eric Lenseigne took over as Country Director & Managing Director of Thales India Pvt Ltd and based in New Delhi. Before moving to India, Eric was the Thales Group Country Director, Nordic and Baltic States and Managing Director of Thales Sverige based out of Stockholm, Sweden. His responsibilities include leading the Business Development activities for the Thales Group.



Saab India Technology Centre in Hyderabad

Saab India Technologies Pvt Ltd has inaugurated the Saab India Technology Centre (SITC) in partnership with Mahindra Satyam in Hyderabad which “aims to form a bridge between India and Sweden”. The aim of the centre is to support the internal operational excellence and optimisation



Saab President and CEO Håkan Buskhe

initiatives within Saab and also supporting Saab to expand in the Indian market. An initial base of 100 qualified Indian engineers is to be inducted and the SITC is expected to increase its headcount to at least 300 over the next three years.

The Centre will undertake research and development in aerospace, defence and urban innovation including civil security. The primary areas of development will include software engineering, electronic engineering and mechanical engineering. The SITC envisages future development in the areas of signal processing and systems engineering.

Inaugurating the SITC, Saab President and CEO Håkan Buskhe stated that “with the establishment of this Research and Development Centre, Saab has invested in a sustainable and long term relationship with Mahindra Satyam to co-develop critical technologies not only for India but to support our global markets. This Centre is a part of Saab’s future offer for the world market.”

CAE, InterGlobe Enterprises and Airbus in JV



CAE, InterGlobe Enterprises and Airbus have agreed on a joint venture for a new pilot and maintenance technician training centre in the National Capital Region. This will eventually train up to 5,000 pilots and technicians annually for airlines in India and the neighbouring region.

Rahul Bhatia, InterGlobe Group Managing Director, said “We are delighted to collaborate with CAE and Airbus to bring to the National Capital Region a world-class training facility. This training centre will be pivotal to meeting the needs of the civil aviation community in India and offer access to globally benchmarked training technology and solutions to aviation personnel here.”

CAE’s Jeff Roberts, CAE Group President, Civil Simulation Products, Training and Service said, “This will be the fifth CAE aviation training facility in the country and our entire focus at these training centres is enhancing the safety and operational efficiency of our customers.”

The centre will be located on 3.5 acres in the Greater Noida Industrial Area about 40 kilometres southeast of Delhi, with focus 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 Delhi training centre will initially house four full-flight simulators and will be capable of expansion to eight simulator bays. Advanced training technology will be used such as CAE Simfinity multimedia classrooms, computer-based training and brief/debrief facilities.

Rolls-Royce India “doing well”

After declaring their half yearly results, Anil Shrikhande, President Rolls-Royce India stated that “the results announced demonstrate the positive progress Rolls-Royce is making around the world—about 40% of the £8.7bn in orders secured during the first half were from customers in the Asia region, which is increasingly important to us. As you are aware Rolls-Royce has a trusted relationship with India since 1932 leading with its civil aerospace and defence aerospace sectors. Currently, all our businesses are well represented here and India is playing a growing role in the scale of our global operations. From licensed production to engineering services and component manufacture, the Rolls-Royce business continues to expand. We will continue to develop our vision for Rolls-Royce in India as a leading power systems company, deeply embedded in India’s industrial fabric and visibly contributing to its infrastructure and modernisation needs. This is an exciting time for Rolls-Royce and our partners in India.”



Swedish Security and Defence Industry and CII sign MoU

Swedish Security and Defence Industry (SOFF) and the Confederation of Indian Industry (CII) have signed an MoU to promote co-operation between India and Sweden in public security and defence. The MoU was signed at the SOFF stand at the Defence and Security Equipment international exhibition (DSEi), in London on 15 September 2011. As per the MoU, both CII and SOFF will continuously share and exchange information, organise trade missions and create opportunities for collaboration among companies of the two countries in the areas of defence, aerospace and security.

SOFF spokesperson Jan Pie said, “India is today seeking to build a defence industry with private participation to confirm its ascendance as a global economic power with strong stake in maintaining peace and security. India’s gains through indigenous development have taken its defence capability to impressive levels. Collaboration between Indian and Swedish companies will help build a broad-based, research and development oriented security and defence industrial bridge, between India and Sweden. This will result in spin-offs into non-defence sectors as well.”

CII head of Committee on Defence, Gurpal Singh stated that “Sweden has a long experience in the defence sector, with innovative technologies and development platforms that are recognised on a global level. The Swedish Defence Industry

has already been a partner to India and with this MoU we further strengthen our co-operation to be instrumental in the Indian development of an independent and indigenous defence industry.

EC225 demonstrated in India

Eurocopter carried out EC225 demonstration flights at Juhu airport in Mumbai on 1 November 2011 to introduce their ‘state-of-the art helicopter’. The EC225 is currently operated by global oil & gas sector companies around the world. Since its introduction in 2004, the EC225 has become the ‘reference helicopter’ for long range or deep water offshore operations.

The EC225 is the biggest helicopter from Eurocopter (11 tons class, 19 to 24 passengers’ seats) belonging to the Super Puma / Cougar family. Till date, over 800 units of this family logging in excess of 4,000,000 flight hours have been delivered.

“The oil and gas industry has been growing steadily and is expected to be a huge economic growth driver in India in the years to come. Helicopters represent a crucial element in the industry expansion process with already 15% of India’s helicopter fleet deployed in the oil and gas sector. Eurocopter being the global leader in the O&G segment will continue to play a crucial role by providing also logistical support to this growing sector” said Marie-Agnes Veve, CEO, Eurocopter India.



Honeywell APU selected by GoAir

Honeywell has extended its agreements with GoAir for the installation and maintenance of 131-9A Auxiliary Power Units (APU) on ten more of the airline's new Airbus A320 aircraft to provide auxiliary power and reduced operational costs. The agreement, which will see Honeywell install the new APUs between 2012 and 2014, builds on the company's existing ten-unit APU contract with GoAir and puts it in charge of APU maintenance across the entire GoAir A320 fleet until 2018.



John Ashton, VP airlines EMEA, Honeywell Aerospace stated that "designed specifically to match the requirements of narrow body air transport aircraft like the Airbus A319, A320 and A321, Honeywell's 131-9A Series APU will save GoAir up to 3.4 per cent fuel burn and provide a 10 per cent power advantage over other APUs, allowing it to cool or heat the cabin two minutes faster. In addition, GoAir has de-rated a majority of the APUs on its existing fleet to deliver reduced fuel consumption through Environmental Control System performance adjustments. This inbuilt option provides a total fuel burn benefit of 4.5 per cent, per aircraft duty cycle, over its original settings."

Jet Airways inks MoU with Vietnam Airlines

Jet Airways (India) and Vietnam Airlines have signed a memorandum of understanding (MoU), which covers the areas of commercial services, technical and training. This agreement was signed in the presence of Confederation of Indian Industry (CII) president B Muthuraman and members of the Vietnamese delegation in New Delhi.

This agreement with Vietnam Airlines is an integral part of Jet's strategy for increased international growth and providing seamless service for travellers between India and Vietnam. "The company is looking forward to the future of

cooperation and collaboration with Vietnam Airlines, bringing greater benefits to its passengers".

Subject to approval of respective governments, Jet Airways and Vietnam Airlines will jointly evaluate and implement services between India and Vietnam.

Kingfisher Airlines in financial turbulence

Dr Vijay Mallya Chairman of Kingfisher airlines has reportedly approached lender-banks for a reappraisal of working capital requirements following a 50% surge in price of fuel in recent months, but denied that the airline has sought any fresh debt restructuring.

He said most of the airline's Rs 600 crore dues to oil companies were backed by bank guarantees. "There are guarantees for almost Rs 560 crore, so the real exposure is only about Rs 40 crore." However, Kingfisher Airlines have cancelled 36% of their winter schedule of 418 flights, mainly owing to 'low load factors'.



Proposal to appoint an Aviation Ombudsman

With a sharp rise in number of “economically unstable airlines”, the government is finalising a slew of measures to come to the aid of hapless air travellers who are affected owing to cancellations of flights. The civil aviation ministry’s economic advisory committee met on 11 November 2011 to clear the way for setting up much-delayed aviation ombudsman who would do grievance redressal of air travellers. Also, an economic regulatory framework is being finalised for framing of airfares, which will also disallow

predatory pricing - practice of charging extremely low fares which force other airlines to follow suit and the entire industry goes sick. This is will also prevent foreign airlines from “dumping fares” in India and making Indian airlines economically unviable.

“The current practice of airlines giving a vast range of airfares where the sky seems to be limit is not a very satisfactory way of ensuring that the consumer is not fleeced. As of now, we can just ask airlines to charge up to the upper limit, which may be too high like Rs 24,000 for a one-way Delhi-Mumbai ticket. This framework will lay down guidelines for deciding fares, that will strike a balance between cost structure and consumer interest,” stated an official.

December 1971 War papers declassified

40 years after the epoch marking sub-continental war of December 1971, newly declassified US documents reveal some interesting details, giving the pro-Pakistani tilt of President Nixon and his Secretary of State, Kissinger.

“A carrier task force of the Seventh Fleet, Task Force 74, made a US incursion into the Bay of Bengal at the height of the Indo-Pakistan War of 1971 in December 1971. Task Force 74 comprised the nuclear-armed carrier USS *Enterprise*, the amphibious assault carrier USS *Tripoli*, three destroyers, *Decatur*, *McKean* and *Orleck*, three guided-missile escorts, *Waddell*, *King* and *Parsons* and a nuclear-powered attack submarine *Gurnard*, and supply vessel *Wichita*. On December 15, a day before the surrender of East Pakistan, the task force entered the Bay of Bengal, at a distance of some 1,760 km from Dhaka. Although the objective of this naval deployment appeared to be an attempt to assist Pakistan, the nature and extent of this assistance has remained unclear.”

On board the amphibious assault carrier USS *Tripoli* (LPH-10), sailing from Subic Bay were embarked the 2nd Battalion, 3rd Marine Regiment to be helilifted by Marine Medium Helicopter Squadron 164 alongwith support elements. The likely objective? Possibly Cox’s Bazaar, at the tip of East Pakistan from where evacuations could take place. It was here that the Indian Army shortly landed a battalion of Gorkha troops to secure the area even as the fall of Dacca was reaching its climax.

STOP PRESS

20 more Hawk AJTs for the IAF

The Ministry of Defence have cleared a proposal worth over Rs 3,000 crore for the procurement of 20 additional Hawk Mk.132 Advanced Jet Trainers (AJTs) for the Indian Air Force. According to reports, this decision was cleared at a meeting of the Defence Acquisition Council (DAC) headed by the Defence Minister A K Antony on 25 November 2011. The Government of India has already placed orders for 123 Hawks with BAE Systems, the first being for 66 aircraft, of which 24 were direct supply and the balance 42 licence manufactured by HAL at Bangalore. This was followed



by a second order for 57 Hawks (including 17 for the Indian Navy) placed in June 2010. It is understood that the additional Hawks will also facilitate re-formation of the Surya Kiran Aerobatic Team (SKAT) with the Hawk Mk.132 and will ‘fill the gap’ consequent to delays with the HAL IJT programme.



THE RISING TIES

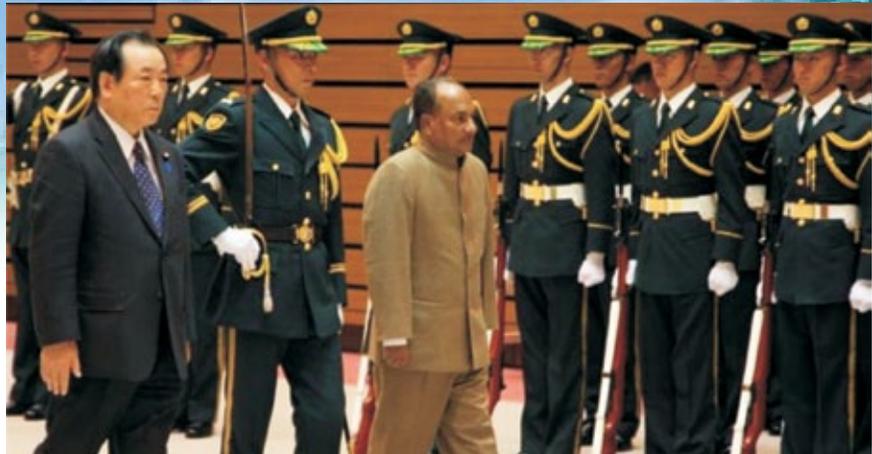
Paradigm Change in Indian-Japan Defence Cooperation

Maritime security, anti-piracy measures, freedom of navigation and maintaining the security of sea lanes of communication to facilitate unhindered trade by the sea routes were some of the issues that dominated the India-Japan Defence Ministers' Meeting in Tokyo late October and early November. The delegation level talks, led by the Defence Minister AK Antony and his Japanese counterpart Yasuo Ichikawa, recognised the importance of sea lanes and decided to "actively pursue consultations and cooperation in the field of maritime security both bilaterally and in association with all other countries in the region".

The Indian delegation included the Defence Secretary Shashi Kant Sharma, the Indian Ambassador to Japan, Alok Prasad, the Vice Chief of Naval Staff Vice Admiral RK Dhowan and GOC-in-C, Central Command, Lt Gen VK Ahluwalia.

Antony said that "maritime security challenges were becoming increasingly complex and varied." India has substantially increased its anti-piracy deployment in the East Arabian Sea since November 2010 but felt that concerted efforts of the world community, under a UN mandate, were necessary to effectively address the problem.

Mr. Antony stated that anti piracy efforts needed to be supplemented by adoption of better security measures by the world's maritime community. "There is a need to not only have a legal framework for prosecuting the pirates, but concerted efforts are also necessary to track the money-trail and to stop it from being channelised for funding terrorist activities, worldwide", he stressed, but expressed satisfaction at the fact that both



Defence Minister AK Antony and his Japanese counterpart Yasuo Ichikawa review honour guard at the Defence Ministry in Tokyo.

Navy were exchanging escort schedules of their naval vessels deployed in the region to coordinate anti-piracy efforts. He expressed the hope that the respective organisations from both sides—MLIT and DG Shipping—would be able to establish a mechanism to share the escort schedules with the merchant ships flagged with them.

Antony said the other serious issue in maritime security concerned the freedom of navigation and maintaining the security of the Sea Lanes of Communication (SLOC) to facilitate unhindered trade by the sea routes. This is of vital importance to all countries which depend on maritime trade. "India supports freedom of navigation in international waters and the rights of passage in accordance with accepted principles of international law, including the United Nations Convention of the Law of the Sea [UNCLOS]. These principles should be respected by all".

The two sides exchanged views on regional and international security and decided to step up defence cooperation and exchanges between the two countries. Antony said India-Japan defence cooperation was 'geared towards peace and prosperity of the region and is transparent'. Discussing specifics of exchanges and defence cooperation, the two sides expressed satisfaction at the planned activities based on agreed annual calendars. The Japanese Defence Minister will visit India early next year. Both sides will implement the Japan-India Defence Policy Dialogue in Tokyo,

also early next year. Both sides will implement Staff Talks between the Japan Ground Self Defence Force (GSDF) and Indian Army in 2012. Staff Exchanges between Japan's Air Defence Force (ASDF) and Indian Air Force will be held in 2012 and be developed to Staff talks at the earliest date.

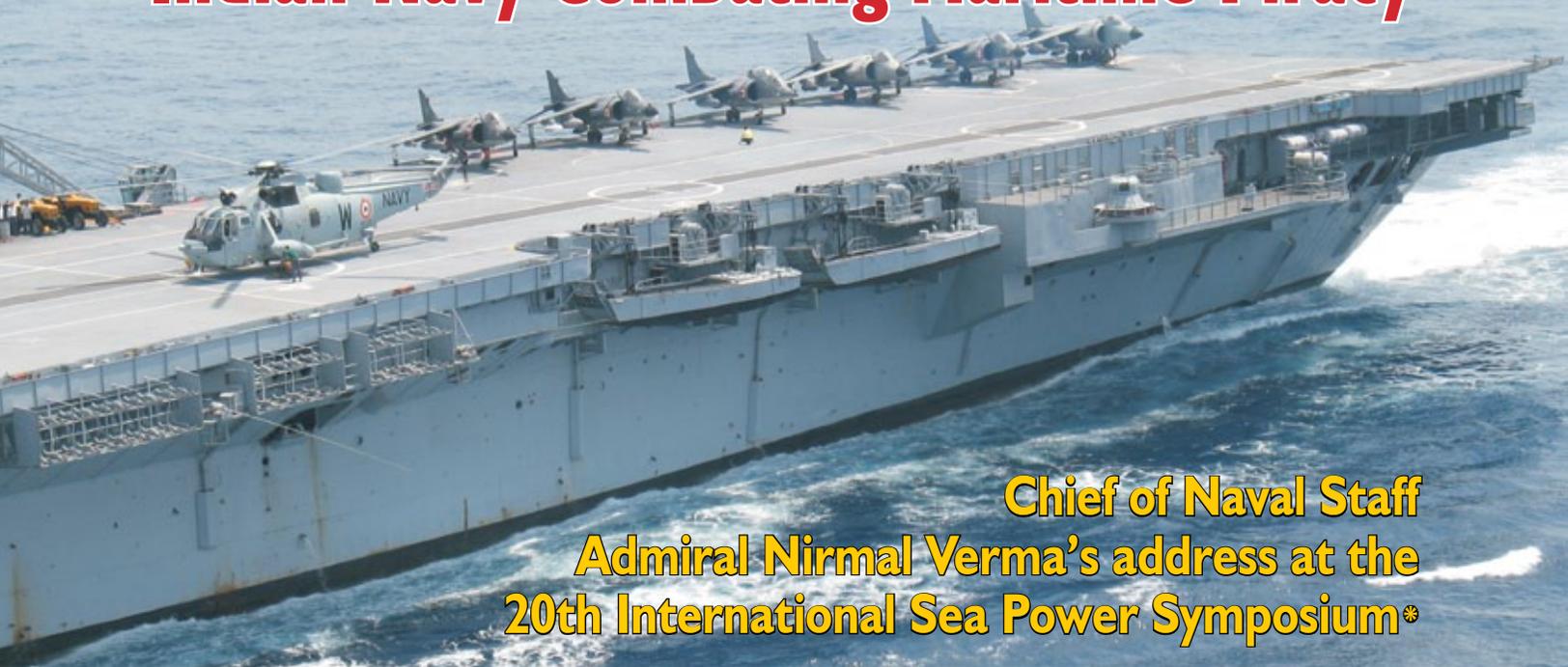
Both sides will carry out mutual visits of vessels and aircraft as appropriate and conduct bilateral exercise between the Japan Maritime Self-Defence Force (MSDF) and the Indian Navy. In 2012, vessels of both sides will make mutual visits and MSDF aircraft will visit India. Bilateral exercises will be carried out on these occasions. The two sides will implement exchanges on peacekeeping operations including exchanges between International Peace Cooperation Training and Exercise Unit of the Central Readiness Force of JGSDF and Centre for United Nations Peacekeeping (CUNPK), India. There will be cadet exchanges between the National Defence Academy of Japan and the National Defence Academy of India. The two sides will also implement exchange of ideas aimed at concrete collaboration, such as joint training for humanitarian assistance and disaster relief.

The two countries have resolved to continue to make active contributions to the peace, stability and prosperity of Asia as a whole. Buoyed by the outcome of the talks, AK Antony expressed confidence that in the coming years India-Japan defence cooperation would scale new heights.



Visiting Indian Defence Minister A. K. Antony (R) is welcomed by his Japanese counterpart Yasuo Ichikawa (L) prior to their talks at the defence ministry in Tokyo.

COLLABORATIVE ENGAGEMENT Indian Navy Combating Maritime Piracy



Chief of Naval Staff Admiral Nirmal Verma's address at the 20th International Sea Power Symposium*

The subject that has affected mariners since times immemorial and yet is very contemporary, is maritime piracy. The difference today is that piracy at sea which was previously robbery has now morphed into an elaborate network of operations to extract enormous quantities of ransom. Ransom amounts have increased to an average of \$ 5.4 million per ship, from just \$ 150,000 five years ago. According to a recent study by *One Earth Future* the economic cost of piracy is maybe as high as \$12 billion a year. This translates into increased operating costs, environmental expenses review, rerouting of ships and most importantly, tremendous human costs. Even as we speak, 9 ships with over 300 seafarers of a range of nationalities, including 53 of my own countrymen are presently hostages in this contentious conflict. Lethal force and physical abuse are being increasingly used by pirates to leverage ransom negotiations.

The roots of piracy are diverse: predominantly, political instability which has created a void of governance and economic opportunities ashore resulting in the manifestation of this menace at sea. Also worth reflecting upon are Somalian claims that the origins of piracy can be traced back to illegal fishing by other countries and dumping of toxic waste in their EEZ. Given the complications involved, no single response will solve the problem.

While there may be some ambiguities about what we can or should do, there is no doubt that the fundamental prerequisite to any solution is the collaborative engagement of a wide range of maritime nations and littoral states. In this context I would highlight the work of the Contact Group on Piracy off the Coast of Somalia (CGPCS) under the aegis of the United Nations, which we believe is doing sterling work for coordinating international cooperation particularly information sharing. In similar vein are the efforts of the Shared Awareness and Deconfliction (SHADE) initiative and that of UK Maritime Trade Operation (UKMTO) which functions from Dubai. These engagements have facilitated an agreement between independently deployed navies like Japan and India to coordinate their anti piracy operations, so that international shipping has more flexible options for escort schedules.

Beyond piracy's complex genesis, it is interesting to highlight the metamorphosis of pirate activities. Despite multinational efforts, the number of incidents and net effects of piracy are on the increase with seasonal variations on account of the



monsoons and geographic shifts dependent on the presence of naval units. The international efforts off the Gulf of Aden have resulted in piracy spreading to other areas of the Indian Ocean which had not experienced such attacks earlier. Some of these areas have been not too distant from India's Lakshadweep and Mincoy group of islands and naturally therefore this has been a cause of concern to us. It has become evident that pirates

are changing their modus of operations as they have been observed to use hijacked merchant vessels as mother ships. This has given them an extended reach of over 1000 nautical miles from the Somali coast.

Given their changing tactics and operations, it is as Clausewitz would tell us, imperative to strike at their centre of gravity 'the hub of all power and movement, on which all else depends'. To my mind, their Centre of Gravity is the elaborate network of financiers that fund operations and facilitate revenue collection. A recent UN report revealed that of the ransom paid in each incident of piracy, only 20% reaches the pirates, while financiers and sponsors hive off 50%. The question that begs an answer is

as to how they manage to divert funds in so unfettered a manner? Therefore, there is a need to build a strategy beyond multinational maritime counter piracy operations to facilitate tracking of the fiscal trail.

It is important that our efforts be cultivated before, what is at present a relatively benign problem of piracy, develops into a nexus with radical terrorism which has a cancerous potential.

Moving on to what we are doing and some thoughts about what it is that we can collectively achieve. What we are seeing today is a hitherto unprecedented, full and willing cooperation between a wide range of navies to combat piracy by providing credible deterrence thereby enhancing commercial confidence and facilitating freedom of navigation in the global commons.

What is required is collaborative engagement of both major maritime powers as well as the littoral states. The importance of littoral states towards a viable solution was best amplified by the success of the South-East Asian countries to combat piracy. While it is obvious to highlight that Somalia is a failed State, in stark contrast to the economically vibrant Southeast Asia, nevertheless, Somalia does have comparatively stable neighbours who could contribute to a regional response and international efforts could provide an impetus to the fledgling Somali Coast Guard. Larger maritime forces could facilitate training of local navies and coast guards.

We in India are particularly concerned about the safety of mariners in the Indian Ocean since we are geographically centred astride the major shipping routes in the region. Units of the Indian Navy have been tasked to carry out escorts in the Gulf of Aden, irrespective of their nationality, since October 2008. So far, of the nearly 1800 ships that have been escorted by the Indian Navy in the Gulf of Aden, more than 80% have been flying flags other than Indian. I had mentioned about the shift in the areas of operations of the pirates closer to our island territories and consequently we have had to increase our anti piracy deployments. This resulted in four pirate mother ships being intercepted by the Indian Navy and Coast Guard earlier this year. Consequently, there has been a reduction of piracy incidents in the area and we intend to maintain this posture to safeguard international shipping.

Subsequently, we also noticed a shift in the ISLs in the Arabian Sea as merchant vessels attempt to avoid piracy-prone areas. Some of these new routes are 15 to 20 nautical miles off our coast and there have now been instances wherein regular fishermen have been mistaken as pirates. In this cycle of 'cause-effect-cause', there is a real danger of innocent casualties on account of mistaken identities. We have therefore issued advisories on this aspect.

If piracy is to be deterred, the present 'risk versus reward quotient' must be inverted exponentially by the development of appropriate laws and Rules of Engagement. These require both national and international consensus which can be facilitated by an exchange of the first hand operational experience of navies presently involved in anti-piracy operations, beside ideas from legal and academic circles as well as the expertise and local knowledge of the regional players.



Naval forces have been facing a major dilemma about apprehending pirates at sea, due to the inadequacy or ineffective legal mechanisms to prosecute pirates who have been arrested. It is estimated that 9 out of 10 apprehended pirates benefit from the 'catch and release' policy followed by most navies till now. In India we are presently faced with the challenge of prosecuting over a hundred pirates apprehended by the Indian Navy and held in our country. We have moved to make new and effective domestic laws, and we hope to have these in place. I am sure similar challenges are being experienced by other countries as well and if we can share experiences in this regard, it will be a positive step in our collective fight against piracy.

While many of these are policy issues that may take time to craft consensus, there are operating procedures that can be adopted immediately. The Best Management Practices that have been published suggest a

variety of planning and operational practices for ship operators and masters of ships transiting through high risk areas. This is a noteworthy initiative which includes suggestions such as having high freeboards, proceeding at high speeds, use of barbed wire and water cannons, employment of sentries and establishing 'citadels' or 'safe rooms' onboard. One measure that is increasingly gaining preference is the use of armed security guards. In this context the maritime community has to be cautious of cases of mistaken identity which I had alluded to earlier.

To mitigate such risks we have been using acoustic devices that have long range capability with built in phraselators that facilitate passing instructions in Somali language.

Towards minimising the possibility of situational escalation we have resorted to a rather unique measure of using our ship's life rafts. Once the mother ship has been forced to stop, the pirates and crew are made to leave the mother ship and get on the life rafts released by the naval ship. This ensures that the pirates cannot carry arms after which, they can be brought onboard for further investigation.

The shipping community could consider installation of mechanisms to disable their engines once it becomes evident that pirates are succeeding in gaining control. This may discourage their attempts to commandeer the vessel with of course the attended risk of force escalation by the pirates on account of their frustrations. This reemphasises the importance of establishing a citadel onboard.

Finally, I would conclude with the reflection that international efforts towards combating piracy would benefit if there were fewer disparate task forces and independent naval operations. India's relative autonomy of efforts towards combating piracy off Somalia can be traced to its preference for a UN mandated operations which we believe if adopted would holistically enhance the efficacy of operations. Our Prime Minister in his speech at the UN General Assembly has called upon the comity of nations to evolve a comprehensive and effective response to the problem of piracy and has assured the world of India's readiness to work with other nations in this regard.

** Under aegis of the US Naval War College, Newport, Rhode Island, USA*

IAI

A Navy Day Perspective



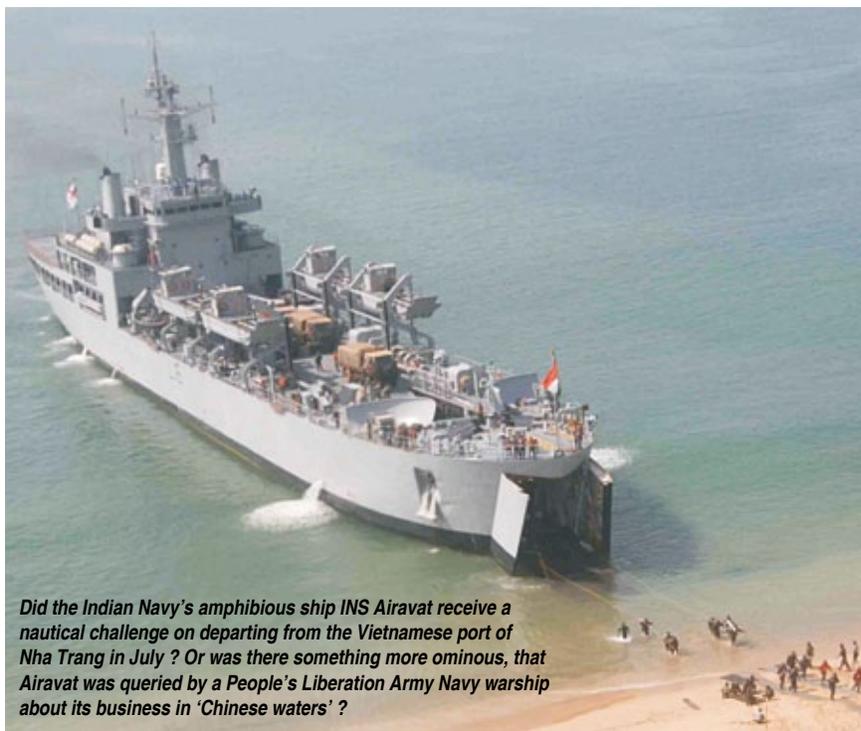
PLAN Type 052C destroyer (NATO code name Luyang II class) features an Active Electronically Scanned Array (AESA) radar system with four statically-mounted antennas for 360-degree coverage. The radar is used in conjunction with vertically launched HHQ-9 long-range air defence missiles. The helicopter in flight is a PLA Navy Z-8JH based on the French-made SA 321Ja Super Frelon while on the aft deck is a Zhi-9C/D, itself based on the AS 365N Dauphin II.

Appraising the Dragon's Teeth

Admiral Arun Prakash (Retd) former Chief of Naval Staff writes on the new developments that challenge the Indian Navy in far distant waters more than ever before.

With its land borders secure and in a world of declining defence expenditures, China's spending on its armed forces has been seeing a sustained 15%-20% annual increase over the past decade. The acquisition, by China, of significant offensive capabilities for waging space and cyber warfare, apart from the continuing accretion of ICBMs, nuclear submarines and now stealth-bombers and aircraft carriers, seem to belie its protestations of 'peaceful intent'. As far as India is concerned, despite burgeoning bilateral trade, its strategic rivalry with China is rapidly spilling over into the maritime domain. This could be aggravated by an emerging overlap of interests because as China looks towards the Indian Ocean, India too is finding 'interests' in the South China Sea.

In a new development which took place in September 2011, India has found itself drawn into the South China Sea imbroglio. Its plans to commence joint



Did the Indian Navy's amphibious ship INS Airavat receive a nautical challenge on departing from the Vietnamese port of Nha Trang in July? Or was there something more ominous, that Airavat was queried by a People's Liberation Army Navy warship about its business in 'Chinese waters'?

offshore oil exploration with Vietnam have already drawn fire from the Dragon. This is the area where China's overbearing claim to almost all of the South China Sea is causing anxiety. By the simple expedient of drawing a U-shaped, line with nine-dashes as the basis for "indisputable sovereignty over the islands in the South China Sea", China could well threaten stability in East and Southeast Asia.

India's naval analysts must keenly be monitoring maritime developments in China because, regardless of actual intentions, each of these capabilities could impinge on India's maritime interests and the Indian Navy's (IN) operational matrix. Moreover, there are many lessons to be derived too. Both the PLA Navy (PLAN) and IN are pursuing projects involving modernisation of old aircraft-carrier hulls, as well as plans to build new carriers despite the environment turning increasingly hostile to this type of warship. Indian scientists and engineers are racing to operationalise the INS *Arihant*,— first nuclear-propelled submarine – a challenging exercise in self-reliance that China seems to have mastered after a 30 year struggle.

Navy Day 2011 would therefore an appropriate occasion for India's naval leadership to undertake an assessment of China's strategic intent and an appropriate Indian response.

Changing Paradigms

China's ongoing military modernisation, force restructuring and doctrinal review are chiefly focused on deterring any declaration of independence by Taiwan and on acquiring a capability to counter external intervention which this may occasion. The latter will, obviously, be initiated by the US naval and air forces located in the Asia-Pacific region. In this context, a significant section of American analysts have believed, for many years, that the PLAN was incapable of posing a real threat to US forces. It was, therefore, theorised that China was preparing to pursue what they termed an "anti access/area denial" (or A2AD) strategy. Such A2AD capability relies on the DF-21-D ballistic missile, configured to home on to a ship target, and a force of nuclear attack submarines to deter the carrier task force.

The A2AD strategy, which strangely did not find mention in Chinese discourse, was supposed to "deter, slow down and



disrupt the deployment of US Navy carrier task forces", the ultimate aim being to frustrate US attempts at military intervention in Taiwan. Viewed with utmost seriousness by the Pentagon, China's A2AD capability has been the

focus of doctrinal attention for some years now. Amongst other measures, US forces had recently evolved an 'Air-Sea Battle' concept which aimed to integrate air and naval forces in order to defeat this latent threat.



The arena of a new Great Game?



Indian Navy's Rajput-class guided-missile destroyer.

In the midst of all this, it is interesting to note that US analysts are now veering around to the view that China's strategy is actually far more radical and goes well beyond A2AD. Using military innovation in air and naval warfare, the PLAN aim has shifted from the aiming for mere delay and harassment of intruding US forces to the far more ambitious aim of paralysing and destroying them through a concerted campaign of ballistic missile warfare.

According to a Congressional Research Service report, China has reoriented its strategy and restructured their 2nd Artillery Corps so that it can bring to bear highly accurate conventional missiles against threats up to 2500 km away. China's conventional missile arsenal is reported to have been expanded during the last decade to include large numbers of medium-range ballistic missiles of the DF-21 family, and long-

range cruise missiles of the Chinese HN-1 and Russian *Klub* and *Moskit*-classes. Saturation attacks with these accurate weapons launched from shore, ship, submarine and aircraft are meant to neutralise US assets, both at sea and on land. A set of extra long-range over-the-horizon (OTH) radars, in combination with a galaxy of 30 Chinese satellites are meant to provide such precise target information.

A second objective of the PLAN, equal in importance to insulation of Taiwan, is protection of seaborne trade and energy traffic. China, in its quest for securing strategic resources, has cast its net worldwide, from Australia to the Russian Far East and from West Africa to the heart of South America. These far flung economic interests make China dependent on extended sea lines of communication which criss-cross the Indian Ocean and expose huge maritime vulnerabilities. This sea lane dependency is certainly a cause for unease in China and adds to the logic of creating a powerful blue-water navy.

The PLAN Profile

Currently in its 64th anniversary year, it is largely Admiral Liu Huaqing's vision that has transformed the PLAN from a relatively inconsequential coastal force to a substantive blue-water navy. In order to discharge its assigned roles and missions, the PLAN has embarked on an ambitious acquisition programme which is a mix of indigenous production and imported platforms. Current PLAN strength, in terms of principal combatants, is estimated at 30 destroyers, 60 frigates, 65 submarines (diesel and nuclear) and 300 aircraft. In addition there are a large coastal and amphibious components backed by a Marine force.

Till a few years ago, the PLAN used to exhibit considerable diffidence towards venturing out of home waters or to participating in multi-national activities, including humanitarian assistance such as the 2004 tsunami relief efforts. Whether the diffidence arose from shortcomings in human or material resources, or in doctrine is something that has not been clear.

However, all this seems to have changed with the dispatch, in December 2008, of a task force for an extended anti-piracy patrol to Somalian waters. This was followed by a second deployment

Role of the United States in the disputed South China Sea

The Obama administration's growing role in mediating regional tensions around the South China Sea has stirred new interest in an international maritime treaty that could advance US goals, especially its demands for restraint by China. During the East Asia Security Summit at Indonesia in the third week of November, President Barack Obama has initiated moves to ease territorial disputes between China and its neighbours "before the conflicting claims become a flashpoint for conflict".

Mr Obama's emphasis on promoting the rule of law, especially where China is concerned has encouraged those who support the Law of the Sea treaty, a 1982 global legal framework under United Nations auspices that the U.S., alone among major nations, has never ratified. It is felt that the US Senate ratification would help U.S. efforts to parry Chinese attempts to claim much of the South China Sea, a resource-rich conduit for roughly \$5 trillion in yearly global trade.

For the last four years, the Pentagon has warned that China is resorting to the use of "legal warfare" to expand its position in Asia, compiling scholarly and legal research to advance its interpretations of international law, to the detriment of neighbors.

Meanwhile, US Secretary of State Hillary Clinton said while visiting the Philippines that the US wants to see "the Law of the Sea used as the overriding framework for handling territorial disputes." China has repeatedly asserted that it prefers addressing any dispute with its neighbors one by one, rather than multilaterally.

in April 2009 and since then, there has been a continuous PLAN task force on station off the Horn of Africa. While the primary objective of these deployments has been “to protect merchant traffic passing through the Gulf of Aden against piracy”, their success has boosted China’s confidence and resolve to use maritime power to protect its overseas interests.

The Chinese Carrier

In the context of long-range blue water operations, the PLAN obviously suffered from an intense feeling of vulnerability, owing to the lack of integral air power. The acquisition of an aircraft carrier has been on its wish-list for many years, as much for its combat capability as for the ‘big power’ status it bestows.

Having purchased the hulk of the Australian carrier HMAS *Melbourne* in 1985, China went on to acquire the former Soviet carriers *Minsk* and *Kiev*. These acquisitions were part of a Chinese master-plan to closely study and undertake, if possible, the reverse engineering of such a ship. Then in 2000, the 20-year old, 65,000 ton *Varyag* was purchased, ostensibly by a private Chinese company from the Ukraine, but on arrival in Dalian she was appropriated by the PLAN and placed in the care of a shipyard.

Varyag’s fate remained shrouded in secrecy and speculation for nearly a decade. Recent reports about this ship, reportedly re-named *Shi Lang* (after a 17th century Manchu admiral) sailing out for her first sea trials, have caused a ripple of animation in maritime circles.

The former *Varyag* is of nearly the same vintage, but bigger in size and aircraft capacity than the Indian Naval carrier INS *Vikramaditya* (former *Admiral Gorshkov*) currently undergoing major modifications in a Russian shipyard. The two ships appear to have a similar Soviet-era weapon fit, and both were acquired with a non-functional propulsion system. While the Dalian shipyard has obviously managed to re-commission the *Varyag*’s complex machinery plant and refurbish the ship in 6-7 years, the Russian shipyard is still struggling to meet a 2012 deadline for completing an almost similar scope of work on the *Gorshkov*.

However, the *Shi Lang* has a long way to go as yet. It may take a year or more for the shipyard to complete her extensive machinery, weapons and



Type 093 Shang-class Nuclear Attack Submarine.

systems trials programme before declaring the ship seaworthy and handing over to the PLAN. Built with a 12 degree ski-jump in the bows, the *Shi Lang* is not equipped with a steam catapult, and if she is fitted with an aircraft arrestor gear, then the classification STOBAR (short take-off but arrested recovery) carrier will apply.

No contemporary western combat aircraft claims a ski-jump operating capability. Therefore for ships such as the *Varyag* the choice of aircraft is limited to just three Russian machines capable of STOBAR: the Sukhoi Su-33 (also known as Sukhoi-27K) and MiG-29K fighters, plus the Sukhoi Su-25UTG trainer. Another candidate could be the Shenyang J-15 ‘Flying Shark’, a reverse-engineered Chinese version of the Su-33.

It is obvious that the PLAN has some years to go before it can claim to have an operational carrier at sea. Till then the *Shi Lang* will remain a trials-cum-training ship for its own purpose. Once a suitable aircraft type is inducted, PLAN pilots, as well as aviation support crew will need to learn how to operate this from the carrier’s deck. Only when all of them are proficient will the *Shi Lang* count as an operational aircraft carrier.

In the long term perspective, it is obvious that the *Shi Lang* would have been merely a stepping stone in China’s maritime grand strategy which envisages 4-6 aircraft carriers. India too has a programme which envisages the indigenous construction of up to three carriers of 40,000-60,000 tons displacement. We also have a carrier-borne aircraft under development; the LCA (Navy). While India is certainly not in a position to enter a naval arms race

with China, it currently has the advantage of half a century of carrier operating experience.

Nuclear Subs

The PLAN’s first nuclear propelled boat was an attack submarine (or SSN), the *Han*, which went to sea in 1974. A more successful design designated the *Shang*-class has followed. The single *Xia* class ballistic missile submarine (or SSBN) has been superseded by the brand new *Jin* sighted in 2009 near a major underground submarine base in Hainan.

Armed with a battery of twelve 8000 km range JL-2 ballistic-missiles (which can target both San Francisco and New Delhi from the South China Sea), the *Jin*-class of 5-6 SSBNs will represent a quantum jump for the Chinese nuclear deterrent. It not only endows China with a better deterrent against a US first-strike but also with greater coercive power, as far as the region is concerned.

Currently Chinese SSNs are possibly being used a counter-poise to US Navy surface forces, including carrier battle groups in the Pacific. Should they be deployed in the Indian Ocean, either in combination with PLAN surface ships or on their own, they could transform the balance of maritime power because of the significant threat they will pose to India’s naval forces as well as merchant shipping.

The sinking of the Argentinean cruiser *Belgrano* during the 1982 Falklands War provided a glimpse of the havoc an SSN could wreak. While bolstering its anti-submarine warfare capabilities, the IN must persuade the national security



Missile Destroyer Haikou 171 of the PLA Navy's South China Sea Fleet.

establishment that the SSN could be a game-changer in the Indian Ocean and that there is an urgent need to dedicate resources to the creation of a small force of 3-4 SSNs to exercise sea-denial and counter a possible PLAN threat.

A Maritime Response

The Sino-Indian military equation along the Himalayan borders, given the relative geographical location of air bases, missile sites and army formations, coupled with quality of interior lines of communication, is heavily tilted in China's favour. Moreover, in the case of a Sino-Indian conflict, Pakistan could render instant support by opening a 'second front'. Under these circumstances, the best that the Indian Army and Air Force can hope to achieve is a precarious stalemate. It is against this background that we need to look seawards and examine what the maritime domain has to offer.

The burgeoning demand from China's energy-hungry economy has led to increasing dependence on overseas imports. China has acquired energy assets abroad, mostly in Africa and the Persian Gulf, and most of it comes home by sea. This then is a strategic vulnerability, because about 70% of China's exports and 90% of its oil imports are shipped via the Indian Ocean and have to transit across

extended sea lanes via the Hormuz and Malacca Straits past India's doorstep.

The Indian peninsula, located at the head of the Indian Ocean, almost at the median between key choke-points of Hormuz and Bab el Mandeb on one side and Malacca on the other, actually dominates the sea lanes of communication that criss-cross its home waters. At the same time, Indian island territories in the Arabian Sea and Bay of Bengal constitute strategic maritime outposts. India can, thus, closely monitor these vital arteries of trade, commerce and energy that virtually go past its doorstep.

The growth of the IN has been structured so that over the next few decades, the Service can shoulder its responsibilities in the Indian Ocean and meet all foreseeable challenges. The ability of the Indian Navy to dominate and, if required, interdict Indian Ocean sea lanes must be factored into the larger security calculus. It is in India's interest that the Indian Ocean be made the arena wherein our maritime forces can be brought to bear in a reckoning with an adversary.

So, while the tools for India to exploit its invaluable maritime advantage are being crafted, it is essential that we also evolve a set of cohesive long-term strategies to guide our actions and safeguard our interests.



Project 1166 (Gepard class) frigate for the Vietnamese Navy.

A National Maritime Strategy

Given their longstanding territorial disputes, respective geo-strategic ambitions and competition for scarce resources, it would be naive to assume that the 'rise' of two powers in such close proximity can be peaceful. In terms of maritime capability, China's rapidly growing surface ship fleet and her force of homebuilt nuclear submarines are now ready for operational deployment. The extended PLAN anti-piracy patrols in the Horn of Africa may just be a dress rehearsal for deployment in the waters of the Indian Ocean.

In the overall picture, China's inexorable rise poses an existential dilemma for India and the options before us to counter threats or coercion are stark. Either we accelerate our economic growth and boost military muscle to stand up on our own, or we strike alliances with willing partners who have convergent aims. If neither is possible, our diplomats must really do all they can to avoid a serious confrontation and buy time.

However, in the interim there are some specific areas that we need to focus upon, as part of a national maritime strategy:

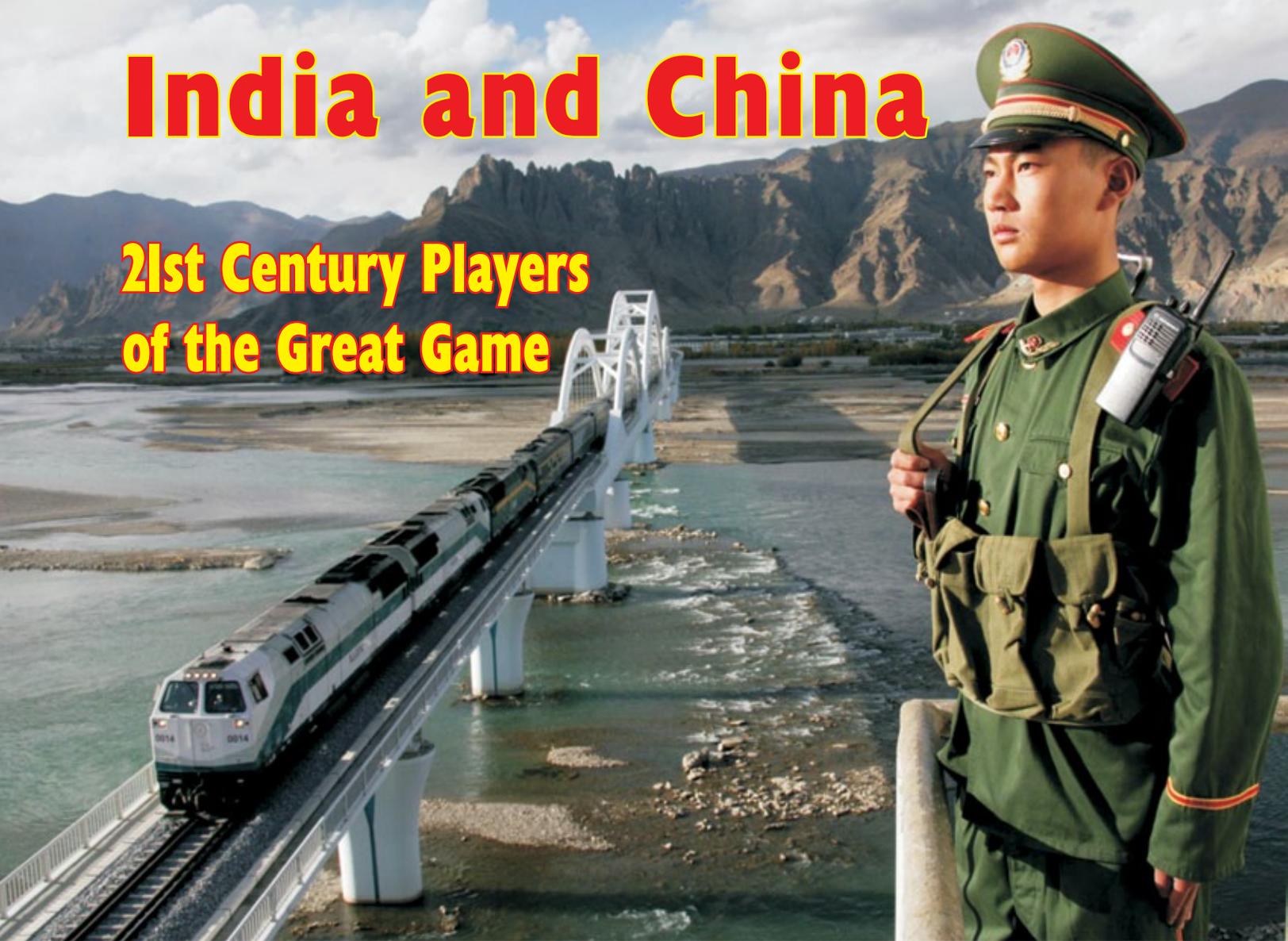
- Rapid attainment of self-reliance in weapon platforms.
- Modernisation and re-vitalisation of warship-building capability.
- Creation of a national capability for serial production of nuclear submarines.
- Creation and sustenance of strong ties with maritime neighbours in the Indian Ocean.

The US Navy's leadership has been articulating serious concern about a number of challenges that China is about to pose in the maritime domain. Apart from its demonstrated prowess in space and cyber warfare, these include the A2AD strategy, to be replaced or supplemented by the missile warfare strategy, its plan to field a number of aircraft carriers in the near future; and its apparent mastery of stealth aircraft technology as manifest in the J-20 prototype.

The very same threats and concerns will impinge on India sooner or later. We need to start thinking about them with all seriousness.

India and China

21st Century Players of the Great Game



Stark evidence of the Chinese ability to rapidly reinforce its Army and Air Force formations in Tibet is this image of a train on the Qinghai-Tibet Railway being used for the logistic support of the PLA Air Force in Tibet. The rail link which begins at Golmud and goes up to Lhasa was completed in 2006 and adds a new dimension to the Chinese build up in Tibet. There are plans to extend the rail network up to the Tibetan town of Dromo, which is close to Nathu La in Sikkim.

In the millennia before India freed itself from British colonial rule, it had tolerated and accommodated (mostly assimilated) invader after invader but ended up by becoming poor and penniless itself. Immediately after Independence, India not only faced armed hostility from its partitioned part, but complacency grew in the form of some popular perceptions that its massive northern neighbour, China, was a peaceful nation: thus ‘Hindi-Chini Bhai Bhai’ became a popular slogan. This dream was shattered by the frontier war of 1962, along the north-eastern and Ladakh frontiers. That traumatic experience is still acutely manifest in Indian psyche half a century later.

China has now become a super economic power and India is striving to attain the same. Despite diplomacy and growing trade between the two countries,

there remains an air of ambiguity, with constant challenges to the security and integrity of the country. In fact, there is deadly and palpable rivalry between these two most populous countries on earth and no degree of rationalisation can wish that away!

There are many signals that a face-off is building up. In March this year, China announced a 12.7% hike in its declared defence budget, the military allocation for 2011 being \$91.5 billion as against India’s defence expenditure of \$36 billion. Analysts are, however, of the view China actually spends double the amount that it officially declares.

And then there are not so subtle threats. The *Qiushi Journal*, official publication of the ruling Government party warned that “China must send a clear signal to our neighbouring countries that we don’t fear

war, and we are prepared at any time to go to war to safeguard our national interests”; further, “China should use its economic clout and trade as a weapon to rein in neighbours”.

Chinese warships are now regularly sailing across to the Gulf of Aden, circumventing the Indian peninsula. China continues its inflexible position on the boundary with assertive behaviour along the Line of Actual Control (LAC) with India, even as it is helping Pakistan build its nuclear, missile and conventional military arsenals. Defence Minister AK Antony referred to this “increasing assertiveness” of China in his address during the Combined Commanders conference in New Delhi recently.

Of late there have also been renewed efforts by China to expand its footprint in the Maldives Islands, which SAARC

country is particularly close to India. China is planning to establish a full-fledged embassy in the Maldives and has plans to take charge of development projects in the 1190-inland archipelago. China is showing special interest in developing the Lhavandhoo and Maarandhoo islands and keen to handle development of Maldives's second international airport at Hanimaadhoo. Even more menacing, from the security angle, is China's reported plan to establish a submarine support base in Marao, one of Maldives's islands.

That China has for long been building its maritime and other close contacts with countries in East Africa, the Seychelles, Mauritius, Sri Lanka, Bangladesh, Myanmar and Cambodia apart from Maldives, confirms the reality of encirclement of India by China, euphemistically dubbed as the 'string of pearls'.

One should however be cognisant of the efforts India has been making to counter China's strategic moves and is stepping up its defence-oriented relationship and reciprocity with such island nations as the Seychelles, Mauritius and Maldives. Indian warships and Dornier maritime patrol aircraft are conducting maritime patrol and surveillance around the Maldives and with India's help,

a network of ground radars is being established on 26 atolls, linked with Indian military surveillance systems.

On the other hand and very sensitive to the Indian Navy's occasional presence in the South China Sea, is China's resistance to oil exploration by India's ONGC. In July, the INS *Airavat* sailing in the region was given a warning which implicitly warned India to refrain from any activity, commercial or military in "Chinese maritime territory". The PLA Navy (PLAN) is dominant in this area and China's aggressive stand on the issue of free navigation in the South China Sea has made littoral countries in the region, particularly Vietnam and the Philippines, even more wary of China. According to an analyst, though India supports a negotiated settlement consistent with international law, the Vietnamese EEZ where ONGC is planning to explore is also claimed by China. This puts India directly into the crossfire of the ongoing conflict between China and Vietnam.

China opposes India's plan for joint oil exploration with Vietnam in the disputed waters as this challenges China's core national interests, which will "damage bilateral ties and affect China's position on India's broader role in international society". For China, the rivalry with India

is not just for energy resources, but to assert its undisputed power in Asia: the only rival to be seriously taken by China has been the USA. The commissioning of China's first aircraft carrier has added further anxiety, particularly for Japan, whose vital interests are linked with the oceans that surround it.

Back on land, Chinese assertiveness vis-à-vis India is heightened by its increased presence in Pakistan-occupied Kashmir (PoK), even as China has undertaken major port construction projects in India's periphery, be it Pakistan, the Maldives, Sri Lanka and Myanmar – an attempt to "encircle India from all sides". While any benefits of ONGC's project to explore for oil in the South China sea can be debated, India cannot ignore China's massive build up of its military infrastructure along the northern Himalayan frontiers. China presently has five fully operational air bases, an extensive rail network and over 58,000 km of cross-country roads in the Tibet Autonomous Region. It can rapidly move 30 divisions (each with over 15,000 soldiers) to their 'launch pads' along the LAC at short-notice, outnumbering Indian forces by at least three-to-one.

In this grim scenario with sinister portents, what are India's defence



PLAN submarines at a Chinese naval base.



PLAAF Sukhoi Su-27s on training flight over Tibet.



The PLA has been carrying out strategic airlift exercises by Special Forces, designed to train and test the ability of the PLA to mobilise military and civilian aircraft to transport troops and material over long distances. PLA paratroopers have also been trained to parachute to land at 5000 meters above sea level (about 16400 feet) in mountainous terrain.

responses if the tragic drama of 1962 is not to be re-enacted? Analysts are monitoring various steps that Indian defence forces are taking to face the challenges in the near future. The Indian Air Force is, as reports indicate, deploying advanced combat aircraft,

UAVs and helicopters to the east in support of the three Indian Army Corps deployed in defence. Construction of over 5,500 'permanent defences and bunkers' along the border are ongoing under the Rs 9243 crore military infrastructure development project.

The Indian Army has been planning a Mountain Strike Corps, having recently raised two new Mountain Divisions, with 1260 officers and 35,011 men, established at Zakama in Nagaland (56 Div) and Missamari (71 Div) in Assam. The Government has given the go-ahead for deployment of Brahmos cruise missiles in Arunachal Pradesh, apart from fresh accretion of 89,000 troops along with 400 officers, estimated to cost Rs 65,000 crores. The Army's expansion on the Chinese border is reportedly to include establishment of a Corps headquarters at Panagarh in West Bengal, along with two more Mountain Divisions.

The IAF is upgrading ALGs in the eastern sector, including those at Pasighat, Mechuka, Walong, Tuting, Ziro and Vijaynagar along with several helipads in Arunachal Pradesh. In the western sector, ALGs at Daulat Beg Oldi, Fukche and Nyoma have been activated.

Apart from progressively basing Sukhoi Su-30MKI fighters and air defence missile squadrons, the IAF's plan includes upgrading the Nyoma advanced landing ground in eastern Ladakh at an altitude of 13,300 feet. With its runway length being increased to 12,000 feet, Nyoma will



With the recent commissioning of INS *Shakti*, the second ocean-going fleet tanker received from Italy, the Navy's force level has reached 132 warships including over 50 'major combatants' and 14 (though aging) submarines. In addition, there are 46 ships 'on order' for the Navy at different domestic shipyards, apart from the aircraft carrier INS *Vikramaditya* (refitted *Admiral Gorshkov*) and three *Talwar*-class stealth frigates being built in Russia.

Defence sources have reported on other major projects taking shape: including the Rs 52,000 crore 'Project-75 India' to acquire six new-generation stealth submarines with air-independent propulsion, equipped with land-attack missiles. Six *Scorpene*-class submarines are being constructed at Mazagon Docks, at a cost of Rs 23,562 crore. The Indian Navy has already received the first lot of carrier-borne MiG-29Ks and is expanding its fixed wing maritime reconnaissance force, plus multi-role helicopters and UAVs which will cost another Rs 85,000 crore.

Amongst new areas of friction between China and India, which may even lead to military confrontation unless resolved diplomatically, is a new development in Arunachal Pradesh and other parts of the north-east where India has discovered a 'treasure trove' of shale oil. It is estimated that these deposits could produce 140 million tonnes per year for 100 years finally making India self-sufficient in oil. But, this shale oil in the area makes China's attraction to this area all the more acute and challenges to India's defence forces severely daunting.

Gp Capt JC Malik (retd)

provide both defensive and offensive options. Similarly the airfield at Kargil will be extended to allow operations by strategic airlift aircraft, including the C-17 Globemaster III and C-130J Super Hercules, and there is talk of fighters being deployed at these forward bases as well. (According to reports, the next squadron of C-130Js will be based at Charbatia in Orissa).

Simultaneously, the Indian Navy is being expanded and modernised. In the pipeline are several ongoing warship, submarine and maritime aircraft acquisition programmes as well as infrastructural projects, at a cost of more than Rs 300,000 crore.



'Friendship Place': ceremonial meetings regularly take place between Indian and PLA officers at Bum La, on the McMahon Line along the Arunachal – Tibet frontier, scene of severe fighting in October 1962.

Flanker vs Flanker



Indian Air Force Sukhoi Su-30MKI taking off during Exercise Red Flag at Nevada.



File photo of Shenyang J-11B

In a future scenario, Indian Air Force Sukhoi Su-30MKIs could well be facing PLAAF Shenyang J-11Bs for air dominance above the ‘roof of the world’ : Tibet. According to Chinese sources, the first J-11Bs (Chinese-built version of the Su-27K) to be deployed in Tibet were from the 97th Regiment of the 33rd Fighter Division from the Chengdu Military Area Command which first carried out operational exercises over the plateau during July 2010.

The first deployment of Indian Air Force Su-30MKIs took place when No.2 Squadron was reformed at Tezpur in the Assam valley in June 2009. A second squadron with Su-30MKIs followed two years later, being based at Chabua in North Eastern Assam.

According to Air Marshal KK Nowhar, then AOC-in-C Eastern Air Command, “the idea is to ensure that the skies and the borders in the east are well protected and secured. The Sukhois can be used for both offensive as well as defensive purposes”.

The north eastern Indian state of Arunachal Pradesh shares a 1,030-km unfenced border with Tibet-China, the frontier defined by the McMahon Line, a notional boundary now known as the Line of Actual Control (LAC). China has not recognised the McMahon Line and claims 90,000 sq km or almost all of Arunachal Pradesh even as China has occupied 8,000 sq km in North Eastern Kashmir (the Aksai Chin plateau).

Meanwhile, there are images and reports of Chinese S300PMU long-range surface-to-air missiles being transferred from the Jinan Military region to the Tibetan plateau and their deployment in the Lhasa and Gonggar areas. According to reports, “China is very sensitive to the Indian Air Force action of deploying Su-30MKI fighters at two air force bases close to the China-India border”.



The first Su-30MKIs of No.2 Squadron on arrival at Air Force Station, Tezpur.



PLA personnel with S300PMU2 long-range surface-to-air missiles.



Pair of PLAAF Shenyang J-11Bs take off from an air base in Tibet.

A CENTURY OF Maritime Patrol Aircraft



The Blackburn Iris biplane flying boat.



Focke-Wulf Fw 200 Condor.

Royal Naval Air Service during World War I, primarily on airborne patrol against the growing threat of German submarines. There were complemented by lighter-than-air ships (Zeppelins and Blimps) which were capable of staying aloft for long periods of time (as much as 10 hours) as needed for such tasks, whilst still carrying useful payload. Shorter-range patrols were mounted by adapted bombers such as the Sopwith 1½ Strutter. Later in the war aeroplanes were developed specifically for the role and were usually large floatplanes such as the Short 184 or flying boats such as the Felixstowe F.2.

The generic term for ‘maritime patrol’ (or reconnaissance) aircraft (MPA), essentially denotes a fixed-wing, multi-engined aircraft type, designed to operate for long durations over water, in particular for anti-submarine and anti-surface vessel warfare, intelligence - surveillance - reconnaissance (ISR) tasks, as also search and rescue.

The first aircraft that can be considered as pioneers in this role were flown by the

Between the wars, aircraft like the Blackburn Iris biplane flying boat aircraft appeared, but on advent of the Second World War, maritime patrol was undertaken by aircraft converted from long-range bombers or airliners such as Germany’s graceful Focke-Wulf Fw 200 Condor. To protect the vulnerable convoys in the North Atlantic, the British introduced a ‘Very Long Range’ version of the Consolidated B-24 Liberator bomber which was capable of patrolling the vast areas between Iceland and Greenland

RAUG

and also to attack German submarines. Interestingly, the Indian Air Force adopted the B-24s 'retrieved' from the bomber's graveyard at Chakeri (Kanpur), for maritime patrol and these were operated by No.6 Squadron from Poona for nearly two decades. Other WWII maritime patrol aircraft included the German Dornier Do-24 and the American Consolidated PBY Catalina, both being amphibian aircraft.

After World War II the maritime patrol role was generally allotted to converted civilian airliners that had both range and performance better than most wartime bombers. The Lockheed Electra thus became the P-3 Orion, the Ilyushin IL-18 evolved into the Il-38, the de Havilland Comet jetliner was the basis for the RAF's Nimrod. However, the new generation jet-powered bombers of the 1950s did not have the endurance needed for long, over-water cruise, and more importantly, did not have the slow loitering speed necessary for



An ex-Indian Air Force Consolidated Vultee B-24 Liberator, with Canadian markings after its 'return' to North America.



Consolidated PBY Catalina.



Beriev Be-12 'Mail'.



Tupolev Tu-16 'Badger'.

Saab 2000MPA



Lockheed Martin P-3 Orion.



Breguet Atlantique is in service with several countries, including Pakistan.



Ilyushin Il-38 of the IN.



Avro Shackleton of the Royal Air Force.



Royal Air Force Nimrods.



ATR-72 Maritime Patrol aircraft with the Navy of Chile.



The Bombardier Q 300 Dash-8 in Dutch colours.



Maritime Surveillance variant of the Bombardier Q 400 Dash 8.

anti-submarine operations. The Soviet's however used the Tupolev Tu-16 and Tupolev Tu-95 for MR and ASW, with mixed results.

Since the threat of a large-scale submarine attack has become increasingly remote, and many of the world's air arms are downsizing their MR aircraft fleets, the shift is towards lighter and medium aircraft types, to be employed mostly for patrol of the Exclusive Economic Zones and enforcement of law and order against smuggling and pirates.

The ATR-72-500MP Surveyor is already in production for the Turkish Navy and will be equipped with the Thales-built AMASCOS (Airborne Maritime Situation and Control System) maritime surveillance system, as well as electronic warfare and reconnaissance systems. AMASCOS will enable the Surveyor to conduct maritime patrol and surveillance missions that include maritime surveillance (EEZ surveillance, surveillance of shipping, drug interdiction, etc), anti-surface and anti-submarine

warfare, SAR, electronic intelligence (ELINT), communications intelligence (COMINT), joint littoral warfare operations, and environmental monitoring.

AMASCOS, together with the Thales-built Ocean Master search radar, has been selected by Indonesia, Japan, Malaysia, Pakistan and Turkey. Optional belly-mounted multi-mode radar offered for the ATR-72-500MP Surveyor are SELEX Sensors and Airborne Systems's X-band Seaspray 7000E 360° active phased-array fire-control radar. Seaspray 7000E provides a wide range of extended surveillance modes, such as moving target indication and high-resolution ground mapping, or interfaces with guided-weapon systems to provide anti-ship cruise missile mid-course target and guidance information.

The Falcon 900 MPA is based on the Falcon 900 DX, latest version of the Falcon 900 family, modified to carry out the entire range of maritime patrol missions.



The Saab 2000 medium range maritime patrol aircraft is based on the high speed regional airliner with spacious cabin, long range and endurance features.

It carries radar under the fuselage, retractable FLIR, two oversized observation windows, sonobuoys/marker launcher, one life raft drop door for SAR operations and under wing pylons. The floor plan is based on a seven crew concept: two pilots, one technical coordinator (TACCO), one deputy TACCO, one acoustic operator, two observers. The flight deck is designed for two-pilot operation. The glass-cockpit EASy, developed by Dassault Aviation is the most advanced flight deck system in the world, and dramatically increases safety and efficiency of the flight deck crew during all the phases of the mission. The Falcon 900 MPA is powered by three Honeywell TFE731-60 engines, each engine controlled by a Digital Electronic Engine Computer (DEEC) allowing the best efficiency and minimum consumption during each segment of the mission.

EADS/CASA's C-295 MPA Persuader has been ordered by Chile, Ireland, Portugal, Spain and the United Arab Emirate. (as the Shaheen 1 MPA). Competing with the C-295



Dassault Falcon 900MPA.

were rival aircraft from Alenia Aeronautica and Bombardier Aerospace. The UAE has since acquired four C-295MPAs, equipped with the FITS (Fully Integrated Tactical System) mission fit which has already been selected by the Spanish Air Force and the Portuguese Air Force for its P-3B Orion MP/ASW aircraft upgrade programme. The aircraft's flight deck is fitted with dual controls for the pilot and

co-pilot, the cockpit equipped with fully digital and integrated TopDeck avionics suite supplied by Thales. The aircraft is powered by two Pratt & Whitney Canada PW127G turboprop engines, each rated at 1,972kW and at 2,177kW with auto-power reserve. The engines drive HS-568F-5 six-bladed composite propellers developed by Hamilton Sundstrand. The aircraft has a maximum range of 5,630km.

Maritime Reconnaissance in the Indian Context



Tupolev Tu-142M of INAS 312.

Substantial expansion of the Indian Navy's airborne maritime patrol force is imminent—and imperative—as existing Indian Navy assets have long been felt as insufficient to monitor the country's 7,516 km long coastline, 1,197 island territories and the over two million square kilometer Exclusive Economic Zone.

Presently, the Indian Navy operates five Ilyushin Il-38 SD Sea Dragons flown by INAS 315 and is upgrading its fleet of Tupolev Tu-142M (*Bear-Foxtrot*) long range maritime reconnaissance and ASW aircraft at a cost of some \$ 500 million.

These eight Tu-142Ms are operated by INAS 312 ('Albatross') and have been fitted with Elta EL/M-2022(V)3 multi-mode search radars. The last two of the eight aircraft were declared operational with the new radars in December 2008 and these will remain in operation until at least 2016 when replaced by the Boeing P-8I.

Meanwhile, Russia's *Taganrogskaya Aviatsiya* (TAVIA) have further developed the type, designated as the Tu-142MSD, which could result in a reduction of the Tu-142M's direct operating costs, along with a re-engining package that includes new-generation propellers, plus a glass



cockpit. The rationale is that such upgraded Tu-142Ms could remain in service until around 2026. After their overhaul in 1996, the IN's Ilyushin IL-38SDs are expected to remain in service until 2020.

In November 2006 the Indian Navy had expressed an interest in new generation jet-powered Multi-Mission Maritime Aircraft (MMMA). In August 2007, the Boeing P-8 Poseidon and a maritime patrol derivative of the Airbus A319 were selected for evaluation. Other contenders included the Dassault Falcon 900 business jet derivative, Lockheed Martin's remanufactured P-3 Orion, and a Russian consortium with the Ilyushin Il-38. As neither the P-8 nor the A319 derivative were flying at that time, all trials conducted in the US and Spain involved simulation, flying of leased commercial Boeing 737s and A320s family aircraft for representative flight profiles, with mission system evaluation using US Navy and Spanish Air Force P-3s, the latter fitted with the EADS Casa FITS mission

system, which had been installed in Spain's upgraded P-3Bs.

By November 2007 the Indian Ministry of Defence short listed two competitors : Boeing's P-8 and the Airbus Industrie A319 and by the end of 2008 the Government of India had selected the former and was poised to conclude its biggest-ever defence deal with US: the around Rs 8,500-crore contract for the supply of eight Boeing P-8I Long-Range Maritime Reconnaissance (LRMR) aircraft for the Navy. On 1 January 2009 the Government of India signed the contract.

The Indian Navy is the first international customer for the P-8 and the first of these LRMR aircraft will be delivered within four years of the contract signature, with the rest being handed over by 2015. India will get the first P-8I towards early-2013, with the other seven following in phased manner by 2015-2016, replacing the eight ageing and expensive to operate Tupolev-142Ms.

Customised for the Indian Navy and based on the Boeing 737 commercial airliner, the sensor-packed P-8I aircraft will go a long way in closing the massive gaps in Indian Navy's maritime reconnaissance capabilities and will carry a range of torpedoes, depth bombs and anti-ship missiles.

Still, and by far the largest number of maritime patrol aircraft wearing IN colours remain the Dornier 228, steadily built by HAL at its Kanpur Division since the mid-1980s. Employed in a number of roles, the versatile HAL-Do 228 serves with Nos. 310, 311, 318 and 550 Squadrons at Cochin, Goa, Vizakapatnam and Port Blair, even as the Britten-Norman BN-2 Islanders / Defenders are being phased out (for detailed coverage see *Vayu* issue III/2011).

Future requirements for the Indian Navy include procurement of Medium-Range Maritime Reconnaissance (MRMR) aircraft that should also be



Ilyushin Il-38SD of INAS 315.



HAL-Dornier 228 IW of INAS 310.



The P-8I in Indian Navy colours.

capable of ASW, while the Coast Guard also requires Multi-Mission Maritime (MMM) aircraft, but without ASW capability.

Aircraft short listed for the Navy’s MRMR requirement are the turboprop ATR-72MP, C-295MPA and Dassault’s Falcon 900MPA and lately the Saab 2000 MPA.

For the Coast Guard the ATR-42MPA Surveyor and C-295 or CN-235MPA are being proposed. The Indian Coast Guard requires an initial six MMMs.

THE RISING SUN



The awesome US -2 seaplane.

VAYU's visit to ShinMaywa Industries, Japan

Vayu was presented an opportunity to visit the most advanced seaplane manufacturing unit in the world. This is a report of the visit of our Bangalore Editor, Cdr. M. Nirmal, to ShinMaywa Industries Limited.

A nation's security surplus status is the real measure of the credentials of a great power. From a maritime perspective, this power surplus contributes to burden sharing towards protection of global public material and the oceanic commons to achieve firstly, freedom of navigation and safety at sea; secondly, promote regional stability through an open and participative security architecture; thirdly, proactively alleviate suffering during disasters in the littorals and, finally

a constabulary capacity to maintain order at sea for the common good. Whilst ships, submarines and aircraft are all qualified in some way or the other for fulfilling the above missions, each of these platforms are limited by some capability gap or the other. In addition, vulnerabilities of assets to attack by enemy forces or by natural forces pose a real problem to timely and opportune deployment in crisis.

Then imagine a situation where deployment is not impaired by enemy

action or natural elements. Imagine an asset that is deployed over the entire expanse of the earth—be it earth, water or aerospace. Imagine delivering several tonnes of food and provisions, spares and even repair expertise to a fleet at sea or a unit ashore in the hinterland combating terror or for troops engaged in HADR missions with equal dexterity. Imagine evacuating patients from isolated islands or ships at sea or offshore platforms with equal ease. All of this imagination is





true—with the coming of age of modern seaplanes.

Japan's ShinMaywa Industries Ltd, as the company is known today, was founded in November 1949. It had illustrious forerunners in, the 'Kawanishi Machinery' company set up in 1920 and later in 'Kawanishi Aircraft Company' established in 1928. Between these two companies, they had produced 2862 aircraft till 1945.

ShinMaywa Industries has developed and manufactured many kinds of aircraft focussed on flying boats and amphibians after the ban on aircraft development and manufacture was lifted in 1952. The then President, Ryoza Kawanishi, set up an Aviation Committee to draw up parameters for a reliable amphibian aircraft to operate in the Pacific and Atlantic oceans in high sea states. Shizuo Kikuhara, the Chief designer led a research project which culminated in the development of 'Spray Suppressor' which allowed the aircraft to operate on rough seas with wave heights of three meters. Another challenge to substantially lower the speed during take off and landing was achieved by using the BLC (Boundary Layer Control) System. This allowed for ultra low speed flights and STOL capabilities.

These two technologies led to successful development of the first of the Utility Seaplanes (US-1) in 1974 and the first aircraft was delivered to the Japanese Defence Agency in 1975. Thus came into being, in 1976, ARS (Air Rescue Squadron) 71 of Japan Maritime Self Defence Force (JMSDF). A modification engineering team was formed in 1996, with ShinMaywa as the prime contractor and a number of other

leading Japanese Aerospace Companies to improve upon the US-1A. Though the project was to modify, it turned out to be a new development programme to meet the changed requirements.

A vastly superior US-2 with improved flight controls such as Fly-by-Wire Controls and FADEC, better on-board facilities and enhanced search and rescue capabilities including the Survivor Position on Tracking System (SPOT). The US-2 made its maiden flight in 2003. The first two US-2 were delivered to the Japan Defence Agency in March and December 2004. Air Rescue Squadron 71 now boasts of a mature STOL Search and Rescue amphibian with US-2 in its inventory. This magnificent aircraft has now been offered to India as the first international customer against the global Request for Information by the MoD for the procurement of amphibious aircraft. This is an opportune moment both for India and Japan just as India is exploring to diversify the vendor

base with USA and Europe, veering away from Russia. It is time to act on the much termed 'Look East Policy' of India and cement friendly ties with Japan towards a stronger defence partnership.

The relationship between India and Japan is most cordial and dialogues at Ministerial level are taking place regularly. During the recent visit of AK Antony, India's Defence Minister to Japan in November 2011, far reaching decisions to strengthen defence cooperation were reached with his counterpart Mr Yasuo Ichikawa. In the Joint Statement, it was stated that "In 2012, vessels of both sides will make mutual visits and MSDF aircraft will visit India. Bilateral search and rescue exercise will be carried out on these occasions." Japan has made successful ventures in many industrial segments bringing in the best in quality and technology products to India. Entry into the defence domain is a distinct possibility with the US-2 which would be





Tools and jigs surround a new build aircraft



Under manufacture



Roll out

a strategic move far beyond the acquisition cost as such a transaction will open the gates for a larger Asian Defence Industrial Co-operation agenda, thereby reducing the dominance of western powers in the Indian acquisition matrix.

The Konan Plant - home of the US-2
Vayu was greeted with the proud sight of the Indian tricolour flying at the main

entrance of the ShinMaywa Office. This plant has the unique distinction of being an aircraft manufacturer without an airstrip facility attached to it! There are two large hangars—one for the manufacture of the US-2 and its major servicing and the other for the production of composite parts for leading international aerospace companies like Boeing, Gulfstream, Airbus etc. ShinMaywa enjoys an enviable reputation

in the manufacture of composite parts. The order book position for the US-2 is seven aircraft from JMSDF. The fifth aircraft is currently under production. The lead time for manufacture is presently three years since the lead time for parts order is long. *Vayu* was informed that the capacity to ramp up production to deliver upto three aircraft per year, if the need arises, is easily possible and the delivery schedule can be compressed further if there is a major order. The facility also undertakes major servicing of the US-2 at a calendar interval of about 26 months. This periodicity may be further reduced once more experience is gained. Due to the highly specialised role of utility seaplanes, the production run has been low which has an impact on the unit cost of the aircraft which is around US \$ 125 million but can be reduced significantly if the orders are larger benefitting both the Indian and Japanese Navies. It was an interesting sight to visit the plant with only a few technicians working proudly to build the best amphibian aircraft in the world. More surprisingly, continuous innovation to reduce cost and increase performance is constantly encouraged by the management and the best solutions are displayed on notice boards.

The Plant has a common mess facility for all employees from the President to the novice worker who all get the same fare!

What struck one during the visit was the attention to detail and a great sense of quality principles, exemplary hygiene, unsupervised discipline all around and an unmatched sense of profound commitment and professionalism.

Flying demonstration of the US-2 STOL amphibian

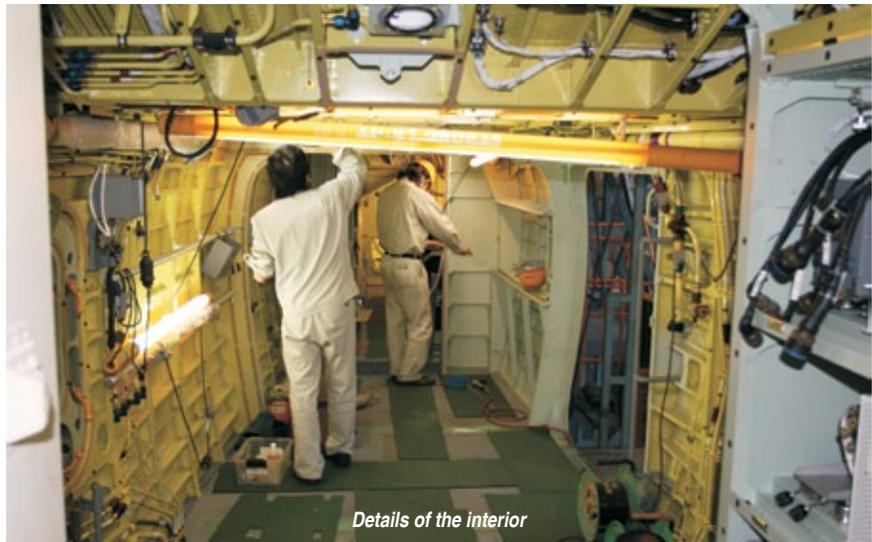
As part of the exclusive visit of *Vayu* organised by ShinMaywa to their Konan plant, flying demonstration of a Utility Seaplane US-2 was also arranged. ARS 71 Squadron flew one of its aircraft from the historic Naval Base, Iwakuni with RAdm Tatsuya Komatsu, Commander, Fleet Air Wing 31 and Capt. Ken Inoue, Commanding Officer of ARS 71 Squadron on board, who interacted with *Vayu*.

In a land where trains run to military precision, the exact time of arrival of the aircraft was not a matter for concern. At the appointed minute, the aircraft made its graceful appearance. Two boats were

deployed by the plant to assist the aircraft in landing and take off from the bay. They patrolled the area to keep any fishing boats or other unwanted intruders from getting in the way of the aircraft. A marker was dropped by one of them to indicate the zone for the landing. The aircraft flew in at ultra low speed before making a smooth touch down and coming to a halt a few metres away from where we were in the Observation boat. Camera's clicked away rapidly and we were rewarded with some superb photographs-the first ever taken by an Indian visitor-of this very suave and good looking amphibian. The impact of landing and subsequent taxiing made a bare minimum splash of water, testimony to a very effective spray suppression system incorporated in the aircraft. The landing of the aircraft in water is akin to an expert diver jumping into the pool - piercing the water-in a manner of speaking- without making any splashes. The only difference is the size and weight of this aircraft as compared to a diver. The spray suppression is achieved in an ingenious way with the help of grooves and spray strips built into the hull. These direct the water flow downwards and sideways, thus preventing it from fouling the propellers and the engines. A depth of 2.3 meters is sufficient for landing on water with the undercarriage retracted and a depth of 3.5 meters is required to lower the undercarriage in case the aircraft has to be taxied onto a slipway.

The aircraft revved up and got air borne with a minimum of fuss and the take off run was unbelievably short. The Boundary Layer Control (BLC) system capabilities were visibly demonstrated and the circuit that followed demonstrated its ultra low flying speeds. One got the impression that the aircraft was in suspended animation! The aircraft made its second landing equally smoothly and taxied to the ramp leading to a concrete hard stand which served as a parking bay.

The sight of the aircraft making its way on water is a very strange sight to say the least-more so to unaccustomed eyes. As the aircraft taxied up the concrete slipway the sight immediately conjured up the vast potential this aircraft has for connecting India's remote island territories without having to build an airstrip, not only for logistics but also medical evacuation, rapid relief operations and even as a



Details of the interior

command platform for anti-poaching and other illegal activities.

A walk around the aircraft enabled one to understand the various features. US-2 has a crew composition of up to 11 personnel consisting of the pilot and co pilot, two flight engineers, two air medics, three rescue scuba divers, sensor operator and search and rescue coordinator. The Search and Rescue coordinator is provided with a very sophisticated, though simple looking and very easy to use, helmet mounted devices to spot the survivor through bubble windows. The device is coupled to the Automatic Flight Control System of the aircraft. Once the survivor is spotted the device inputs the coordinates to DFCS to manoeuvre the aircraft for landing. Other surveillance equipment includes a combined weather and search radar, FLIR, etc. The all-weather aircraft has important features including a very sophisticated auto-pilot, glass cockpit and

a pressurised cabin to make it extremely user friendly and to ensure high rate of success during missions. It carries its own boat and engines for SAR missions and in a CASEVAC role has a capacity to accommodate 11 stretchers and provide first aid in the pressurised area in addition to relief materials/medicines.

In the transportation role it can carry 30 fully kitted troops and an additional few tonnes of cargo. The most noteworthy aspect of this aircraft is its radius of action of 1000 nm with two hours on station and a ferry range of more than 2500 nm. Every asset and area of interest to the service can be covered with the US-2. This aircraft is eminently suitable to fulfil the urgent aspirations of India for International cooperation in terms of humanitarian assistance, disaster relief, maritime security, military medicine and peace keeping operations, so meeting India's and its Navy's requirements fully.



Yasuo Kawanishi (General Manager, Aircraft Business Development, Sales and Marketing, ShinMaywa Industries), Cmde Sujeet Samaddar (Director and CEO ShinMawya Industries India Pvt. Ltd) and Cdr. M.Nirmal (Vayu) in Japan.

VAYU Interview with Mr. Yoshihiro Onishi, President and CEO, ShinMaywa Industries Ltd.



VAYU : India and its Navy has embarked on a major defence acquisition programme and is slated to spend around US \$ 20 billion by 2015 towards capital equipment. What are ShinMaywa's interests in India?

Onishi: The Indian MoD had expressed interest in procuring amphibian aircraft and indicated the requirements to be met by the aircraft. We are happy that our aircraft US-2 (to be known as Company Model No. SS-3 for India) will meet or even exceed the requirements of the Navy. We believe that this will be the beginning for a long and mutually beneficial association between us and the Indian Navy.

VAYU : ShinMaywa has been in the global arena for a while. Has it done business with India before?

Onishi: We are constantly enhancing our international network to better meet the needs of growing global market. Towards this end, we explored the feasibility of manufacture and sale of special purpose trucks. In this process we found the Indians to be quick in absorbing new technologies and innovative in many ways. Though the venture did not take off, we have understood the process to deal with India. We have a large foot print with eight over seas subsidiaries, five JVs and seven technology partners. So we are more than sure that we can come up with right products at the right time for the Indian market.

VAYU : India has moved away from the concept of 'buyer-seller' to partnerships and cooperative endeavours. In this context what will be your approach?

Onishi: We are most comfortable with this concept and it is our preferred option too. We have contributed to societies around the world since our first export in 1952. Today, we supply a wide range of products to 100 odd countries across three business categories. In every location, we

seek to improve life for people and strive to contribute to society.

VAYU : The Indian Navy operated amphibian aircraft in the 1950s with the Short SeaLand amphibian. They provided aerial logistics for Commonwealth navies. However Indian Navy's aspiration will be very different now, after nearly six decades. How will US-2 enhance the operational aspects of Indian Navy?

Onishi: The US-2 is a vastly superior aircraft with fly by wire flight controls, glass cockpit with integrated instrument panels, pressurised cabin and new main engines with increased power. Its high performance capabilities and versatility enables the aircraft to be deployed for a wide spectrum of missions including surveillance and medical transportation to support the security and management of remote islands and offshore platforms, improved on-board facility for patients during transfers and enhanced open sea search and rescue capabilities, logistic support and many others. Every day we hear that the aircraft can be given more missions because of its unique capabilities. These ultimately benefit society.

VAYU : Multi-role capability of the aircraft will be a differentiator in the process of selection. Can US-2 be adapted or modified to perform additional roles?

Onishi: There are no plans at present as no such requirements have been indicated by Indian side.

VAYU : The acquisition cost of US-2s will attract provision of the offset clause. What are your plans?

Onishi: We have many ideas. We will finalise them only in due course of time.

VAYU : India has world class IT industries and a mature aerospace industry. Are you likely to leverage them?

Onishi: We are still in the due diligence phase. We intend setting up MRO facilities, training simulators etc. We have already commissioned an office in India to address such issues and advise us of every local requirement

VAYU : Please give our readers some idea about life cycle costs and life term support of the US-2.

Onishi: The US-2 is a fairly recent addition. Though adequate data is not yet available for calculating lifetime cost we are using older data to determine the life cycle cost. As far as life term support is concerned, it is a 'given'. We have to! This is the strong point of our company.

VAYU : What is main advantage of the US-2 over its competitors ?

Onishi: The STOL Technology based on BLC (Boundary Layer Control) which allows ultra low speed operations and introduction of Spray Suppressor technology which enables operation in rough seas with waves of three meter high which no other aircraft has achieved. It also requires the shortest take off and landing distance whether on land or sea, the longest range, the highest payload and is the only aircraft in its class which is proven, in-service and certified/ruggedized for military specifications. It's radar system combines both weather and surface surveillance. For India, another advantage is that the US-2 uses the same engines that the C130J uses. I think we have a very good product for India.

VAYU : The Indian defence acquisition process is woefully slow and long drawn affair. Are you prepared for it?

Onishi: ShinMaywa has been in business for nearly nine decades and has dealt with well over 100 countries. We believe we have enough experience and knowledge to make our endeavours a success in India.



VAYU Interview with Rear Admiral Tatsuya Komatsu, Commander, Fleet Air Wing 31 and Capt. Ken Inoue, Commanding Officer, ARS 71 (Air Rescue Squadron)



Cdr. Nirmal from Vayu Aerospace and Defence Review presenting the book 'Fly Navy', authored by Pushpinder Singh of the Society for Aerospace Studies.

VAYU: Can you please give us a brief, on the role of Japan Maritime Self Defence Force?

ADM: Our paramount role is to serve as an effective response to new threats and diverse situations in view of the significant changes in the security environment, in conjunction with the Ground and Air Self Defence Forces. We conduct coordinated surface, under sea and air defence operations. In addition, we have been actively promoting bilateral and multi lateral exercises, security dialogues and defence exchanges apart from participating in anti-piracy missions off the Gulf of Aden.

VAYU: What is the prime role of ARS 71 which is operating the US-1A/US-2, STOL Search and Rescue Amphibian?

ADM: The squadron is primarily responsible for search and rescue of vessels/aircraft at sea, disaster relief, transportation of passengers and supplies.

VAYU: Please tell us about the salient features and performance of US-2.

ADM: The JMSDF US-2 is powered by four Rolls Royce turbo prop engines and has six bladed propellers. It uses the Ocean Master Search Radar from Thales combined weather and maritime surface search operations. Together with the FLIR and the SPOT - Helmet mounted survivor sight the system has fail safe detection and enables continuous tracking of survivors. The US-2 has a FADEC system and Fly by Wire flight Control systems. It can easily operate with three



engines. Its sensor and communications suite can be configured to meet specific requirements. The maximum take off and landing weights are 47.7 tons and 43 tons on land and water respectively. The take off distances on ground and on water are 320 meters and 280 meters respectively. The cruise altitude is 9000

meters (30,000ft). The normal and max cruise speeds are 480 km/hr and 565 km/hr respectively. The max range is 4500 km. Amongst all amphibian aircraft in the world only US-2 has the capacity to operate in rough seas with wave height of three meters which is equivalent to the sea state 4/5 because of its extremely



The interview over a hot cup of coffee!



low landing speeds, wave suppression systems and hydrodynamic design. I must also add that the US-2 can be deployed in several other roles such as disaster relief, outer island surveillance and intelligence gathering, fleet support and these roles are expanding every day. In transportation version the US-2 has carried 30 personnel and relief material easily.

VAYU: What have been the highlights of amphibian operations?

ADM: The JMSDF has been undertaking SAR missions since 1976. As of September, 2011 it has undertaken 898 missions of air-sea rescue service, transportation of patients etc and has rescued 883 people.

VAYU: Has the US-2 participated in any international events?

ADM: US-2 participated in the ASEAN Regional Forum's voluntary demonstration at Manila in 2009. It performed a simulated landing and rescue operation which was very well received by the participating nations and much appreciated. The US-2 also demonstrated its super STOL performances with take off and landing on sea during the International Fleet Review held at Brunei Darussalam in July 2011 in which 11 countries participated including India.

VAYU: How has been cooperation between the Indian Navy and JMSDF?

ADM: Good and constantly improving. Five officers one each from the IAF and IN are under training in Japan.

There is a proposal for bilateral exercises between the JMSDF and IN in 2012 in which US-2 is slated to participate. We also have regular Navy-to-Navy talks and exchange port visits by our ships and JMSDF ships were very recently in Port Blair for a transit visit. During high level ministerial talks maritime security cooperation is always the foremost item on the agenda.

VAYU: What is your experience in maintaining the US-2?

ADM: US-2, though fairly new, is a proven aircraft. The squadron is able to maintain an average serviceability of 80 % 'plus'. The first and second line maintenance are undertaken at Iwakuni base. The aircraft is flown to ShinMaywa's Konan plant for major servicing after perhaps more than two years of operations. We have had no serious issues on this account and the maintenance system is both hours and calendar-based.

VAYU: What is the strength of the squadron in terms of aircrew and technical personnel? What is the training requirement?

ADM: The unit establishment of the Squadron is seven aircraft. It has 120 aircrew and 80 technical personnel. Conversion of a pilot ex P-3C takes less than 200 hours of which 30 hours will be on simulator. The training also caters for 40 sorties of sea operation, which is a unique experience for any aviator. In addition, our pilots have to also be conversant with sea rules when landing

in harbours. The JMSDF places a very high premium on safety and hence the training syllabus is very detailed. This can be reviewed according to need and the training duration changed to suit specific requirements.

VAYU: What is the limitation for take off? What is the recovery procedure, should the aircraft become unserviceable on landing at sea?

ADM: The aircraft can take off with three engines. In case it is unserviceable at sea, the aircraft is to be towed back to the base. Provision has been made for towing the aircraft and I think it is much more simple than towing a ship or boat! However, the aircraft is manufactured to very high quality standards – the best in the world – and I do not see any reason why the aircraft should suffer any malfunction when on missions. Also, we have a Flight Engineer who is trained to handle most emergencies and first line repairs.

VAYU: Will the JMSDF assist IN personnel in operational training of US-2?

ADM: Yes, of course. The JMSDF and the Indian Navy are strong partners. We would like to take our relationship to the next level as Asian powers. For this, the JMSDF is willing to assist Indian Navy train its pilots and crew for this unique aircraft. Of course, this will require a formal request from the IN and I am sure the JMSDF will be more than happy to extend full cooperation to our friends from the Indian Navy.

TRANSFORMATION of Indian Naval Aviation



The first Boeing P-8I new generation long range maritime patrol and ASW aircraft for the Indian Navy at Renton, USA.

Indian Naval Ship *Hansa* has been synonymous with the history and growth of India's Naval Air Arm and it is therefore befitting that in marking this occasion, we recall the past, look at the glories achieved, the trails and contrails that we left behind and look through the head up display to the future that we have set for this operational arm of the very versatile Indian Navy.

The Indian Navy's air wing which began in mid 1953, was indeed modest but nevertheless, the inventory of Short Sealands well served their intended role. Over the next decades we iterated through to our current inventory of more than 200 aircraft. The Indian Naval air arm is now recognised as a multi-faceted, capable force, equipped to protect India's maritime interests with the ability to influence the maritime domain which has an area of approx six million square kilometres. That we have reached this stage where the Indian Navy

*** Key Note Address by Vice Admiral Shekhar Sinha, CISC at INS Hansa Golden Jubilee on 5 September 2011**



Vice Admiral Shekhar Sinha, CISC, seen at INS Hansa.

is considered a reckonable force, is owed to the deft planning by our predecessors and it is incumbent upon me to formally acknowledge their contribution to India's Naval Air Arm.

The Navy's 'Vision Document' states that "in order to ensure that the Indian Navy continues to retain its relevance as a prime instrument of state policy in the midst of future imponderables, we will



need to develop a flexible approach and ensure continuous upgradation of our war fighting capabilities and skills. Above all, we must cultivate a propensity to embrace change when necessary.”

We are in midst of change and transformation especially as concerns the naval air arm. Sometime in the future, when timelines would be perused and milestone periods recognised, then the current phase that we are passing through would certainly stand out as the landmark period, what with the major acquisitions poised to leapfrog this arm into an extremely capable force.

Our operating environment is likely to remain in flux and is largely unpredictable owing to a variety of factors which include geo-politics, emerging technologies and continuously evolving capabilities in our maritime neighbourhood. The growth of the naval air arm would be in congruence with the geo-strategic picture of the region. In the arena of the Indian Ocean Region (IOR), major states are clamouring for dominance with struggle to control the global commons, while the extractable expendables have also made this area into a confluence of the powers to be.

It is this expanse of Ocean which is the sub-set of interest domain to India, China



Kamov Ka-31 AEW helicopters will remain integral with the fleet at sea.

and the Western Powers. The influence of global powers in this focussed expanse heightens the conflict quotient.

China’s rising power globally - and in our extended neighbourhood - warrants paramount consideration. With an increasing number of nuclear submarines and development of long range missile capability, China’s strategic focus is

shifting to the seas as a sphere of influence. Developments such as putting to sea of the former Soviet Union aircraft carrier *Varyag* have brought to fore the long cherished dream of the Chinese to own and operate aircraft carriers. However, even while China plans to venture into the IOR, it follows the policy of ‘anti access and denial of access’ in its EEZ. In furtherance



Jointmanship: Indian Naval Sea Harriers being flight-refuelled by IAF II-78MKI tanker, even as a MiG-29KUB awaits its turn.



HAL-built Dornier 228s serve with the Indian Navy in the information warfare role and for other tasks.

of this policy, China is in the process of developing the DF-21 ‘anti-Carrier’ missile. Such diverse maritime capability acquisitions put China in a position which was not envisaged earlier.

Pakistan and China have a mutually complementing relationship and further nurturing of their defence ties is a compulsion for both nations so as to keep ‘competing forces’ in check. Maritime cooperation between Pakistan and China is but a natural progression of the larger defence cooperation and this is the environment in which we have to transform the Indian Navy and its air arm.

Given the prevalent security scenario, our strategy to counter the envisaged challenges should be to develop ‘full spectrum’ capability, exercise sea control in India’s primary area of interest and consolidate Blue Water capability by using the Naval air arm effectively.

With induction of the INS *Vikramaditya* on the anvil, and the indigenous aircraft carriers to follow, Naval aviation would enter the next generation of operational capability. The Indian Navy’s aircraft mix would thereafter consist of the Boeing P-8I, Tupolev Tu-142, Ilyushin IL-38SD, Dornier 228, MiG-29K and Sea Harrier/

LCA (Navy) augmented by a range of helicopters including the Ka-31AEW, Sea King/UH3H, Kamov Ka-25/28, Chetak and UAVs. This is a heady mix of aircraft types. Naval Utility Helicopters (NUH) and multi role helicopters are also on the list of procurements.

Navies draw their significance from being able to influence events on the mainland. India’s maritime military strategy recognises that the use of maritime power to influence operations ashore is a primary role of maritime force employment. The role of naval air power is to support such maritime military strategy. Domination of



MiG-29K of INAS 303 (‘Black Panthers’) approaching INS Hansa.

Rafael



The LCA-Navy is under development at Bangalore and is to supplement the MiG-29Ks.

the maritime area of operations and the littorals has become primary task for the naval air arm whatever be the nature of employment in support of the tactical milieu. We could consider ways to support littoral warfare as the domination of littorals also demands suppression of the adversaries' air and underwater forces. This is an inherent strength of the integral air arm with carriers and support ships. Littorals are also places from where non-state actors such as pirates and terrorists venture out for maritime crimes and thus these need to be kept under constant surveillance. UAVs and possibly armed rotarywing UAVs could be the possible way forward for maintaining eyes in the sky, addressing the requirements of anti-piracy tasks as well as LIMO.

The Chinese would consider operating aircraft carriers in the IOR for their SLOC protection as analyses indicate that other methods of reducing vulnerabilities of their tanker shipments addresses only 9% of the volume requirements. Considered assessment is that China's oil transportation across the Indian Ocean will still be around 53% of the total till around 2050 and therefore this aspect reveals continued vulnerability.

It is understood that whatever be the inventory strength, actual numbers would

always be lower than the requirement to meet such operational challenges. Planners are to work towards narrowing the gap in an earnest manner but there is definite need to augment the air strike element at sea.

As is true with any maritime force, Indian naval operations rely on 'Maritime Domain Awareness.' Even after the acquisition of air assets as envisaged in the Maritime Capability Perspective Plan (MCP), our surveillance capability would fall short and efforts are to be made for bridging this gap at the earliest, so that our maritime area of operations remains under continuous surveillance by sub surface, surface, air or space-based assets at all times. The aircraft carriers will need integral AWACS to handle the large volume of data of possible adversaries and for elimination of these.

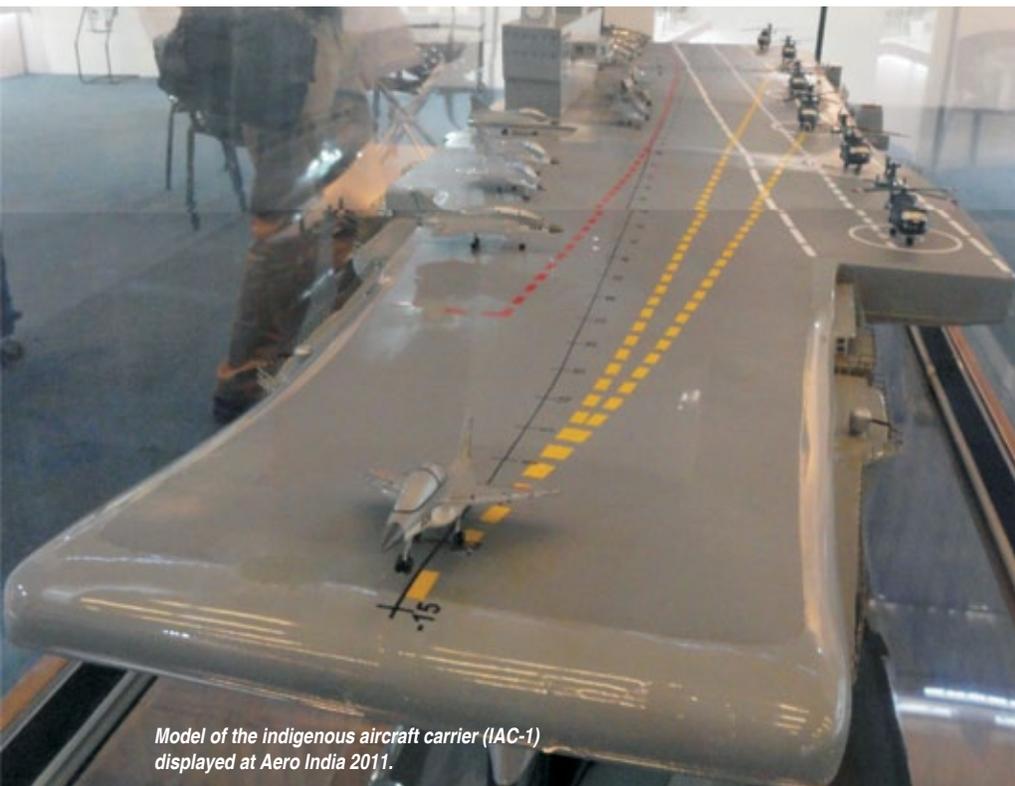
Strengthening of the Indian Navy's air arm is therefore essential. This is the ideal time to realise the provision of offsets in Defence Procurement Processes and apply these with ingenuity for air capability building. In the next 15-20 years, it is expected that billions of dollars worth of offsets could become available and we must identify the technologies to be absorbed by the Indian industry or

by forming JVs with OEMs. The OEMs may also initiate joint ventures so as to provide life cycle support for the products supplied as well as to fulfil the spare part requirement worldwide, taking advantage of our lower cost, skilled manpower.

We must also look at MTOT to upgrade the Naval Aircraft Yards and need to identify niche areas where SMEs and MMEs could carry out the support maintenance which will reduce manpower holding costs and logistics supply chain of the Navy. Then there is the case for acquiring or creating airfields along the coastlines as also modernising the existing ones.

Transformation brings in multi-faceted requirements and demands firm leadership at every echelon to succinctly steer this. The very management of such transformation would be a formidable challenge for the naval air arm. We have lately been able to integrate the *Black Panthers* in the same sanctuary as the *White Tigers*. More such tests will follow. Organisational changes would need to be brought about swiftly and in domineering fashion. Management and sharing of the infrastructure, training imperatives, logistical inventory augmentation and restructuring of personnel policies, cadre management, transition worries

Agusta Westland



Model of the indigenous aircraft carrier (IAC-1) displayed at Aero India 2011.

in context of the rising as well lowering of expectations, are all which need to be deliberated, factored and actioned. I would here like to suggest some caution, that the euphoria of the 'new' should not overwhelm the time-tested 'old'. While expectations would rise in the newly raised echelons, care needs to be taken that this should not lead to any decline in adjacent sectors, clear leadership and planning is needed on every aspect in the process of the transformation which will be judged and critically dissected by analysts thereafter: how we manage such change would be critically analysed sometime in the future and therefore we need to be extremely cautious of the processes that we adopt today.

Induction of new platforms will bring in new operational philosophies, some of which could well be at variance from prevalent ones. Merging these operational requirements with current ones would need extensive iterative studies, embedded with scenario projections. In-depth technical know-how



HAL-built Hawk Advanced Jet Trainers will supplant the HAL HJT-16 Kirans in the Indian Navy.

is therefore imperative. Training must be tailored towards operational realities of the present and a foreseeable future and optimisation needs to be worked out. 'Out-of-the-box' thinking will be requirement of the times, shedding of inhibitions and reaching out very much required from all concerned.

Some caution: infrastructural development may not keep pace with the expected acquisitions. Space, both physical and organisational would need to be shared, long term requirements thought of, projected and acted upon by those responsible. We should be mindful of the fact that the country's defence budget will be adequate as long as India's economy is doing well. We therefore need to plan well ahead and then get to move on.

Still even as we move along this path of transformation, events may not exactly happen along the desired trajectory and things may go askew as we move into 'uncharted waters'. Honesty, patience and discretion would be hallmarks of the leadership.



Artist's impression of the INS Vikramaditya with MiG-29Ks and Ka-31 AEW embarked.

Maritime Situational Awareness*

The following is a given: 70% of the Earth is covered in water; 80% of the world's population lives within 100 miles of the coast; 90% of the world's commerce is seaborne; 75% of that trade passes through a few, vulnerable, international straits.

There then are growing challenges in the waters around the world and the need to enhance maritime surveillance capability is being addressed by most countries including India. The Indian Navy's

analysing the data and making decisions based on real time information.

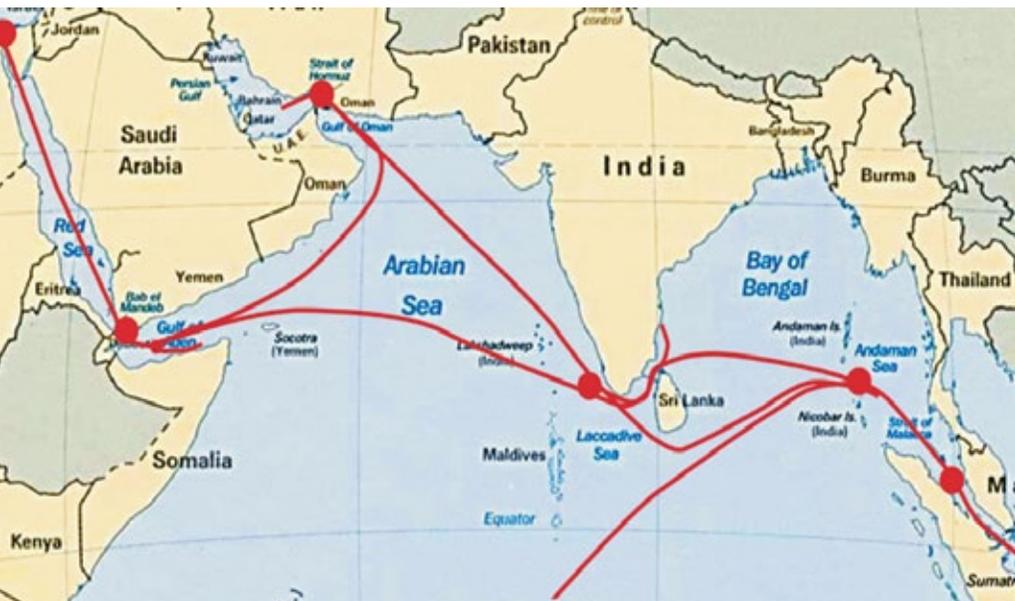
The key is employment of maritime patrol aircraft with requisite sensors. Close to the coast, lighter aircraft are employed, as also UAVs, being essentially airborne antennas gathering information for the MOC to analyse and take decisions. Further out on the high seas, there is typically the need for an independent aircraft with advanced C2 systems and these should ideally also have strike capability.

programmed algorithms and libraries using all various sensors with library data (EW and Vessels database with pictures). Tactical planning and orders for engagement would then follow. In fact the C2 system is the key for mission success and makes the well-equipped MPA the most effective means for ensuring maritime situational awareness.

A recent entry of a platform for Medium Range operations is the SAAB 2000MPA, being developed with sensor suites including 360° radar and IFF, ELINT for detection, recognition, classification and identification, COMINT for detection, recognition, classification and identification, Direction Finder, Automatic Identification System (AIS) and Electro Optics EO/IR. Manning of operator stations in a typical layout would include the radar operator, tactical operator, electronic warfare operator and communications operator.

The Saab 2000MPA could be configured to carry appropriate missiles for Anti Surface Warfare or torpedoes for Anti Submarine Warfare and even gun pods.

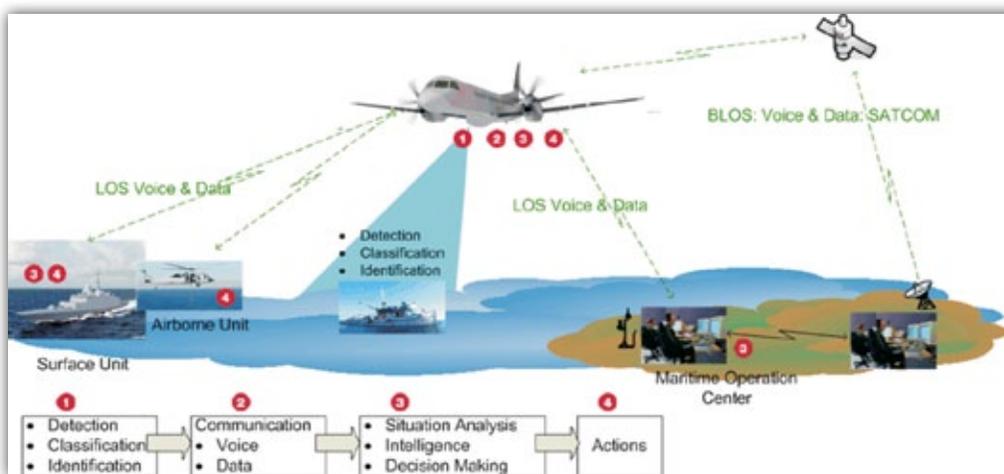
It is to be stressed that on the high seas, it is necessary to have the capability to make the right decisions and then carry out conclusive actions, whether surveillance, search and rescue or even strike all of which is possible with maritime situational awareness combined



responsibility is immense and the Indian Ocean Region (IOR) includes specific areas of concern such as the Maldives, Mauritius and the Andaman & Nicobar Islands. Plus there are high density choke points of the Gulf of Aden, Straits of Hormuz and the Malacca Straits.

There is need for network-based maritime situational awareness with appropriate means to protect and control the situation by creating various layers, all being networked for maximum effectiveness. These include land-based sensors, surface vessels and airborne assets, ranging from coastal patrol to medium range and long range/long endurance maritime patrol aircraft, all transmitting information into a centralised maritime operation centre (MOC).

The sensor data is transmitted over data-links via satellites or by point to point radio links, the users seeing a common recognised picture with headquarters



In briefly describing the C2 system, the inputs to the system should first be understood: the operator controls and selects the information, then marks specific targets for further investigation. These inputs are recognised by the C2 system for analysis, comparing data with

with a next generation Maritime Patrol Aircraft.

* Extracted from the presentation by Tommy Hultin, Business Development Director of SAAB, at INS Hansa during an international symposium on 'Indian Naval Aviation: Roadmap to Transformation'.

Tail-hook training

China's JT-9 carrier jet trainer

The PLA Navy's Guizhou JT-9 (JL-9H) advanced fighter trainer reportedly went into flight test on 20 June 2011, demonstrating once again China's focussed progress towards creating a credible aircraft carrier-centric Navy.

The aircraft is based on the JL-9 Shan Ying but has a supersonic fixed intake, a leading edge extension to the inner section of the delta wing, a redesigned vertical tail and no fins under the rear fuselage thus enabling an arrestor hook to be fitted. Reports suggest that once PLAN pilots are taught the fundamentals of carrier operations including 'tailhook landings', they would move to the Chinese reverse engineered J-15, an upgraded Chinese version of Russia's Sukhoi Su-33 shipborne naval multi-role fighter operating from the *Admiral Kuznetsov*.

According to a Chinese spokesman, "this trainer will be mainly used by the pilots of the ship-based fighters to conduct simulated take-off and landing training on carrier decks... marking a serious step towards qualifying pilots to fly off China's aircraft carrier rumoured to have been named the *Shi Lang*."

In sharp contrast, the Indian Navy with its decades of experience of catapult launching and tail hook landing from aircraft carrier decks (Sea Hawks and Alizes from the *INS Vikrant*), 'lost' such



JT-9 in flight: poor quality image from Chinese television broadcast.

techniques with advent of the vertical take-off and landing Sea Harrier from the *INS Viraat*. With the return of 'conventional' fighters such as the MiG-29K and LCA Navy fitted with tail hooks, the Indian Navy will have to train their pilots on appropriate aircraft.

Some years back, batches of IN pilots were instructed on special tail hook deck landing techniques by the US Navy under a programme wherein nominated pilots were trained at Pensacola in Texas, transiting from the Turbo Mentor to the Goshawk advanced jet trainer on board USN carriers. It was intended that after their DLQ, the IN pilots would return for conversion to the new MiG-29Ks but in the event have had to await their induction. Meanwhile, the Indian Navy is to receive 17 BAE Hawk Mk.132 Advanced Jet Trainers from HAL but these are standard land-based aircraft without tail hooks.



First images of the PLA Navy's Guizhou JT-9 (JL-9H) advanced fighter trainer



Indian Navy's MiG-29Ks with tail hooks deployed are to be based on the yet to be delivered INS Vikramaditya (Admiral Gorshkov)

Enter the (Sea) Dragon



China's first aircraft carrier in sea trials

China's first aircraft carrier began its inaugural sea trials in August 2011, a move likely to stoke concerns about the nation's rapid military expansion. China only recently confirmed it was revamping that old Soviet ship *Varyag* to become its first aircraft carrier, adding to worries amongst its neighbours over the country's military build-up and growing assertiveness on territorial issues. "According to plans, the first sea trials will not take long," the Chinese defence ministry said in a statement. "After returning to the shipyard (in the port city of Dalian), the carrier will continue its refit and test work." The Chinese Government, in July, sought to play down the capability of its first carrier, saying the vessel would be used for training and "research". Chen Bingde, the nation's top military official, however provided the first official acknowledgment of the aircraft carrier in a Hong Kong newspaper interview in early June.

However, informed media (including the *Vayu*) and military analysts have maintained for years that the 300-metre (990-foot) ship was in full scale development. The carrier,



Indifferent quality pictures from the net showing the aircraft carrier under completion.



once called the *Varyag*, was originally built for the Soviet Navy, with construction interrupted by the collapse of the Soviet Union in 1991.

Andrei Chang, head of the Kanwa Information Centre, which monitors China's defence said. "The first sea trials are just for testing different items, like whether the engines work or not," he said, adding that from Soviet and French aircraft carrier experience, "on-off sea trials would continue for another year or two."

Japan has also voiced concerns over China's growing assertiveness and widening naval reach and over what it called the "opaqueness" of Beijing's military budget. The aircraft carrier project also comes amid heightened tensions over a number of maritime territorial disputes involving China, notably in the South China Sea, which is believed to be rich in oil and gas and is claimed by several countries. The issue has heated up recently with run-ins between China and fellow claimants Vietnam and the Philippines, sparking concern among those neighbouring countries and the United States (see articles).

Marianne Barriaux

True Maritime Cooperation

Enhancing India's influence in the Asia-Pacific Region



United States Super Carrier during the Malabar series of exercises with India at Malabar 2007

navies participated in *Malabar 2010*, the 14th in this series of annual exercises that have helped to bring the two navies together in the domain of joint naval operations maritime cooperation.

Cooperative Security

Over the last two decades and in keeping with its growing stature as a regional power, India has shown enhanced interest in international military-to-military cooperation, including the maritime domain. Defence cooperation is being effectively employed as a foreign policy tool to promote India's national interests. It is now one of the main forms of engagement with many countries such as Bhutan, China, France, Indonesia, Israel, Japan, Mauritius, Myanmar, Nepal, Oman, Singapore, South Africa, South Korea, Sri Lanka, Tajikistan, the United Kingdom, USA and Vietnam. Military-to-military contacts are particularly vibrant and dynamic with countries like Bhutan, Nepal and USA. There is increasing realisation in the Government of India that defence cooperation can play a key role in regional and global security and it must be further enhanced with countries in the region so that bilateral and multilateral ties can be improved even further. While inaugurating a seminar on defence cooperation organised by the *Centre for Land Warfare Studies*, New Delhi, on 18 February, 2008, A K Antony, India's Defence Minister, said that globalisation has affected defence as much as any other activity and there is a need to continually find avenues for exchanging points of view with colleagues overseas, as well as learning from successful innovations being implemented elsewhere.

Throughout history, India has had major maritime trade links with Africa, Arabia, Mesopotamia (now Iraq) and West Asia, the Mediterranean, South East Asia and China. Many Indian kingdoms

In February 2010, the Indian Navy hosted *Milan 2010*, a biennial meeting of navies from the Indian Ocean and Asia-Pacific regions, at Port Blair in the Andaman and Nicobar Islands. In addition to the Indian Navy, ships from 12 other navies (Australia, Bangladesh, Brunei, Indonesia, Malaysia, Myanmar, New Zealand, Philippines, Singapore, Sri Lanka, Thailand and Vietnam) participated in this four-day event. The exercise was

aimed at building "mutual confidence and interoperability between navies of the Asia-Pacific region and was intended to promote understanding and cooperation in areas of common interest." It also sought to work together in future to safeguard the sea lanes of communication from poaching, piracy and terrorist activities, as well as engage in joint search and rescue and humanitarian operations. Two months later, in April 2010, the Indian and US

located on the Deccan Plateau had fairly sophisticated navies and their cultural and civilisational influence then extended all along the Indian Ocean littoral. Today the region faces a variety of security threats from non-state actors that endanger maritime peace and stability. The threats also include the smuggling of weapons of mass destruction (WMD): in (June 1999, alert Indian customs officers in Kandla port had discovered a North Korean ship carrying clandestine cargo of missile components from Pyongyang to Karachi), organised crime, trafficking in human beings and drugs, poaching in territorial waters and in the EEZ, environmental degradation through oil and even radioactive spills, maritime terrorism and piracy. Almost 70 per cent of the world's natural disasters also occur in the Indian Ocean region.

No navy can undertake these diverse tasks single-handed and it makes sense to make common cause with other friendly navies in the region. The Tsunami disaster relief and Lebanon refugee evacuation operations clearly showed the huge benefits of working alongside and operating seamlessly with other navies. Hence, in the fragile regional security environment obtaining in the Indian Ocean, it is essential for the Indian Navy to cooperate with other friendly navies to maintain peace and stability. The Indian Navy can do this only through constructive engagement.

Multilateral Exercises

Although the problems of comprehensive maritime security in the Indian Ocean are enormous, opportunities are not lacking either. According to Rear Admiral Pradeep Chauhan, "The concerted and cooperative effort of the littoral states of the Malacca Straits has led to a dramatic decrease in depredations such as 'armed robbery' that were, not too long ago, being visited upon ships with disconcerting regularity and ferocity. On the western flank of the region, the efforts of the multi-national *Task Force 150* in keeping the incidents of piracy off the coast of Somalia under control need to be appreciated."

Present efforts at constructive engagement are truly multilateral. The operations undertaken by the USNS *Mercy* and USS *Peleliu*, have been

commendable. In response to a 2006 request, an Indian Navy medical team consisting of five specialist doctors and two general practitioners (including a lady medical officer) and three paramedics, along with another team drawn jointly from the Indian Army and the Indian Air Force, participated in a four-month operation to provide medical and humanitarian relief to affected people in the Philippines, Bangladesh, Indonesia and East Timor. In 2007, 10 medical, veterinary and medical-engineering specialists from the Indian armed forces sailed with the USS *Peleliu* on the ship's mission covering the Philippines, Marshall Islands, Vietnam, and Papua New Guinea.

Large naval exercises are not new to the Indian Ocean region and the Indian Navy has always participated in them with gusto. From 1949 up to the 1965 war, the Indian Navy joined other Commonwealth navies, including Australia, Britain and Pakistan, to participate in exercises called *Joint Exercises Trincomalee* (JET). Then the

imposed on India consequent to the Pokhran-I nuclear test in May 1974, the Indian Navy was isolated. As was bound to happen, almost four decades of insularity took a toll on the tactical and doctrinal skills of the Indian Navy.

In the late 1980s and early 1990s, the Indian Navy, though still a 'brown water' navy suitable mainly for coastal defence but with two operational aircraft carriers, was seen as somewhat of an emerging threat by some countries in South East Asia, including Indonesia, Malaysia and even Australia. In March 1989, India had intervened in the Maldives to suppress a coup against the government of President Maumoon Abdul Gayoom. A *Time* magazine cover story (3 April 1989) of India's emergence as an Asian power, with an Indian Navy ship on the cover, further fuelled suspicions in the region. However, the littoral countries soon realised that a strong India could act as a regional stabiliser and over time, initial suspicions gave way to thoughts of mutual cooperation.



Naval ships from India, Australia, Japan, Singapore and the United States steam in formation in the Bay of Bengal during Exercise Malabar on 5 September. The formation included USS *Kitty Hawk*, USS *Nimitz*, INS *Viraat*, JS *Yuudachi*, JS *Ohnami*, RSS *Formidable*, HMAS *Adelaide*, INS *Ranvijay*, INS *Brahmaputra*, INS *Ranjit*, USS *Chicago* and USS *Higgins*.

Royal Navy pulled out of the Indian Ocean and the US Sixth and Seventh Fleets sailed in to fill the 'vacuum'. Around this time, India-Pakistan relations also soured and thoughts of joint naval exercises fell by the wayside. As Indo-US relations became estranged, especially after tough sanctions were

Gradually, defence relations with the USA improved, particularly after the 1991 visit by General Claude M Kickleigher of the Pacific Command. The first joint exercises with the US Navy, part of the *Malabar* series, were held in 1994. In the beginning, the exercises were basic in nature but

progressively improved in content and complexity with the introduction of advanced surface ships, while submarines and long range maritime patrol aircraft acted as a catalyst to the nascent naval cooperation. The relationship was beginning to gather momentum when the Pokhran-II nuclear explosions in May 1998 led to some knee-jerk international reactions as India was seen to have rocked the non-proliferation boat. However, a more rational appraisal of India's emergence as a Southern Asian military power followed soon after and many navies made it a point to come calling.

With India's unique position astride the shipping lanes of the Indian Ocean, which has over 100,000 ships transiting through annually, it was only natural that the maritime community that depended on these sea lanes of communications should befriend the sole regional navy. The Indian Navy began to exercise with the navies of Britain (*Konkan series*), France (*Varuna series*), Indonesia, Oman, Russia (*Indra series*) Thailand, Singapore (*Simbex series*) and the US (*Malabar series*). In addition to these bilateral exercises in the Indian Ocean, the Indian Navy availed the opportunity of port calls to Australia, China, Japan and New Zealand to carry out limited tactical manoeuvres at sea.

From bilateral exercises to multilateral ones, which reduce sailing time and costs and multiply operational benefits, was but a short step. According to Admiral Arun Prakash, former Chief of Naval Staff (CNS), "Over the past decade or so, our surface-ship operators, submariners and aircrew have gained tremendously in self-confidence and expertise by pitting their professional skills against the best in the business. However, each such exercise takes months of preparation, and consumes ship, submarine and aircraft operating hours; in the past few years it was becoming obvious that by exercising separately with so many navies we were overstretching both our material and personnel. The answer was to go multilateral, reduce the time, multiply the benefits, save machinery hours, and give more leave to the sailors. The Ministry of External Affairs was initially not very keen, but obviously

the navy managed to convince them. This is the real reason that for the first time *Malabar* (now) has five navies participating — not because of secret instructions from the Pentagon."

The *Varuna* series of Indo-French joint naval exercises were held in 1993, 1996, 1999 and 2000. In May and November 2002, there were two joint exercises, including with the *Charles De Gaulle*, the French nuclear powered aircraft carrier. The two navies have now formalised the scope and extent of their cooperation. The eleventh annual joint naval exercises were held off the coast of Goa in January 2011. Annual exercises are also held with the Singapore Navy. Coordinated patrolling exercises are being undertaken with Indonesia twice a year in March and September to prevent illegal fishing, poaching, migration and smuggling of arms.

Despite wide-ranging political, economic, social, cultural and linguistic differences and varying military structures, the Indian Navy has actively participated in UN Peace Keeping and Multilateral Track II arrangements like the Council for Security Cooperation in Asia Pacific (CSCAP) and Western Pacific Naval Symposium (WPNS). India's first integrated military command at the Andaman and Nicobar Islands at Port Blair hosted 'Milan 2003' from 11 to 15 February 2003. The gathering was a confluence of navies from several Indian Ocean countries. Warships and naval delegates from Australia, Indonesia, Malaysia, Myanmar, Singapore, Sri Lanka and Thailand participated in the event.

After the terrorist attacks on the World Trade Centre and the Pentagon on 11 September 2001, the US requested New Delhi to support the international war on terrorism by undertaking escort duties in the Malacca Straits. India agreed and Indian naval ships escorted US-flagged 'High Value Vessels' through the Straits under an operation that was code named *Op Sagittarius*. Indian Naval Ships *Sharda* and *Sukanya* escorted 24 US vessels between 2 April and 16 September 2002. The Indian and the Sri Lankan navies have considerable experience in joint operations. The Indian Navy had actively participated in Operation *Pawan* in the mid-to-late

1980s at the request of the Sri Lankan government to help it to fight the Tamil Tigers (LTTE). The Indian Navy conducted maritime operations in the waters around Sri Lanka and in Palk Bay, north of Sri Lanka.

Other International Engagements

In 2007, the Indian Navy launched a new cooperative regional maritime movement called the 'Indian Ocean Naval Symposium' (IONS). The aim is to provide a platform for the Chiefs of Navy of all littoral States of the Indian Ocean region to meet every two years to discuss multilateral issues having a bearing on regional maritime security. IONS is founded upon the concept of cooperative comprehensive security rather than competitive security. It asserts that the oceans connect landmasses which challenges the long-held belief that the oceans separate landmasses.

In 2001, the Indian Navy hosted the International Fleet Review (IFR), the first of its kind, since independence. Addressing the gathering of sailors and ships from 23 countries, the Indian Prime Minister voiced that the Indian Navy plays a crucial role in India's co-operation with other countries, especially those that share maritime borders. He said that active co-operation between navies was necessary in these times of sea piracy, gun running and drug menace, which are all part of international terrorism. He added that by institutionalising arrangements for cooperation, it could be said that India had built 'bridges of friendship', which was also the theme of the fleet review.

The new Great Game

There is clearly an underlying message in the Indian Navy's enhanced engagement that has not gone unnoticed in the intended quarters. Much like the 'Great Game' played out in Central Asia in the late 19th and early 20th centuries, the major Asian powers and the US are jostling for advantage to maintain the balance of power in Asia. India is a reluctant newcomer to this new Great Game. China, Russia and the Central Asian Republics have come together to form the Shanghai Cooperation Organisation (SCO) to guard their interests and to balance ASEAN and APEC. China is

assiduously engaged in pursuing a 'string of pearls' doctrine that is clearly aimed at the strategic encirclement of India. By creating client states around India that are dependent on it for their major arms purchases (Bangladesh, Myanmar, Sri Lanka and Pakistan), making inroads into Nepal and building ports at Gwadar (Pakistan), Hambantota (Sri Lanka) and in Myanmar and Maldives, China is not only safeguarding the sea lanes over which its oil and gas flow but also attempting to confine India to the backwaters of the Bay of Bengal and the Arabian Sea.

When Japanese Prime Minister Abe suggested a "quadrilateral" meeting between Australia, Japan, India and the USA over a year ago, the move raised China's suspicions. China formally queried the Japanese about the underlying motives as it became apprehensive that the four countries were likely to gang up against it. Chinese scholars and analysts have even dubbed this loose group of democracies as an 'Asian NATO.' The quadrilateral is far from becoming a cooperative military venture as India does not join military alliances and prefers to maintain its strategic autonomy. In fact, it is not so well known that the Chinese, Indian and Russian foreign ministers have met four times in the last three years. Hence, there is a clear attempt on India's part to cooperate with all the major Asian powers to maintain peace and stability in southern Asia and northern Indian Ocean regions.

At the same time, in keeping with its growing power and responsibilities, India has been steadily enhancing its expeditionary and military intervention capabilities for out-of-area contingencies. Some of these growing capabilities have been amply demonstrated. During the 1991 Gulf War, India airlifted approximately 150,000 civilian personnel who had been forced to leave Iraq, from the airfield at Amman, Jordan, over a period of 30 days. During the South East Asian tsunami in 2004, the Indian armed forces were in the forefront of rescue and relief operations. Over 70 Indian Navy ships had set sail with rescue teams and relief material in less than 72 hours of the disaster even though the Indian people on the eastern seaboard had themselves suffered horrendously. Indian naval

ships on goodwill visit to European countries during the Lebanon war in 2006 were redeployed and brought back 5,000 Indian civilian refugees.

With the arrival of INS *Jalashwa*, the erstwhile USS *Trenton*, at Mumbai in September 2007, India's strategic sea-lift capability has been substantially upgraded to transportation of one infantry battalion at a time. The Su-30MKI long-range combat aircraft with air-to-air refuelling capability that India acquired from Russia, the C-130J Special Forces transport aircraft now in service and the AWACS and maritime surveillance capabilities that India intends to build over the next five to 10 years, will give India considerable strategic outreach. However, India

notable engagement has been that with the US armed forces, especially the US Navy. However, there obviously is still a long way to go before the operations of both the navies in the Indian Ocean region can be truly harmonised in the common interest of the international community.

Admiral Sureesh Mehta, former Chief of Naval Staff, had set five objectives for multilateral and bilateral exercises with other friendly navies: the gaining of operational and doctrinal expertise; the sharing of transformational experiences; the examination and imbibing of 'best practices'; the generation of interoperability; and the enhancement of maritime domain awareness through a variety of information-sharing



Indian Navy ships which took part in the Joint Naval Exercise SIMBEX-10 held off the Visakhapatnam coast between navies of India and the Republic of Singapore.

has consistently favoured military interventions under a 'UN umbrella'. Though that position is unlikely to change quickly, India may join future coalitions of the willing when its vital national interests are threatened and need to be defended.

Defence diplomacy and maritime cooperation are potent instruments for promoting national interests. In recent years, the Indian armed forces have shed their hesitant approach to engage more widely with the armed forces of other friendly countries, but most endeavours are still essentially in the fields of training and 'friendly' visits. The most

mechanisms. In his view, "very high comfort levels have been established" and this has enabled the Indian Navy to concentrate on high-end activities.

In order to upgrade maritime cooperation in the field of real-time operations, so as to contribute more effectively to regional security, Admiral Arun Prakash advocates an 'Asian Maritime Partnership' to establish "a modest naval 'force in being' to serve the common cause" of ensuring security of the SLOCs.

Brigadier (R) Gurmeet S Kanwal
Director, Centre for Land Warfare Studies, New Delhi



“Freedom at Work”



The USS Bush sails out

The USS *George Herbert Walker Bush* (CVN-77) is the latest aircraft carrier of the United States Navy and the last descendant of the USS *Nimitz*-class carriers. The 41st President of the United States of America gave the name of the ship not only for being a (former) President but also his role as young naval aviator during the 2nd World War. In the 1940s George HW Bush was a pilot on the Grumman TBM Avenger in the Pacific Ocean and the callsign of the ship is appropriately ‘Avenger’. The ship has as its motto “*Freedom at Work*”.

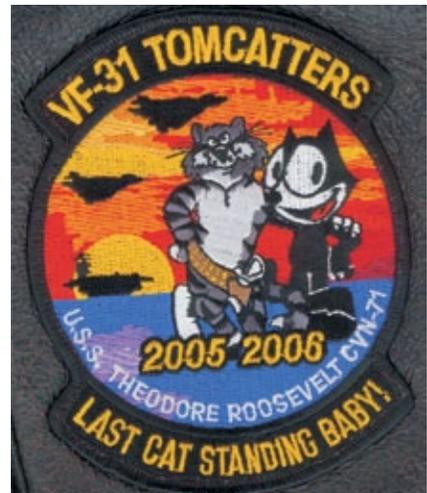
After transferring more than \$6 billion to the bank-account of the famous Newport shipyard the US Navy added the USS *Bush* in 2009 as its 10th nuclear aircraft carrier of the *Nimitz* class. There are differences between the first USS *Nimitz* (CVN-68, designed in the 1960s and delivered in 1975) and the USS *Bush* (CVN-77), as the world of naval aviation has greatly changed. Compared to the various aircraft types (A-6, A-7, EA-6B, F-4, F-14, S-3, F-18) in the US

Navy inventory of those days, the USS *Bush* now has an all F-18-based air wing embarked. In 30 years of naval aviation, ideas and doctrines have also greatly changed. This is reflected in a number of changes to the USS *Bush*, relative to the predecessor USS *Nimitz* of 1975:

- the number and the location of the refueling and arming points have been redesigned and relocated to reduce the number of sailors on deck
- the island (the building on the deck) has been increased in size and moved to the rear for better overview on the deck
- the sanitation system has been renewed; fresh water (instead of the corrosive sea water) is used to flush the toilets, waste-water that will be retrieved by a vacuum system comparable to the a toilet onboard a commercial airliner.
- updates in electronics and avionics, introduction of network, wifi and fibre-optics throughout the ship
- redesigned and smarter arresting gear that ‘judges’ weight of the landing

aircraft and adjusts the restraining force automatically.

- reduction of the radar signature of the ship by adding changes to the deck, hull and island.
 - redesign of the blast-deflectors
- After its maiden-cruise, the USS *Bush* will be completed to the latest standards, one of these being addition



CVW-8 and its embarked squadrons

Squadron	Squadron title	Nickname	Type of aircraft
VFA-15	Strike Fighter Squadron 15	Valions	F/A-18 Hornet
VFA-31	Strike Fighter Squadron 31	Tomcatters	F/A-18E Super Hornet
VFA-87	Strike Fighter Squadron 87	Golden Warriors	F/A-18 Hornet
VFA-213	Strike Fighter Squadron 213	Black Lions	F/A-18F Super Hornet
VAW-124	Carrier Airborne Early Warning Squadron 124	Bear Aces	E-2C Hawkeye
VAQ-141	Electronic Attack Squadron 141	Shadowhawks	EA-18G Growler
VRC-40	Fleet Logistics Support Squadron 40, Detachment 5	Rawhides	C-2A Greyhound
HSC-9	Helicopter Sea Combat Squadron 9	Tridents	MH-60S Seahawk /Knighthawk
HSM-70	Helicopter Maritime Strike Squadron 70	Spartans	MH-60R Seahawk

of multi-barrel guns for close-in-self-defence.

The emblem of the USS *Bush* consists of a circle with 41 stars, for the 41st president of the USA, a picture of the aircraft-carrier itself and a composite picture of 3 aircraft types :

- * silhouette of a TBM Avenger that George HW Bush flew during the 2nd World War
- * silhouette of an F-18, depicting the current fighter type
- * silhouette of an F-35 Joint Strike Fighter, the future aircraft type to fly on the USS *Bush* in a few years.

First cruise

After commissioning of the USS *Bush* in 2009, a very thorough 'shakedown testphase' was performed for over a year, where the complete ship, from bow to stern and from top to bottom, was tested for reliability and durability.

After the normal carrier working-up phase, the maiden cruise started in May 2011 departing the homeport of Norfolk (Virginia,USA), sailing into the control zone of the US Navy 6th Fleet. First stop was in the United Kingdom where the ship participated in the exercise *Saxon Warrior*, then transit into the Mediterranean Sea with a short portstop in Cartagena (Spain) and a 4-day visit to Naples (Italy). After the Naples visit, the transition through the Suez canal brought the USS *Bush* into the 'hot' area of operation of the US Navy 5th Fleet: operations in the Gulf-region.

The USS *Bush* is not sailing alone, but is part of the "Carrier Strike group 2" (CARSTRKGRU 2) under command of Rear Admiral Nora W. Tyson, consisting of the USS *Bush*, 3 cruisers, 4 destroyers, 1 frigate, 2 submarines and (temporarily) the Spanish ESPS Almirante *Juan de Borbón* (F102). (This Spanish ship sailed with the strike group until the Mediterranean Sea).

CVW-8

Carrier Air Wing Eight (CVW-8) is the naval air wing assigned to this first cruise of the USS *Bush*. After 'losing' the Grumman F-14 Tomcat in the 2005-2006 cruise onboard of the USS *Roosevelt* ("Last Tomcat cruise"), VF-31 Tomcatters and VF-213 'Black Lions' traded in their Tomcats for Boeing F/A-18 E/F Super

Hornets and renamed VFA-31 and VFA-213. And after the last cruise of CVW-8 on the USS *Roosevelt* in 2008-2009, the venerable Grumman EA-6B Prowler of VAQ-141 (Electronic Attack Squadron 141, 'Shadowhawks') was replaced by the Boeing EA-18G Growler. CVW-8 consisted of only F-18s (VFA-15 and VFA-87 with the 'older' F/A-18s, VFA-31 with F/A-18E Super Hornet (single-seater), VFA-213 with F/A-18F Super Hornet (two-seater) and VAQ-141 with the EA-18G Growler. This all-F-18 wing concept will reduce operational costs as there is much communality between the F-18s, upto 70-80% between the F/A-18 E, F and G subtypes.

For the deck-crew, the all F-18-wing has a number of advantages, as dimensions and maintenance are more or less the





same. The deck-planners of Flight Deck Control (who prepare or handle all aircraft on deck via the “Ouija –board”, using washers, nuts and pins to mimic status of the aircraft (un)armed, (un)fueled, etc) prefer this type standardisation. The larger and heavier F-14 Tomcats and EA-6B Prowlers sometimes gave manoeuvring restrictions while the weight of a fully loaded, fueled and armed F-14 Tomcat could sometimes restrict the pulling force of a deck-tractor.

In the past, older aircraft were often assigned the role of aerial tankers for aerial refueling, a role the S-3 Viking performed during the last years in naval service. Today, the new F/A-18E/Fs are equipped with centreline fuelpods to refuel their buddy F/A-18s, the VFA-31 F-18Es using refueling pods with the title of Felix the cat standing next to a fuelpump. The more powerful Super Hornets can carry 4 wingtanks with 1 centreline refueling pod while they are armed with missiles and cannons, thus reducing the number of defenders needed for the unarmed S-3’s and KA-6’s in earlier times.

The EA-18G

For VAQ-141, this will be the first operational cruise in the electronic warfare role with the Growler, whereby two pilots, supported by sophisticated computer power, can do more work than the older and more analogue equipped 4-seater EA-6B. Procedures, tactics, doctrines and strategies for the operational use of the Growlers in carrier wings are prepared by US Navy departments, but most is only written down with pencil. The lessons learned by VAQ-141 and CVW-8 will be the basis for a renewed set of procedures, doctrines and strategies; lessons are learned every day and improvements are incorporated in the procedures. The

EA-18G handbook is changed on a daily basis as predicted characteristics are often modified by reality.

The EA-18Gs are standard production F/A-18Fs that will differ by only 10% with the standard F versions. The role specific hardware is installed in the empty cannon compartment and in pods mounted on the wingtips and in pods below the wings. As defensive weapons the AIM-120 Advanced Medium-Range Air-to-Air Missiles (AMRAAM) are carried and as offensive weapons the AGM-88 High-speed Anti-Radiation Missile (HARM) can be used to attack electronic targets. If needed, an EA-18G can be converted back into an ordinary F/A-18F, except for the missing cannon.



MH-60R

Another newcomer type onboard is the MH-60R SeaHawk helicopter of Helicopter Maritime Strike squadron 70 (HSM-70 ‘Spartans’). The Romeo variant of the MH-60 is fitted with a glass cockpit and has several improvements with the sonar, the sensor-package, the datalink and the armament. While the squadron was previously



named HSL-70 (for Helicopter Anti-Submarine Light,) the new Romeo variant increases the role of the helicopter and is renamed as Helicopter Maritime Strike (HSM). The MH-60R can be distinguished easily from the MH-60S helicopters (used in the Search-and-Rescue and Vertical Replenishment roles by Helicopter Sea Combat Squadron-9, HSC-9 'Tridents') by the chin-mounted pod. On a MH-60R, the pod is facing upwards while on a MH-60S the pod is facing downwards.

Our visit

Our visit to the USS *Bush* started at the airport of Mallorca (Spain), where a C-2 Greyhound (COD, Carrier Onboard Delivery) of VRC-40 detachment 5, flew us towards the carrier. An hour after take-off, a holding pattern near the carrier was entered and gradually descent us towards the carrier was initiated. During the landing phase the crew shouted "Here we go" at $\frac{3}{4}$ of a mile (after the pilots "called the ball") and a few seconds later

the tailhook grasped the arresting cable, stopping the C-2 from a speed of over 105 miles per hour within the boundaries of the flight deck.

After a tailhook-landing with the C-2 Greyhound an interview with "the big boss" Capt Brian 'Lex' Luther was held in the 'George Bush room'. This room was decorated with photos of a room in the Bush mansion (and when George Bush visited this room, he and his wife felt at home immediately.) The walls are





leads the 8th Airwing (CVW-8) onboard the USS *Bush*. He was very pleased to have the all-F-18 FighterWing onboard and he knew that new tactics and procedures would be developed during the cruise.

About the future, he was very confident on the existence of manned aircraft. Unmanned aircraft (UAVs) will play a greater role in the areas of patrol and surveillance, and in very high threat areas the UAVs can be used with less risk for human casualties. But the human eye and brain would still be needed in manned aircraft for split-second decisions on the battlefield. That kind of decisions could not be made in by an operator on another continent, operating the UAV with its obvious delays using satellite communication.

HSM-70 ‘Spartans’ started in July 2010 with the startup phase for this cruise, learning to use the new HS-60 Romeo variant in combination with aircraft and helicopters of the USS *Bush*. They also switched the role and therefore became HSM-70 instead of the older HSL-70 squadron designation. The new radar and sonar, armament and electronic warfare equipment were well integrated during this phase; but the proof of the pudding will be when the helicopter will be used operationally in the Gulf.

This was first cruise of the EA-18Gs of VAQ-141 ‘Shadowhawks’ and Cdr Pugh called it “a leap in technology”, from the

decorated with photos from the various stages in his life and a signed baseball is located in one of the portholes.

Captain Luther spent a previous cruise as XO (Executive Officer) on the USS *Nimitz* (CVN-68), before transferring as the CO (Commanding Officer) of the USS *Bush*. Serving on the first nuclear carrier USS *Nimitz* (of the *Nimitz*-class) and now serving on the last carrier of the *Nimitz*-class, he described himself as the ‘Alpha and Omega’ man of this carrier-class. He could well describe the differences of more than 30 years of these carriers. Less steam, more electronics; a larger island, located more to the stern; a new balancing system to stabilise the ship;

other locations for refueling and arming the aircraft; intelligent recovery system that measures and adjusts the arresting force automatically. The total cost of ownership is reduced, so less aircraft and less personnel are needed to fulfill the same task.

The next morning an interview was held with the CAG (Commander Aircraft Group) CVW-8: Capt Jeffrey Davis (CAG) and the commanders of 3 squadrons:

VFA-31: Cdr Jeremy Gunter

VAQ-141: Cdr Karl Pugh

HSM-70: Cdr Amy Bauernschmidt

Capt Davis (CAG) is a highly experienced pilot with more than 4000 hours on the F-14, F-18, EA-6B and E-2, and he now





1960s into the next millennium. With modern computers, the work of 4 persons in the EA-6B can be done by 2 persons in the EA-18G. They have a 'blank sheet' to describe the use of the Growler in a real war situation, the strategies and tactics that they use now are derived from EA-6B operations and from exercises and work-up cruises. But these are written in pencil and as they learn by the day, the new Growler handbook will be added to on a daily basis.

The EA-18G crews are very enthusiastic with this modern aircraft and it's new possibilities, and do not want to go back to the EA-6B! With the new Growlers, "they kept up with the Joneses" using the newest aircraft available in the US Navy's inventory.

For VFA-31 it is the second cruise with the F-18E, after retiring the F-14 Tomcat in 2006, they flew their first cruise with the F-18E on the USS *Roosevelt* in 2008-2009. The F-18E used by VFA-31 is a single-seater version, while the F-18F of VFA-213 is a two-seater version. In 2006 the VF-31 and VF-213 crews wore a patch "Hornets by mandate, Tomcats by choice"; but now they fly the F-18E/Fs they do not want to go back to the Tomcats: the F-18s are less heavy and have better performance and endurance. The common airframes of the F-18s allow maintainers to make better use of the aircraft during maintenance. The F-18 commonality allows the pilots to make better use of the flying assets, and on some missions fewer aircraft are needed than anticipated, to fulfill the mission goals.

The Future

The next carriers to be built, will be the USS *Ford* (CVN-78) and the USS *Kennedy* (CVN-79). These carriers will be a class of their own as will not follow the USS *Nimitz*-class. The steam catapult will be replaced by an electromagnetic launch and recovery system and the catapults will be redesigned to allow 4 equal catapults. With the *Nimitz*-class carriers, the number 4 catapult can launch only aircraft with limited weight and armament, due to the proximity of the forward flightdeck and structures built next to the catapult. The USS *Bush* is thus a 'stepping stone' for this next generation of aircraft carriers, with a myriad of improvements at various levels.

Article and photos: Joris van Boven



Submarine Operations : Strategies for the 21st

The sixth Annual Maritime Power Conference of the National Maritime Foundation (NMF) at New Delhi had the theme ‘**Submarine Operations: Strategies for the 21st Century**’.

Admiral Arun Prakash, former Chief of Naval Staff and presently Chairman of the National Maritime Foundation (NMF) set the pace for the two-day conference and in an aside, referred to the previous year’s conference on aircraft carriers during which twelve month period, “much has changed.” He recalled the dramatic turn of events where the Royal Navy’s large aircraft carrier programme had been drastically curtailed and choice of the prime on-board fighter altered. He referred to the Chinese strategy on ‘sea denial’ which is of much discomfort to the ‘other side’. On the other hand, India has an elaborate naval warship building programme which includes two-three aircraft carriers, a dozen new generation diesel electric submarines while its first indigenous nuclear submarine will be followed by another two or three.

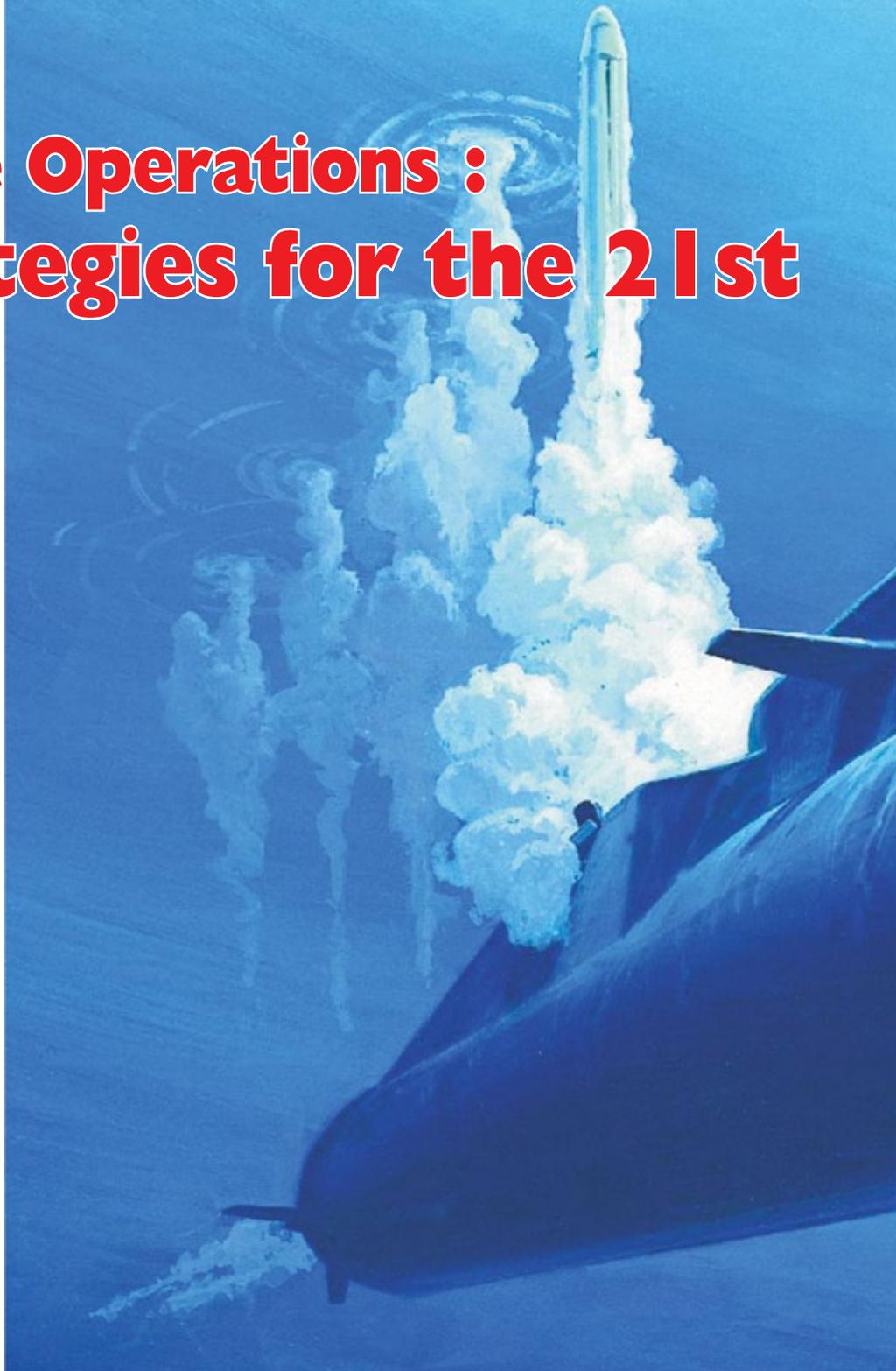
The first part of the conference had *Submarine Operations* as the larger theme, for which Chairman of the National Maritime Foundation (NMF) Admiral (Retd.) Arun Prakash chaired the session. Rear Admiral (Retd.) K Raja Menon was the first speaker and spoke about *Conventional Submarines in Future Maritime Wars*. At the outset he referred to the five nations operating nuclear submarines, along with India’s foray into this group. “To exemplify the use of submarines as warships, one can ascertain that, firstly, the submarine was developed as a warship and secondly the great successes of the submarine against shipping necessitated a force level of hundreds,” stressed Menon.

He also questioned if the issue was not whether the submarine has changed its nature, but what was the relative advantage or disadvantage that the submarine had undergone vis-à-vis the other warships? Submarine warfare analysts need a

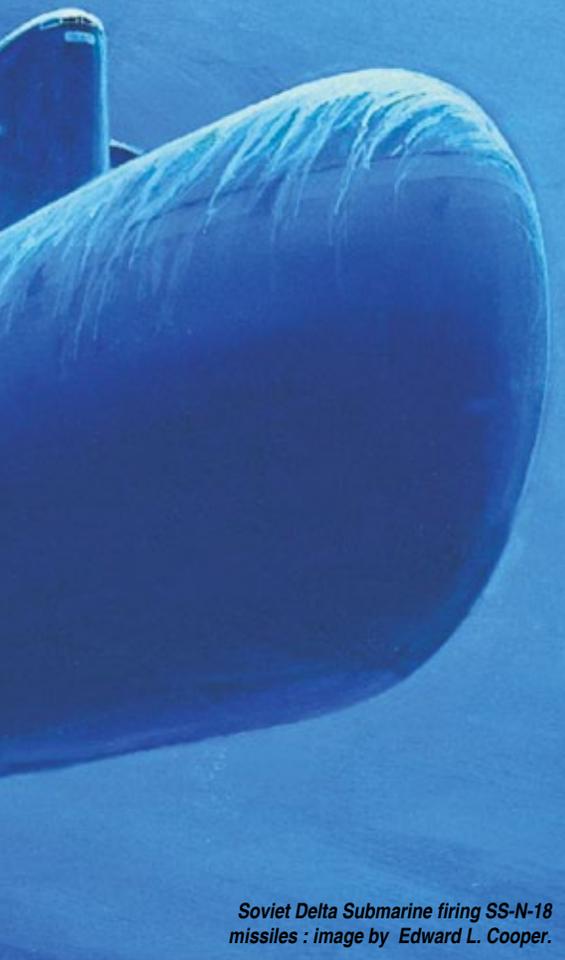
clear understanding on whether the growth in all technologies has given the conventional submarine an edge over its surface counterpart, or whether the gap of superiority of the submarine has remained the same over the years. “Despite the many doubts that appear on the nature, duration and objectives of conventional war at sea, navies are still relying on conventional submarines to perform a number of roles. It is worthwhile to debate whether

conventional submarines can address the political purpose of war as well?” concluded Menon.

Rear Admiral Osvaldo Schwarzenberg from Chile, spoke about *Operational Exploitation of Scorpene submarines*. “The Scorpene submarine has provided us with a platform capable of performing all the traditional tasks allocated to submarines, but with more efficiency and greater engagement ranges,” he stated.



Century



Soviet Delta Submarine firing SS-N-18 missiles : image by Edward L. Cooper.

carefully studied by the Chilean Navy to fulfil its requirements. The massive firepower combined with state-of-the-art sensors has allowed us to start a new era in submarine operations, developing tactics and procedures to fully integrate them in task forces in order to exploit their capabilities.”

Cmde PJ Sudhir talked about *Communication with Dived Submarines*. “In the present day scenario, communication has gained primacy since transforming into its new avatar – information. For proponents of warfare, this translates to C4I or Command, Control, Communication, Computers and Intelligence. Interestingly, quality and secure communications is central to superior C4I which in today’s seamlessly connected world translates to information

the platform in the face of opposition but also ensure integration of the platform to the extent necessary for achieving information dominance. While submarine communications have never been easy, we are moving from the desire to have better connectivity with dived submarines to having the ability, procurement permitting, to deliver it,” concluded Cmde Sudhir.

Capt Gordon Andrew from Australia spoke about *Conventional Submarines in Open Ocean Warfare*. Keeping an Australian perspective in mind, he delved into how submarines contribute to a maritime strategy as part of a balanced naval force.

“Australian Maritime Doctrine sees the tasks of navies as a triangle of diplomatic, constabulary and military roles and while submarines can, and do, contribute to the



The Scorpene submarine exposed.

The submarine’s operational aspects for exploitation include stealth, longer detection range, long range weapons, tactical mobility and strategic mobility. With its longer detection ranges, it has optimised visual detection, better sonar detection and classification ranges along with real time data link sharing, Schwarzenberg concluded by stating, “Many of the weakness of an SSK experienced in the Scorpene, have been

dominance!” He further added that the future of communication with dived submarines clearly revealed the urgent requirement for submarines to have duplex communication capability while operating at depth and speed. This capability is equally required for conventional, AIP as well as nuclear propelled submarines. “The need of the hour is to have class/type specific communication systems which would not only ensure survivability of

first two roles, it is the military role that is of most interest and where submarines really provide the greatest effect,” Andrew stated at the outset. He added that “Submarines in isolation, are not a substitute for a properly balanced force, the maritime environment is too complex for any asset, however sophisticated, to provide a universal answer. But they do represent an integral and abiding component of any defence force which seeks to exert any

real measure of influence and control over conflict at sea.

Then these was an umbrella theme of 'Submarine Construction,' which was chaired by Vice Admiral (Retd.) BS Randhawa. The first speaker, Vice Admiral (Retd) RN Ganesh spoke about *Submarines in the Indian Calculus: Challenges of Construction & Design*. "The future place of the submarine in the Indian strategic framework will obviously depend on the way the strategic scene in the Indian Ocean region unfolds. With increased Chinese activity in the Indian Ocean and ships of NATO and the US deployed to combat piracy, this will affect increasing security concerns of India. One will begin to see the roles of submarines defined under defensive and offensive operations in littoral and focal areas, ocean patrols in surveillance and classic sea denial missions, and strategic deterrence," conveyed Admiral Ganesh.

The submarine has definitely evolved as a crucial factor in the Indian strategic calculus. It is effective in the role of defending naval objectives in the event of war, maintaining surveillance and preparedness at times of peace, denial of

militarily significant sea areas to hostile forces in times of conflict, and in the vital role of strategic deterrence in the interests of national and regional security and stability. In conclusion Admiral Ganesh stated, "There are however, challenges to be met. Among the most important is the acquisition of design, technological and engineering skills and the management of human resources. While the need for a clear concept is a pre-requisite, continuity of strategic intent is essential for successful implementation."

Cdr Jens Nykvist from Sweden spoke on *Advances in Submarine Stealth Technology* and discussed the importance of expert personnel in the future. "The future submarines need to have a different maintenance programme to increase the operational effect and time at sea. We can't afford to be at shipyards for long periods with only 4 operational submarines. But the biggest challenge today and in the future is personnel, to recruit and to make them stay in the Navy and that they don't leave for a civilian job. Professional crews are of utmost importance and people are a very important asset. He further concluded by stating "the technical development of

submarines during the last 20-30 years has been remarkable, but in the long run it is always the commanding officer and his or her crews' knowledge and skills that make it possible."

Capt Alain Gaubert of the French Navy talked about, *Barracuda: New Generation French Submarine*.

Chaired by Vice Admiral Pradip K Chatterjee the next session had the broad theme *Submarine Rescue & Safety* which had three speakers including Rear Admiral Simon of the Royal Navy speaking about *Advances in Submarine Rescue Technology*. Talking about *Delivering Fly Away Submarine Rescue Capability: a Technical Perspective* was the second speaker Mr Ben Sharples from UK's James Fisher Defence. He was followed by Dr Thomas Langer from EADS, Germany who gave a presentation on *Advanced Concepts in Submarine Safety*, and mostly focused on RESUS (Rescue system for Submarines) as a system to ensure rapid surfacing in case of submarine emergency situations.

The next session broadly themed *Submarine Acquisition, Training & ASW* was chaired by Vice Admiral (Retd)

Scorpene Submarines

"O'Higgins" and "Carrera"

Project "Neptune"

This considers the acquisition of two new submarines that will shortly be incorporated into service for the renovation of our combat units. The SS "O'Higgins" will arrive in Chile during 2006, and the SS "Carrera" will arrive in Chile during 2006.

- Special units that operate in covert missions, anti-submarines and surface warfare.
- Conventional platform, the most modern in the world with the latest technology and low maintenance costs.
- Propulsion System with integrated Platform Control and an Integrated Combat System.
- Infra-red Radiation Detector
- Modern armament that can maintain its essential condition as a dissuasive platform.
- Capacity to operate at more than a depth of 300 metres.
- Its stay under water can last up to 60 days.

66 metres in length
6.2 metres diameter
Displacement of 1,700 tons under water
Maximum Immersion > 300 metres
Cruising Range of 50 days on patrol

31 Crew Members
Electrical-Diesel Propulsion
Active and Passive Sonar
6 torpedo tubes, missile capacity, SM 39

Premvir S Das and was international in nature, with three speakers namely Capt Caio Renaud from Brazil, Capt Itsuya Toyoma from Japan and Capt John E Weyne from the Netherlands.

Capt Caio Renaud focused on *Drivers for Submarine Acquisition*, stating that “with technological advances in the 21st Century, modern submarines with their basic characteristics widened become the ideal means to be operated in areas controlled by the enemy, thus contributing to enhance the capability of a friendly naval force.” Another tendency that has been observed is the growing participation of the submarines in control and interdiction operations of maritime areas, where the submarine operates with direct or associated support to a naval or air-naval force in order to carry out tasks of intelligence, surveillance and reconnaissance in hostile waters. “Progressively, the submarine will stop operating in an isolated way in order to fit in the concept of joint operation with the participation in a theatre of operations, composed of elements of the Navy and the Air Force, working together to assure defence of the country and, consequently, guaranteeing its safety,” concluded Renaud.

Expressing his views on the *Futuristic ASW Environment* Capt Itsuya Toyoma from Japan stated that, “the Asia-Pacific region has been getting more global attention due to the rapid development of economies, resulting in enhanced coordination and cooperation among countries. On the other hand, this region is considerably rich in political, economic, and religious diversity, and conflicts between countries/religions remain, even after the end of Cold War, unlike Europe. Because of these reasons, major changes in the security environment have yet to emerge and long-standing issues of territorial rights and reunification continue to plague the region.”

“The future of ASW relies on underwater information supremacy. The international security environment has been undergoing enormous challenges in recent years and the international society faces a variety of challenges ranging from traditional issues between nation states to new threat and diverse circumstances. In maintaining and securing their sea lanes, Japan’s ASW operation will play great



China's Jin-Class Type 097.

importance in the defence of Japan,” added Capt Toyoma.

Capt John E Weyne of the Royal Netherlands Navy spoke about *Advances in Submarine Training*. With regards to Netherlands, “one of the most important start-offs for effective and efficient training programme is an administrative one. Over time the minimum required knowledge and experience for each function on board have been detailed to the greatest possible extent. All education has to be and is certified to ISO standards. Furthermore the training process is cross-checked, bounced about as intensively and frequently as possible, internally within the Navy with damage control, operational and technical schools, but foremost externally with the British and Norwegians and with feedback of students of the Submarine Command Corps,” said Weyne. He further added that the main driving factor for the Netherlands submarine service was to further improve operational capability, not only by training itself but also by optimising the

interrelations between the mentioned factors in close cooperation with external actors. “The concept applies to any service which either has deficiencies in one of the mentioned factors or wants to step up its operational capability.”

The final session of the conference had an umbrella theme of ‘*Nuclear Submarine Operations*’ which was chaired by Vice Admiral (Retd) AK Singh. The first speaker Rear Admiral Michael J Connor who is the Director of Submarine Warfare in the US Navy, spoke about the ‘*Advances in Nuclear Propulsion: Nautilus & Beyond*’ and discussed the challenges and opportunities in developing a nuclear submarine force, the evolution in submarine missions that nuclear propulsion enables and finally challenges in operating a force of nuclear powered submarines.

The last two presentations were made by Capt Grigory V Pivovarov and Capt Veniamin Alexandrov of the Russian Navy who spoke about ‘*Role of Submarines in Nuclear Deterrence*’ and ‘*SSBN’s in Modern Warfare*’ respectively.

The Project 75 India stealth submarine project

The Government of India is reportedly to shortly issue the global tender for construction of six new-generation stealth submarines with the help of a foreign collaborator, which at a cost of over Rs 50,000 crore will be the country's single biggest defence project. The Defence Acquisitions Council (DAC), chaired by defence minister A K Antony, had sometime in 2010 cleared this submarine programme called 'Project-75India' and then subsequently issued RFIs (request for information) to five submarine manufacturers.

Selection of the foreign collaborator for the P-75I will be after the five, Rosoboronexport (Russia), DCNS/Armaris (France), HDW (Germany), Kockums (Sweden) and Navantia

(Spain), respond with their final proposals to the tender. "The government has cleared P-75I, which is the next lot of six submarines... at the moment we are in the RFI process. I hope within this year we would be able to push off the tender," stated Navy chief Admiral Nirmal Verma.

This massive naval programme involves six new vessels with land-attack capabilities as well as air-independent propulsion (AIP), which substantially enhances a diesel-electric submarine's capability to stay underwater without frequently surfacing to get oxygen to recharge its batteries.

As per the approved plan, while two submarines will be imported from the foreign collaborator, the other four will be built indigenously under "transfer of technology." While three will be

constructed at Mazagon Docks (MDL) in Mumbai, the fourth will be built at Hindustan Shipyard Ltd (HSL) in Visakhapatnam. MDL is already engaged in building six French Scorpene submarines under Project75, currently valued at Rs 23,562 crore (which incidentally is running three years behind the 2012-2017 schedule earlier set for it.)

The Navy is keen that Project P-75I gets going as soon as possible since it will shortly be left with just over half of its present fleet of 14 ageing conventional submarines, 10 Russian *Kilo*-class and four German HDWs, by 2015. Though India does not have nuclear submarines and SLBM (submarine-launched ballistic missile) capabilities at present to complete its "nuclear triad", it hopes to induct its first indigenous nuclear submarine *INS Arihant* by 2012. Moreover, it hopes to also induct the *Akula-II* class nuclear-powered submarine K-152 Nerpa on a 10-year lease from Russia in 2012.

Arihant in sea trials



India's first nuclear submarine, the *INS Arihant*, has gone to the high-seas for an extended trial, indicating that this is on course to be inducted by the Navy by 2012. The *INS Arihant* with a 80 Mwe nuclear reactor at its core, was launched to water in July 2010. The sea trials will be carried out for more than a year in different conditions to test the endurance and performance of the nuclear submarine, which is capable of staying under water for several months.

Once inducted, *INS Arihant* will reportedly become the 'third leg of the nuclear triad' enabling India to have retaliatory second strike capability from

way out at sea. At the defence research and development organisation's annual awards function attended by Defence Minister AK Antony, DRDO chief VK Saraswat mentioned '*INS Arihant*' as a significant technology achievement. For

obvious reasons Saraswat did not mention anything about the two other nuclear submarines, which are being constructed presently: the hull of the second nuclear submarine is under construction at an L&T facility in Gujarat.



Stepping up of Indo-Russian Defence Relationship



AK Antony and his Russian counterpart AE Serdyukov exchanging the signed protocol after the 11th Meeting of the India-Russia Inter-governmental Commission on Military and Technical Cooperation (IRIGC-MTC) in Moscow on 4 October 2011

As precursor to Prime Minister Manmohan Singh's visit to Russia in December 2011, Indian Defence Minister AK Antony met with his Russian counterpart AE Serdyukov at the Eleventh Meeting of the India-Russia Inter-Governmental Commission on Military Technical Cooperation (IRIGC-MTC) held on 3-4 October 2011 at Moscow. The entire spectrum of defence cooperation was reviewed with exchange of views on the regional and global security situation. The Defence Minister AK Antony flew into the Russian Capital along with a high level delegation via Dushanbe in Tajikistan in an IAF ERJ 145 executive jet.

The Government of India is working on an array of projects with Russia, considered as critical to defence preparedness and modernisation of the Armed Forces. The importance of Mr. Antony's visit was strikingly evident by composition of the

team which accompanied him, including the Defence Secretary Shashikant Sharma, Secretary Defence Production Shekhar Aggarwal, Lt Gen MS Buttar (DGWE), Air Marshal RK Sharma (DCAS), Vice

Admiral NN Kumar, Controller of Warship Production & Acquisition, Dr. Avinash Chander CC R&D, Ashok Nayak, Chairman HAL and Vivek Rae, DG Acquisition (MoD).



Prototype of the T-50/FGFA.

In a protocol signed after the meetings, AK Antony expressed “readiness to take all necessary measures to further expand the cooperation on a mutually beneficial basis” and both sides noted that steps were taken to “to deepen interaction in the development of defence technologies, modernisation of military equipment and joint manufacture of military-purpose products.”

“There is a strong impulse, both at the level of the Government and among the people of India to further strengthen our special strategic partnership which is based on mutual trust and complementarity of interests. The world in general and our region in particular, are witnessing significant developments which have an impact on regional and global security. In the evolving scenario, the special strategic partnership between our two countries assumes even greater significance. Both our countries must continue to strengthen our joint efforts to address these challenges.”

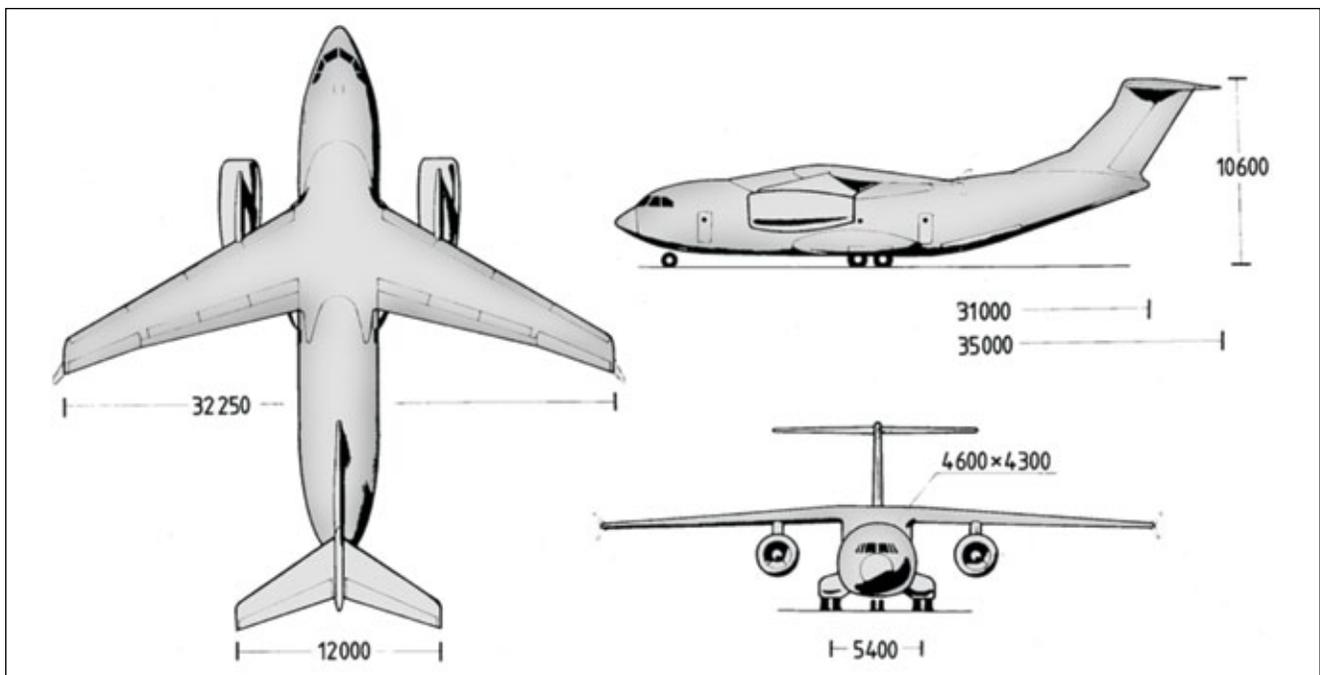
Mr. Antony reviewed the progress in various projects including the “development and production of the Fifth Generation Fighter Aircraft, BrahMos missile system, licensed production in India of T-90 tanks, Su-30MKI production and upgradation (‘Super Sukhoi’), the aircraft carrier INS *Vikramaditya*, its prime ship-borne fighter MiG-29K and the Multi-Role Transport Aircraft (MRTA).



The Brahmos supersonic cruise missile is an example of successful collaboration between India and Russia.



Commissioning of the INS Vikramaditya (nee Admiral Gorshkov) is long overdue.



Three-view drawing of the proposed Indo-Russian MRTA

Irkut



AK Antony being greeted by Tajik Defence Minister Col General Sherali Khairylleov during his stop over at Dushanbe

The INS *Vikramaditya* (nee *Admiral Gorshkov*) programme has been long delayed with cost overruns while a recent CAG report has raised questions on the weapon systems to be integrated on the MiG-29Ks (see *Vayu V/2011*). AK Antony expressed the hope that “induction will take place, on schedule, by end 2012” and also that “all activities on the MiG-29K will be completed to achieve synchronisation with the aircraft carrier”.

Antony however expressed concern on the “tardy progress” made in the design and development of the Multi-Role Transport Aircraft (MRTA). The two sides agreed to accelerate the progress of this Project and would meet later in October to review this.

Regarding the to-be jointly developed Fifth Generation Fighter Aircraft (FGFA), both sides noted that, after completion

of the preliminary design contract and training programme for Indian engineers covering 20 courses which was completed in July 2011, the PD Contract would be finalised before 2012.

The Russian Defence Minister Serdyukov described India-Russia defence ties as a “stable and promising relationship” but, significantly, expressed Russian concerns over India’s offsets policies.



An Indian footprint in Central Asia? Google image of Ayni Air Base, south of Dushanbe in Tajikistan with clear details of aircraft on the tarmac and taxiway. These include eight Mi-17 helicopters, an An-26/32, five L-39s, two piston-engine trainer types and one IL-76 on the taxiway. Rumours of Indian Air Force MiG-29s to be based here are only speculative.

Vayu's visit to MBDA in Italy and the UK

A Constellation of Missiles



MBDA's extensive portfolio

An Exocet anti-ship missile under final assembly.

It's a busy time for MBDA in India- what with an impressive record of missiles manufactured in India dating back decades to ongoing tenders now across the three Services including arming the HAL's Dhruv helicopter and future potential collaborations and manufacturing plans - the Company has its hands full!

In mid-October 2011, select Indian media visited MBDA's facilities in Italy and the UK which followed the tour last year of the Company's production lines in France.

On arrival at Naples (Italy) we were taken to MBDA's facilities at the Fusaro plant to be briefed on MBDA Italy and the Marte Family of light anti-ship missiles. Later, after detailed briefings on the Taurus and PARS 3 systems, we headed for Rome, next day for Manchester (UK) to visit the facilities at Lostock. At this facility we learned about the Dual Mode Brimstone and Fire Shadow weapon systems before embarking on a site tour which included orientation on key technologies and capabilities. The visit also included a factory tour of sub-system integration and tests and



An Aster missile undergoes testing.

manufacture of the DM Brimstone, Fire Shadow, Meteor and ASRAAM. Next day at the other site in Stevenage (near London), details were given on the MICA, SCALP and ASRAAM missiles, all of which are on offer to the IAF for the MMRCA

requirement. We also managed to have a long question and answer session with Mr. Antoine Bouvier, CEO MBDA via a video link-up (see item).

With industrial facilities in four European countries and within the USA, MBDA achieved a turnover of €2.8 billion in 2010 with an order book of €10.8 billion (the company is jointly held by BAE Systems and EADS having 37.5% share each plus 25% by Finmeccanica). With more than 90 armed forces customers in the world, MBDA is a leader in missiles and missile systems. They are a single group capable of designing and producing missiles and missile systems that correspond to the full range of current and future operational needs of the three armed forces (land, sea and air). In total, the group offers an astonishing array of 45 missile systems and countermeasures products already in operational service and more than 15 others currently in development.

In this first of a two-part review are covered various aspects of MBDA's products and the latest in developments. Also, a separate report on their Marte anti-ship missile.

Operational successes of the Dual Mode Brimstone

“RAF officials have made presentations to the IAF recently on the use and success of the DM Brimstone missile”, Russ Martin MBDA Missile Systems military adviser stated. “MBDA had highlighted the role of these missiles in combat without causing any civilian casualties. There was interest in arming the IAF Sukhoi Su-30MKI’s with this weapon too”, *Vayu* was told during the tour.

The unique capabilities of Dual Mode Brimstone (DM Brimstone), as the “strike weapon of choice” for the Royal Air Force, have resulted in an additional order for MBDA from the UK Ministry of Defence. A first contract for additional DM Brimstones was placed on MBDA in December 2010 to replenish the original UOR stock. The onset of operations in Libya and ongoing operations in Afghanistan saw increasing demand for the established DM Brimstone inventory. MBDA’s Lostock and Henlow facilities and their employees demonstrated flexibility and dedication to supply the Royal Air Force and prove the military value of an indigenous industrial base developing for, and supporting, the UK Armed Forces.

To achieve the demanding requirement to sustain simultaneous theatres of operation, MBDA demonstrated its ability to ‘surge’ supply when called upon. MBDA’s UK production facilities began deliveries four months earlier and with 50% greater throughput than in the contract plan. In addition, throughput of missiles returned back to the operational theatres saw deliveries three times greater than was planned in the same timeframe.

DM Brimstone has been used successfully against a variety of different targets in support of Operation *Ellamy* and Operation *Herrick*, providing precision effects



combined with very low collateral damage, in line with restrictive rules of engagement, achieving greater than 98% mission success. Key targets have included main battle tanks, armoured fighting vehicles, pick-up trucks with rocket launchers plus coastal radar antenna.

The DM Brimstone weapon system comprises a re-usable launcher with 3 missiles each, “easy enough to be mated with all kinds of aircraft including the Indian Air Force Jaguars which are soon to be upgraded with new engines, weapons and sensors”.

MBDA

Fire Shadow: filling the gap



Steve Wadey, Executive Group Director Technical and MBDA UK Managing Director told *Vayu* that “Fire Shadow fills a gap in the capabilities needed by the Armed Forces as ongoing operations show every day. From the outset, the Fire Shadow programme has been leading by example with its rapid development approach. The incredible rate of technical achievement and progress means that this unrivalled capability will be ready for delivery to the UK early next year. The system’s potential is such that it lends itself to new roles and has been designed to adapt and evolve to ensure that weapon provides an operational edge now and for the future.”

Fire Shadow provides precision capability to engage high value targets in

The Fire Shadow weapon system has successfully completed a series of demonstration trials and two more successful firings in a ground breaking rapid development programme that was launched in March 2010. These achievements pave the way for a planned entry into service next year with the British Army. The first of these firings, using a complete weapon system, was carried out on 21 November 2010 at Vidsel in Sweden to demonstrate system integration, launch, stable flight, waypoint navigation and data-link function which supports maturing of the munition and its control. The munition flew for “scores” of kilometres and its trajectory included a number of manoeuvres, such as a loitering pattern. All objectives were satisfied and the trial was witnessed by UK customer representatives.

The second firing at the same location took place on 13 May 2011. A more complex trial scenario was conducted where the Man-in-the-Loop functionality was fully exercised. The operator was able to select and successfully engage a representative target. The trial was “another complete success”, underlining the performance and robustness of the product.

Throughout the programme MBDA has continued to work closely with the end user and other stakeholders. Various “hands-on” trials at MBDA integration facilities at Filton and Bedford have enabled British Army personnel to tailor the “look and feel” of the system, to



refine Tactics, Techniques and Procedures (TTPs) and to prepare for formal training later in 2011. The system was also demonstrated to operate seamlessly within a modern battlespace HQ context at the Coalition Warrior Interoperability Demonstration event.

complex scenarios. Surface launched, the munitions have a range of ~100 km and can conduct a direct transit to target or be positioned to loiter in the airspace for a significant time (~ 6 hours). A Man-in-the-Loop decision then enables a precise and rapid attack against a selected target.

MBDA advances the FASGW/ANL programme



Since launch as a Joint Assessment Phase in 2009, MBDA has been successfully developing the technical maturity data of the main FASGW(H)/ANL (Future Anti Surface Guided Weapon (Heavy)/Anti Navire Leger) sub-systems that highlight the forward momentum of this important Anglo-French missile programme.

High speed wind tunnel trials have been performed on a representative scale model of the missile and confirm the chosen original design. Gas gun firings have been achieved and validate the warhead design. Motor firings have been carried out to confirm performance in various thermal environments. Sea trials of data link terminal and missile antenna have been carried out under a wide range of sea states and weather conditions. Main missile sensors, such as the seeker and the radio-altimeter have been trialled at sea or in simulation so as to gather the necessary data for the Demonstration & Manufacture phase.

The FASGW(H)/ANL is a Helicopter Launched Anti-Surface Guided Missile aimed at delivering a solution to meet the UK and French military requirements. The weapon is designed to undertake both offensive and defensive maritime missions against targets ranging from corvette sized vessels to fast inshore attack craft and is designed for the AW159 Lynx Wildcat, NH90 and Panther.

Next generation naval missile FLAADS-M on cusp of global success

MBDA's Future Local Area Air Defence System (FLAADS-Maritime) programme is achieving key development milestones that exemplify the high maturity and global market potential of the system. The FLAADS-M system will equip the Royal Navy's Type 23 frigates and future Global Combat Ship and can rapidly be integrated onto a range of alternative naval platforms. The heart of FLAADS-M is the Common Anti-Air Modular Missile (Camm), a high performance missile intended to deal with all current and future threats. Camm will also be the centrepiece

of the related FLAADS-Land system intended to replace the British Army's Rapier Air Defence System by the end of the decade.

MBDA is progressing rapidly with the FLAADS-M programme, fully exploiting its experience of developing the world leading Sea Viper system now in service on the Royal Navy's T45 Destroyers. Significant achievements are being made in all areas, notably with the development of the FLAADS Command and Control system (featuring greater than 75% re-use of Sea Viper C2 software) and the development of the FLAADS Platform Data Link, both of

which are already undergoing trials in MBDA development facilities. Moreover there has been a seamless progression of experienced staff and facilities from the Sea Viper programme onto the FLAADS-M programme, all to ensure that the lessons learned during the successful Sea Viper development are fully brought to bear.

FLAADS is the next generation of short range air defence weapons systems planned to replace the Seawolf, Rapier and eventually possibly ASRAAM in the maritime, land and air environments respectively.

MBDA Germany prepares way for C-RAM laser system

The ability to direct 10 kW laser power over a long distance and reach a target with high quality beams is a decisive forward step and MBDA Germany has conducted several successful tests with its laser demonstrator. This is evidence of major progress in terms of achieving a C-RAM (Counter Rocket, Artillery, Mortar) laser weapon system. For the first time, 10 kW laser power reached a moving target located more than

two kilometres away while retaining a high quality beam. The tracking of dynamic objects and the effects on the object were demonstrated over a distance of more than 2,300 m and an altitude differential of 1,000 m under real-life environmental conditions.

These results are of major significance. The successful combating of RAM munitions is of major importance for the protection of soldiers in the field. Since countermeasures against RAM must be carried out within a few seconds, it is necessary to achieve high laser power and a high quality laser beam against a fast moving target at distances of between 1,000 m and 3,000 m.



Taurus offered to the Indian Air Force



The Taurus being launched from a German Air Force Tornado.

MBD A have offered their 300 km-range Taurus stand-off missile system to the Indian Air Force for its combat aircraft, including the Su-30MKI. “We have received a Request for Information (RFI) from the IAF for a stand-off long range missile from the IAF and we have offered the Taurus missiles as we feel that it meets all the desired requirements,” Anders Axebark, Business Development Manager told *Vayu*.

The Taurus air-to-ground missiles are manufactured by the Germany-based Taurus Systems GmbH, which is a joint venture between MBDA and Swedish firm Saab. India is going to upgrade the first batch of its Sukhoi Su-30MKIs in collaboration with Russia and is looking to enhance capabilities of the aircraft by equipping it with new radars, long-range weapons and avionics. “The IAF has already been briefed by the company at Air Headquarters in New Delhi about the operational advantages that the missile would provide”.

VAYU in conversation with Antoine Bouvier, CEO MBDA on Indian programmes and others

On the IAF Mirage 2000 upgrade: “India is negotiating a modernisation package of its Mirage 2000 fighters, which would open the door for sales of several hundreds of MBDA Mica radar and infrared guided missiles. We have also pitched our vertical launch Mica system for India’s short-range surface-to-air missile system.”

On Brimstone for India: “The Brimstone is on offer to India as part of the missile package for the 126 medium multi-role combat aircraft (MMRCA), whose acquisition by the IAF looks imminent following the short-listing of the four-nation Eurofighter and the French Rafale.

On the PARS 3 LR: “We have conducted three firing trials of the PARS 3 LR fire and forget precision missile earlier this year as part of our campaign to sell this to the armed forces of India; all three tests were successful.”

On the proposed co-development of the Maitri: “MBDA and Indian industry are proposing to co-produce the Maitri surface-to-air missile system to meet requirements of the Indian military for a short range SAM. We have been assured of support at the highest political level by French President Nicolas Sarkozy after he discussed the project with Prime Minister Manmohan Singh during the former’s visit to New Delhi. Discussions with Bharat Dynamics Limited (BDL) and the Defence Research & Development Organisation (DRDO) began in November 2005 are on track



and progressing well. The next step is joint development with the DRDO and production by the BDL; some of the missiles can be exported”.

On the ASRAAM: “This is part of the Jaguar upgrade and this strike aircraft would be capable of firing the ASRAAM short range air to air missile. The upgrade calls for an above the wing pylon launched air-to-air missile and this is an ideal solution as this missile has an exceptionally high launch speed and low drag to ensure clearance from the aircraft’s wing”

On the Milan 2T anti-armour missile: “MBDA has signed an agreement with BDL which transfers production of the latest version of the Milan anti-tank missile to India. The deal allows BDL to meet Indian demand, but there also are discussions on exports of the Indian Milan. MBDA has worked with BDL for 30 years under a licensed production deal.”

On the Scalp weapon system: “I would especially like to congratulate the MBDA and government teams for the total success of this firing. SCALP Naval is in effect a priority for us all. It goes without saying that the most recent operations have served to remind us of the strategic necessity of a sovereign capability weapon for first strike”.

On Anglo-French co-operation: “As planned, the Assessment Phase contract has now delivered a system design and the necessary sub-systems proof of maturity. I am confident that these

results together with the discussions we are having with the two national customers will allow us to enter soon into the demonstration and manufacture phase and confirm FASGW(H)/ANL weapon as a cornerstone of Anglo-French cooperation in the Complex Weapons Sector.”

On Libya: “The experience in Libya has shown that capabilities such as deep strike, precision close-air support and air superiority based on the highest level of technology are a must to succeed in a conflict. Our missiles were used extensively and with great success.”

The future of MBDA Marte missile family

Such weapons can be classified as heavy anti-ship missiles, as they weigh between 500 and 700 kg (Soviet/Russian missiles weigh much more). Besides these systems, there are some medium anti-ship missiles, of about 300 kg, most suitable for use on naval platform of smaller size, and easily integrated with fixed/rotary-wing aircraft. Such systems, maybe less known than the above, but are equally important and often as effective. Further, such categories of weapons are more appropriate because weight is a key factor, especially for helicopters.

Among missiles of this category is the Marte Mk-2/S a weapon that has long been in MBDA's portfolio. The first Marte Mk-2 was developed in the 1980s by Oto Melara together with Sistel, starting from the previous Sea Killer programme (carried out in the 1970s by Sistel) in order to meet a requirement of the Navy for a weapon for helicopters with 20-25 km range and weight comparable to that of a torpedo, warhead of significant size (considering its category) and an active radar seeker. The technical specifications were written to develop a weapon for helicopters such as the Sikorsky SH-3D for the Navy, which could be used from a reasonable distance (away from anti-



A snug fit on a helicopter!

Thanks to their extraordinary effectiveness - well demonstrated in war-like theatres – missiles have become the most prominent anti-ship weapon, regardless of the launching platform used, as this could be another ship, an aircraft or a helicopter. The products that most contributed to the success of this category of weapon, at least in the Western world, are still in production today – in increasingly updated and effective versions, according to a general trend that stretches the life of a weapon system far beyond what initially expected), and these include the Boeing Harpoon, MBDA Exocet and MBDA Otomat (Teseo for the Italian Navy).

India's medium range anti-ship missile requirements

Five competitions are at different stage of maturity for Medium Range Airborne or Surface Launched Anti Ship Missiles:

- RFP Sea King Mk42B Mid Life Update (FET mid-June 2011)
- RFP Indian Multi Role Helicopter (FET-September 2011)
- MMRCA (in progress)
- RFI for Medium Range Maritime Reconnaissance Aircraft
- RFI for Land Based Mobile Coastal Defence



air/anti-missile defence systems) and able to cause serious damage to corvettes and frigates.

The new missile Marte Mk.2 was a hybrid and combining the cell of the long

Sea King MLU and the AgustaWestland offer

Sea King Mk42B MLU is offered with 2 Marte ER Missiles

Marte ER will share the same logistics support in terms of scheduling, tools (benches, trolley, test equipment) with Mk2/S. The main difference is the turbojet engine, proposed as an integrated solution, requiring no maintenance for 15 years and allowing the same maintenance scheduling as the Marte Mk2/S

and tapered Sea Killer with a front section with a bigger diameter. This peculiar shape was due to the need for installing an active radar seeker (operating in band I) and its (comparatively) long antenna. The sensor, developed by former SMA (now Selex Galileo) and called SM-1, was similar for ST-2, in use on Otomat Mk.2. The connector between the front part (with a diameter of 316 mm) and rest of the missile was made inserting a new trunk conical section, which housed the warhead.

In the 1990s, following a contract between the Italian Air Force, an airborne variant of Marte was studied for fixed-wing aircraft, the Mk-2/A, launched from a rail (and not released free fall as in the previous system), destined to be used with the MB-339 (for AMX). This programme led to a family of missiles: Marte Mk-2/S for helicopters (S for 'Short'), the Marte Mk-2/A for aircraft (without booster, later Mk-2/S-A) and

Marte Mk-2/N, to be used from ships. The first to be developed was Mk-2/S that for the Italian Navy which represented the follow on of Marte Mk-2, also because the new EH-101 and NH-90 require modern anti-ship weapons. The improvements incorporating developments carried out during the programme Marte Mk-2/A (that culminated in a series of firings), provided for the introduction of digital avionics, of inertial navigation units, of an improved warhead (equipped with insensitive explosives), of folding wings (more compact), of an efficient main rocket motor (with enhanced range in excess of 30 km), of two new side boosters instead of the original single one (the missile is about metre shorter) and of an improved radar seeker with digital signal processing (that benefited from improvements on the equipment ST-2 of Teseo Mk-2 Block III). With these measures, the missile was able to operate effectively in complex theatres,

Being launched from an AW101.



with autonomous selection of targets according to the established criteria and against targets near the coast.

At the end of 2003, MBDA was contracted by ARMAEREO (General Direction of Aeronautic Weapons) to produce 38 missiles (plus 6 pre-series Marte Mk-2/S and 8 launching systems) to equip the EH-101 (now called AW 101) for the Italian Navy. Production was started in 2004 and the first qualification firing of Marte Mk-2/S was carried out in March 2005 from an AW101 of the Italian Navy, using a weapon equipped with telemetric warhead. On 2 October 2006, after successful firing from an AW-101 at the Poligono in Salto di Quirra (PISQ), the development programme was complete, and the Marte Mk-2/S missiles delivered to the Italian Navy between 2007 and 2008.

The Mk-2/S is housed in a box canister, for ease of transportation. The weapon, weighing 310 kg and not bulky thanks to the folding wings, is extracted from the canister, tested and transferred, with a trolley, below the helicopter and hooked through a rafter (the same used for lightweight torpedo MU-90). Since the weapon in its general configuration

Collaborative concepts with DRDO

For the MRH requirement:

- Partnership with DRDO for management of the local manufacturing, final assembly and check out of Marte Mk-2/S
- For effectiveness over time by involving DRDO in key future follow on activities including, but not limited, to seeker evolution and ECCM Adaptation
- Support product in India where Marte ER is growth path for Mk-2/s on NFH and baseline solution for Sea King Mk42B Mid Life Update

For all other medium range anti-ship missile requirements:

- Develop a master plan to minimise development of Marte ER timescales and risks
- Once proposals accepted by the Navy, form a partnership for co-developing and manufacture of Marte ER for India and other potential customers worldwide
- Consider option to upgrade standard Mk-2/S to Marte ER configuration

is almost identical in the three versions (helicopter Mk-2/S, aircraft Mk-2/S-A and ship Mk-2/N), it makes logistic sense.

As far as missions from helicopters are concerned, there are two solutions available. On the AW101 there are two boxes dedicated to the mission system, called MMCU (Marte Missile Computer Unit) and MIU (Missile Interface Unit) respectively. On the NH-90, the software and functions of the mission system of the Mk-2/S are integrated with avionics of NH-90.

Operational Mk-2/S firing is divided into three phases: separation from helicopter, mid-course flight (inertial guidance) and terminal homing.

The surface-to-surface version is the system's latest evolution. The missile is virtually the same as that used on helicopters (its range is also 30 km) but the firing system and especially the launcher/canister are different. The latter performs two functions: it protects the missile from environmental conditions and ensures correct firing of the weapon.

The launcher/canister of Marte Mk-2/N is small in size (only 610 mm long), which is key of the system. It

is a disposable aluminium structure, a recyclable one that can be mounted and dismantled around the missile; thus weapon maintenance and control are simpler. The front and back covers of the launcher/canister are made of carbon fibre, and separated by excess pressure when the launching boosters ignite.

The naval system can be integrated in the CMS of the ship (entirely compatible with the data bus of the present engagement systems) and available in two configurations: one is totally integrated in the CMS of the ship, the other is a stand-alone version (weighing only 21 kg). Among available options, MBDA also offers the possibility of integrating the missile in its own lightweight CMS, called CWSP.

Typical configurations are those with two single launchers/canisters (for a total 1,500 kg), with two twin launchers/canisters (3,000 kg) or with two four-pieces launchers/canisters (5,400 kg).

The United Arab Emirates have ordered 12 systems with about one hundred missiles. The UAE are also interested in the aircraft version Mk-2/S-A (weighing, at launch, about 300 kg), to standardise on anti-ship missiles. This configuration, available in two sub-versions according to launcher type (vertical separation as helicopters, or horizontal separation in launch by rail), should be used by the M/T-346 and so is linked for trainer/attack aircraft by AleniaAermacchi.

The Marte Mk- 2/S and all its family are of interesting to other countries, such as India. During 2005-2006, MBDA began developing a variant of the Marte with turbojet propulsion, inspired by a requirement issued by India. Thus began formal development programme totally self-funded, even though the Italian Navy was already interested. 'Go ahead' was eventually given in 2009 at Le Bourget in Paris. This new product the Marte ER (Extended Range) is really a new missile, having two significant characteristics: turbojet propulsion (generally increasing range by 400% compared with rocket propulsion) and a new cylindrical isocaliber cell. The missile does not have a bulbous nose, thanks to this new cylindrical cell (about 315 mm diameter) and is propelled by

the new turbojet made by Williams (USA). In order to simplify and speed up the programme (and reduce costs as much as possible) MBDA will re-use several components of the present Marte, including the seeker and warhead as also the folding wings, the two rocket boosters, electronics, avionics and the actuators, all modified versions of the previous models (with a commonality of 80%). Also in common is the concept for deploying the missile, firing sequence, phase of separation from boosters, flight phase (both mid-course and final attack).

The missile also maintains a modular criterion, like the previous Mk-2/S, and is formed in 6 sections: the guidance warhead; warhead; guidance section (including Flight Control Computer, radar altimeter, inertial guidance section and GPS; the engine's Power Control Unit, batteries and the cross-shaped wings); the engine section (comprising fuel tank and turbojet) and the back end (made up of the nozzle, the tail wings and their controls, servo-mechanisms and thermo protections). The sixth element is constituted by two side rocket boosters, similar to those of Mk-2/S.

The previous Marte Mk- 2/S and also the older model Mk-2, have an aerodynamic configuration of the type wing control and driven through movements of the front wing (that is, the surface most contributing to the missile carriage), while the end surfaces are fixed.

The missile was designed in two versions: one with sealed tank (and synthetic fuel) that would not require any maintenance for 15 years and the second with traditional fuel. In the latter, the weapon is stored with an empty tank (to be filled before use). Choosing between the two depends on requirements and preferences of each navy.

With all these changes, the new missile is able to exceed a range of 100 km, while velocity (both for course and final attack) is increased. On the contrary, the length is shorter if compared to the previous model, while logistic systems, such as the box canister for transport and storing of the helicopter version and the trolley for moving and hooking the missile to the aircraft, are the same as for model Mk-

2/S (or versions with a few changes), with obvious advantages.

During the Preliminary Design Review, MBDA is setting up project financing for this programme that could lead to production of the first missile within 3 plus years.

Development of the Marte ER should bring some benefits for Otomat/Teseo as well: the Italian Navy would like to keep in service such heavy anti-ship missiles until

Benefits: one missile in many platforms

One fully compliant missile, single logistic support and several applications for rotary wing, fixed wing, small vessels, coastal applications and dimensions of the missile not limiting the performance of the platforms

- The MBDA cooperation with DRDO for managing the transition of the MK2/S into Marte ER.
- Full interoperability between Marte MK2/S and Marte ER

2040 and studies are being undertaken in order to identify upgradation and improvements for this missile.

Since the avionics were completely digitised through the latest evolution, called Block IVA, the most urgent improvements should affect propulsion. MBDA will replace the old micro-turbine Turbomeca Arbizon III with a new-generation engine. MBDA estimates that, if combining better performance (in terms of consumption) with reduced weight and volume (that should allow carrying more fuel), it will possible to double the already long range. A second, indispensable, action is for replacing the GPS with a model of the GPS III compatible with future standards.

All this evolution would be transferred on Marte ER in order to further improve it's already "remarkable performance". Thus, with comparatively low investments, MBDA will evolve two new anti-ship missiles, keeping them updated and effective for many years to come.

Eugenio Po/VSC

Boeing 737 AEW&C for South Korea with NGC's MESA Radar

The first Boeing 'Peace Eye' 737 Airborne Early Warning and Control (AEW&C) aircraft has been delivered to the Republic of Korea Air Force, with its key radar sensor designed and developed by Northrop Grumman. The Multirole Electronically Scanned Array (MESA) radar "will enable airborne surveillance of the entire Korean peninsula".



The 'Peace Eye' programme includes four 737 AEW&C aircraft plus ground support segments for mission crew training, mission support and system maintenance. The three remaining MESA radar systems are currently being integrated into the Boeing AEW&C aircraft, with delivery to the South Korean Air Force scheduled for 2012. South Korea is the second country to have the MESA radar in its fleet, after Australia.

300th Typhoon for the Spanish Air Force

The 300th Eurofighter Typhoon produced by the four partner companies of the European consortium has been delivered by Cassidian to the Spanish Air Force, *Ejercito del Aire*. Eurofighter Typhoons, developed and manufactured by Cassidian in Germany and Spain, BAE Systems in the UK and



Alenia Aeronautica in Italy, are now in service with several air forces, with 16 squadrons in six air forces replacing 11 earlier aircraft types.

Gripen offered to Croatia

Swedish Defence and Security Export Agency (FXM) have offered the Gripen fighter to the Croatian government, involving the sale of either twelve or eight of the latest version



of the Gripen C/D. The offer also includes a support and training agreement for pilots and technicians. In order to ensure that the Croatian Air Force remains operative without interruption when its current MiG-21s are decommissioned, Sweden is initially offering a loan of older Gripen-A aircraft until the delivery of the Gripen C/Ds.

Grob G120TP ordered by Indonesia

The Grob G 120TP turboprop basic trainer has been selected by the Indonesian Air Force to meet its future basic trainer aircraft requirement. Deliveries will commence in 2012.



The German company is confident of winning several additional competitions from Air Forces in Asia, the Pacific, Central and South America and the Middle East. "Asia is seen by Grob as a key region with the potential for several other Air Forces to procure the G 120TP and thereby deliver to their Training Organisations, the highest possible advanced training potential at the lowest possible operating and maintenance cost", according to the company.

While Grob will be supplying the G 120TP to the Indonesian Air Force within a fully integrated, maintenance support contract, the type is being seriously considered by other Air Forces to replace current training aircraft types such as the PAC Mushshak, CT-4, SF260, PC-7 and various obsolescent Russian and Chinese-origin basic trainers.

India Aviation

All RAAF Super Hornets delivered

Four new Boeing F/A-18F Super Hornets have joined the Royal Australian Air Force at RAAF Base Amberley, completing delivery of all 24 RAAF Super Hornets “ahead of contract schedule”. Arrival at the base was marked by the four new Super Hornets joining the 16 other RAAF F/A-18Fs



for a dramatic 20-aircraft formation flypast. The Australian government had announced plans in March 2007 to acquire 24 advanced Block II versions of the F model Super Hornet, which features a two-seat cockpit.

Ambiguity over Australian JSF Purchase

There are several questions on Australia’s JSF acquisition with the possibility of reducing or even abandoning the purchase of Lockheed Martin F-35A Lightning IIs if delays continue to plague the aircraft’s delivery to the Royal Australian Air Force (RAAF). Minister of Defence Steven Smith has stated that a final decision to proceed with the acquisition of Joint Strike Fighters would be made in 2012. Around 100 F-35As are needed to replace the F/A-18 Hornet fleet, with Australia having committed to acquiring an initial batch of 14, of which the first two were due to be handed over in 2014-15.

Owing to these delays, the possibility exists that the RAAF may acquire a different type to cover the gaps between the retirement of its ‘legacy’ Hornets and service entry of the F-35. The alternative being considered is the Boeing F/A-18F Super Hornet, 24 of which have already been ordered to replace the General Dynamics F-111 Aardvark fleet; 20 of these are already in service with Nos. 1 and 6 Squadrons operating from RAAF Base Amberley at Queensland.

LM F-35 Flight Test Progress Report

Lockheed Martin’s F-35 flight test programme has reached closer to attaining year-end milestones since the last update as the F-35 Lightning II 5th generation multirole fighter conducted 124 test flights, bringing the total number of flights for the year to 642. Overall, the F-35 system development and demonstration (SDD) flight test remains “on or ahead of plan” for 2011, despite



15 days of testing lost owing to fleet stand-down after a ground mishap involving the Integrated Power Package (IPP).

Sagem’s IR Hammer SBU-64 enters service

In July 2011, the French Air Force and Naval aviation began operational deployment of the infrared terminal guidance version (SBU-64) of the Hammer IR AASM modular air-to-ground weapon, as seen below with the Rafale. Developed



and produced by Sagem (Safran group), with French defence procurement agency DGA acting as programme manager, the Hammer AASM is a family of air-to-ground weapons, comprising a guidance kit and range augmentation kit fitted to standard bombs, which makes the AASM a high-precision guided weapon with a range exceeding 60 kilometers.

Adding infrared terminal guidance to the standard hybrid GPS/inertial version of the AASM, the Hammer IR proved to be particularly well suited to precision strikes against targets with uncertain coordinates, offering impact accuracy to within a few meters, even when GPS signals were unavailable. Missions are planned using Sagem’s own SLPRM mission planning and restitution system, already in service with the French Air Force and Navy.

IBAE

Four C-130J Super Hercules for Qatar

On 28 September 2011 four C-130J Super Hercules airlifters were formally delivered to the State of Qatar. The Qatar



Emiri Air Force's new Super Hercules are the longer fuselage or 'stretched' variant of the C-130J.

HC-130J for US Air Force

Lockheed Martin has delivered the first HC-130J 'Combat King II' to the United States Air Force's Air Combat



Command (ACC), the first of 11 currently on order. The new aircraft, which is based on a KC-130J tanker baseline, has the enhanced service life wing, enhanced cargo handling system, a universal aerial refueling receptacle slipway installation (boom refueling receptacle), an electro-optical/infrared sensor, a combat systems operator station on the flight deck and dual Satcom. "In-line production of this configuration reduces cost and risk and meets the required 2012 initial operational capability".

Cassidian transponders for German aircraft

Cassidian, the defence and security division of EADS, has concluded modernisation of the identification equipment of all German Forces' aircraft. With the final deliveries in a multi-year modernisation programme, Cassidian has handed over the last tranche of its STR 2000 transponders to the German Procurement Authority BWB. In total, more than 650 transponders were delivered since 2002, the new equipment ensuring the safe operation of aircraft in civilian airspace according to new requirements of the European air traffic control authority EuroControl.

Egyptian Air Force receives C295

The Egyptian Air Force has taken delivery of its first Airbus Military C295, as part of a three aircraft order placed by the EAF in October 2010. The other two aircraft are to be delivered during the last quarter of 2011. The C295 is configured



with standard equipment as well as the Cargo Handling and Aerial Delivery system (CHADS) and can also be equipped for paratrooping and medical evacuation, and humanitarian relief missions. It can carry payloads of upto 9 tonnes in standard cargo pallets, or 71 soldiers in transport missions, or 50 paratroopers.

A400M key certification tests

The Airbus Military A400M new generation military airlifter has passed a series of key tests as the aircraft continues to progress towards civil and military type certification. The



aircraft ('Grizzly 1') successfully performed the high-energy rejected take-off test which confirms the capability of the braking system to stop the aircraft safely following a rejected take-off at high speed and high weight. Emergency evacuation tests were also carried out to demonstrate that the aircraft can be safely evacuated in a specified time when loaded with troops or other passengers in various configurations. The high-energy rejected take-off test is one of the toughest in the programme and because of the risk of damage to the aircraft, is among the last items performed before preparation of the aircraft flight manual.

Hungarian Gripens complete 6000 flight hours

On 7 September 2011, when flying over the Hungarian Air Force Base 59th *Szentgyorgyi Dezső* in Kecskemet the Hungarian Gripen fleet exceeded 6000 flight hours, with a



formation of three fighters celebrating the achievement. After the formation flight, Major General Zoltan Pinter, Air Force Commander and Brg Nandor Kilian, Commander of the 59th *Szentgyorgyi Dezső* Air Base congratulated the pilots, the technicians and the Swedish technical support team "for their professional performance during the past years".

Pakistan Air Force showcased at Dubai

Barely a couple of hours flying time from Pakistan, Dubai has for long been a popular location for showing off PAF aircraft to an international audience. In earlier years, the PAF



Saab 2000 AEW&C.



JF-17 Thunder.

has displayed and demonstrated some of its training aircraft including the K-8 Karakoram jet trainer and Mushshak basic trainer. At Dubai 2011, the PAF displayed its new Saab 2000 AEW&C aircraft as also the JF-17 Thunder which was flight demonstrated.

Royal Australian Air Force's fifth C-17 Globemaster III

Boeing has delivered the fifth C-17 Globemaster III airlifter to the Royal Australian Air Force (RAAF) during a ceremony



at the C-17 programme's final assembly facility in Long Beach on 14 September 2011. There are currently 235 C-17s in service worldwide, 24 with international customers. India became the newest C-17 customer in June, when the country's Ministry of Defence signed an agreement with the US government to acquire 10 C-17s that will be delivered in 2013-2014.

Rheinmetall to assist German Air Force pilot training

Rheinmetall Defence will continue to assist in training German Air Force Eurofighter pilots. Together with CAE Elektronik GmbH and Cassidian, the Group has just been



awarded a contract for the upkeep, maintenance and repair of the German Air Force's Eurofighter flight simulators, extending "the longstanding, successful public-private cooperation in this field".

Sikorsky S-70i Black Hawk for Mexico

Sikorsky has delivered an S-70i Black Hawk helicopter to Jalisco, the first state government in Mexico to acquire the



newest variant of the "world's most employed military utility aircraft". Jalisco state police will deploy the aircraft for general law enforcement with initial aircraft operation anticipated during October's XVI Pan American Games. The S-70i helicopter marks the 20th Black Hawk aircraft now operational in Mexico. The Mexican Air Force, the Mexican Navy and Federal Police operate a total of 19 UH-60L and UH-60M Black Hawk aircraft acquired since the mid 1990s. Sikorsky expects to deliver another three UH-60M Black Hawk aircraft to the Federal Police by early 2012.

Bell's Kiowa Warrior's new capabilities

Bell Helicopter's OH 58 Kiowa Warrior has successfully demonstrated several ground breaking capabilities that will enable interoperability among multiple aviation platforms, such as manned and unmanned vehicles. The exercise was conducted at the Manned Unmanned System Integration Capability (MUSIC) demonstration, sponsored by the US Army at Dugway Proving Ground in Utah in mid-September 2011.

Spain orders Eurocopter EC225

Eurocopter will supply an EC225 helicopter for Spain following the country's competition to select a new rotary-wing aircraft for maritime search & rescue (SAR) and



pollution control operations. The new EC225 will replace one of SASEMAR's Sikorsky S-61N helicopters, and will provide the agency with a high-performance asset for maritime, SAR and surveillance operations in all weather conditions.

Danish Army selects ITT

ITT has been selected for a four-year framework contract with an estimated total value of \$50 million by DALO (the Danish Defence Acquisition and Logistics Organisation) to

provide High Capacity Data Radios, ancillaries, training and support to Danish Army units. The High Capacity Data Radio (HCDR) is a combat proven, self-managing, ad hoc networking UHF radio providing a secure data backbone between mounted and dismantled headquarters and warfighters.

NGC Demonstrates 5th Generation IRCM System

Northrop Grumman has successfully demonstrated the company's fifth generation infrared countermeasures (IRCM) system specifically designed to protect military rotary-wing platforms. The demonstration proved the system's capability to effectively receive commands from the missile warning system, slew a pointer/tracker to acquire a fast moving target, and maintain jam energy to defeat advanced infrared missiles. The optical design of the system utilises a contiguous dome to avoid the obscuration issues that are consistent with older technology-faceted windows pieced together.

Raytheon to integrate Griffin on AT-6

Raytheon will integrate the Griffin missile onto the Hawker AT-6 light attack aircraft. Griffin weighs 44 pounds with its launch tube, is 43 inches long and is an air-and ground-launched, precision-guided missile designed for rapid integration onto rotary- and fixed-wing aircraft and ground-launch applications. Griffin "enables engagement of targets via a user-friendly graphic interface and guide the weapon to the target using GPS coordinates or laser designation". To maximise lethality, the user can choose to engage the target with height of burst, point detonation or fuse delay. The Griffin missile is in production and integrated on the C-130 Harvest Hawk. While Griffin A is an aft-eject missile designed for employment from non-conventional platforms such as the C-130, Griffin B is a forward-firing missile that launches from rotary- and fixed-wing aircraft and ground-launch applications.

First Euro Hawk for German Armed Forces

The first Euro Hawk Signals Intelligence (SIGINT) Unmanned Aircraft System (UAS) for the German Armed Forces, was presented to government officials and media during a rollout ceremony held in Manching at Germany on 11 October 2011. The UAS arrived on 21 July 2011 following a nonstop ferry flight from Edwards Air Force Base in California to Manching. After its landing, it was successfully fitted with the Integrated Signal Intelligence System (ISIS) developed by Cassidian and will undergo flight testing in 2012. Euro Hawk is the first international configuration of the RQ-4 Global Hawk High Altitude Long Endurance (HALE) UAS.



(Picture shows left to right): Dr. Stefan Zoller, CEO Cassidian, Gary Ervin, President Northrop Grumman Aerospace Systems, Stéphane Beemelmans, Secretary of State German MoD, General Kreuzinger-Janik, German Air Force Air Chief, General Manfred Engelhardt Commander SKUKdo and Neset Tükenmez, CEO EuroHawk GmbH.

Northrop Grumman Litening G4 Targeting Pod

Northrop Grumman Corporation has completed delivery of the first 50 Litening G4 Advanced Targeting (AT) Pods under a \$277.8 million "indefinite delivery, indefinite quantity" contract from the US Air Force. The Litening G4 Advanced Targeting Pod is the newest addition to the company's Litening family of targeting pods, delivering the latest advancements in sensor, laser imaging and data link technology. Northrop Grumman has delivered more than 550 targeting pod systems to US and international customers.

Fourth growth version of Boeing CH-47 Chinook

The US Army has initiated the fourth major growth version of the Boeing CH-47 Chinook helicopter on the eve of celebrating 50th anniversary of its first flight. A modernisation



programme office was opened in early September at the acquisition headquarters for the army aviation at Redstone Arsenal, Alabama. The army is already considering options for introducing a new CH-47H variant in the 2020 timeframe, succeeding the CH-47F and MH-47G models launched about a decade ago, said Maj Gen William Crosby, programme executive officer for army aviation.

With the CH-47F/G models, the US army introduced the Rockwell Collins common avionics architecture system (CAAS) cockpit and the BAE Systems digital advanced flight control system (DAFCS). A minimum effort would increase the helicopter's lift by 1 tonne by optimising the existing rotor hub and transmission. The CH-47H modernisation programme would be launched after the F/G-model production line ends in 2019.

USAF budget's "undetermined state" affects aviation programmes

Three aviation programmes, the Boeing KC-46A tanker, Lockheed Martin F-35A fighter and a next-generation bomber, have received firm and explicit backing from US Air Force leaders despite sweeping new budget cuts. "There is no question we face difficult choices, but with these priorities firmly in mind, we can still advance air force capabilities," stated Secretary of the Air Force Michael Donley. He added military satellites to the list in a keynote speech at the Air Force Association's Air & Space Conference in Washington, DC on 19 September 2011. But Donley's list of top priorities left at least four other major programmes, involving new helicopters and trainers, in limbo, awaiting the USAF's next moves in either the acquisition or budget processes.

Neither Donley nor Gen Norton Schwartz, USAF chief of staff, rose to defend or even mention the service's commitment to these four programmes, (T-X advanced jet trainers, light attack trainers, utility helicopters under the common vertical lift support programme (CVLSP) and combat search and rescue (CSAR) helicopters).

The T-X programme to replace about 450 Northrop T-38C Talons received the most attention. BAE Systems announced teaming up with Northrop Grumman Technical Services, which has agreed to manufacture the Hawk 128/T2. The agreement leaves Alenia Aeronautica still without a US-based manufacturing partner for the T-100, the USAF version of the M-346. Boeing unveiled a concept image for a V-tailed, all-new trainer to replace the T-38 after around 2020. Lockheed displayed a model of the T-50 Golden Eagle, which is manufactured by Korea Aerospace Industries.

The USAF has received bids from the Embraer/Sierra Nevada A-29 Super Tucano and the Hawker Beechcraft/Lockheed AT-6, but a planned follow-on contract to buy light attack and armed reconnaissance trainers for the USAF is now in jeopardy. Both the House of Representatives and the Senate are considering proposals to eliminate funding for the programme.

Turkey's TF-X Project

Turkish Aerospace Industries (TAI) have signed a two-year conceptual design contract with the SSM (Undersecretariat for Defence Industries). This contract will outline a concept of operations and provide a requirements analysis, main and sub-system definition and feasibility studies for local production and international partnership models of the TF-X. In December 2010, the Defence Industries Executive Committee had authorised the SSM to initiate contract negotiations with TAI for the conceptual design, for which a budget of \$20 million has been allocated.

The TF-X Project will require TAI to design and develop a new generation jet aircraft to enter service in the 2020s. In all probability, TF-X will be built in two variants: an advanced trainer to replace the Northrop T-38M Talon (being upgraded to T-38M standard under the ARI *Bee* Project) and a fighter to replace McDonnell Douglas F-4E 2020 Terminators and earlier blocks of Lockheed Martin F-16 Fighting Falcons in the Turkish Air Force inventory.

Slovak and Czech AF re-equipment plans

The Slovak Air Force will retain 12 MiG-29AS/UBs until 2030, the other nine in service being retired, leaving the 12 upgraded aircraft that were redelivered by Russia in 2008 as the country's sole combat aircraft. After 2030, Slovakia will be seeking a replacement for its fighter capability in the form of a joint venture with Visegrad Four partners (Czech Republic, Hungary and Poland) seeking a western supersonic aircraft. It is also possible that the Czech Republic may cease supersonic fighter operations in 2014, when its current lease of 12 Saab JAS39 Gripen ends.

If a capability beyond 2014 is confirmed, then a tender will be issued in late 2011, for which several countries and manufacturers have expressed interest. These include the Saab Gripen, Lockheed Martin F-16 Fighting Falcon and Boeing F/A-18E Super Hornet, plus the Eurofighter Typhoon.

South Korea receives F-15Ks

The South Korean Air Force has received three more F-15K 'Slam Eagles' from Boeing, bringing its fleet of the aircraft to 13, flown to Daegu Air Base from St. Louis facility. "We are pleased to receive the latest three F-15K Slam Eagles from



Boeing,” said Lt. Col. Kim Tae-uk, commander of the 110th Squadron, 11th Fighter Wing of the South Korean air force.

Boeing delivered the first six of 21 F-15Ks it is producing under the Next Fighter II contract in 2010, followed by two in April and two more in May. The remaining eight aircraft will be delivered through April 2012. Six of the new F-15K Slam Eagles are to participate in an advanced aerial combat training exercise at Nellis Air Force Base, in late January 2012. The F-15K Slam Eagle was the first variant of the Strike Eagle cleared to carry twelve 227 kg (500lb) JDAMs on conformal fuel tank stations.

Turkish Contract for CH-47 Chinooks

Turkey has signed a government-to-government deal with the United States to buy six CH-47 Chinook heavy-lift transport helicopters, worth some \$400 million. The six CH-47F Chinooks will be the first heavy-lift helicopters in the Turkish Army’s inventory, with deliveries expected to begin in 2013 and end in 2014.

Five Chinooks are for the army and one for the *Ozel Komutanligi* (Special Forces Command). Preparation of the infrastructure is already underway. Originally, Turkey wanted 20 helicopters, but negotiations commenced on the basis of a requirement for 14 helicopters, which was further reduced to ten in early 2011 and finally six are being ordered. A decision on whether to order a further eight or four Chinooks has been put on hold.

First AH-64D Apache Block III delivered

On 2 November 2011, the Boeing Company delivered the first AH-64D Apache Block III multi-role attack helicopter



to the US Army in Mesa. “The Block III Apache begins a new era in combat aviation by delivering advanced technologies and capabilities to benefit soldiers and battlefield commanders”.

Boeing will produce 51 AH-64D Apache Block III helicopters for the Army under Low Rate Initial Production, but the acquisition objective stands at 690 Apache Block III aircraft. In addition, a growing number of defence forces worldwide have contracted for, or are considering, upgrading to or adding the Apache Block III to their rotorcraft fleets.

The Apache Block III incorporates 26 new technologies designed to enhance the aircraft’s capabilities. The improved drive system features a new split-torque face gear transmission that increases power capability to 3,400 shaft horsepower. The new composite main rotor blade accommodates that power increase, resulting in improved aircraft performance with increased payload. Integrating the T700-GE-701D engine with the enhanced digital electronic control unit and other drive system technologies results in an increase in hover ceiling altitude at greater gross weight on a 95 degrees Fahrenheit day.

250th C-130J Super Hercules

Lockheed Martin celebrated the roll out of the 250th C-130J Super Hercules on 1 November 2011, this C-130J destined for Dyess Air Force Base at Texas, which is scheduled to receive a total of 28 C-130Js. This aircraft is the 2,404th C-130 of all makes and models to be built at Marietta.

The C-130J programme continues to deliver new capability to new countries and existing operators, with India and Qatar most recent operators, while the US Air Force recently received HC-130J personnel recovery and MC-130J special operations aircraft. Aircraft are currently in production for the US Air Force and Marine Corps, Iraq, Israel, Republic of Korea, Kuwait, Oman and Tunisia. C-130Js are also flown by Australia, Canada, Denmark, Italy, Norway, the United Kingdom and the US Coast Guard.

CAE military contracts

CAE has been awarded a series of military contracts from the defence forces of seven countries, valued at more than \$125 million. These include a contract to develop two multi-crew simulators for a new undergraduate programme of the United States Navy, additional work for the United States Air Force as part of the KC-135 Aircrew Training System (ATS) contract and two contracts from “undisclosed customers” in the US and the Middle East to design and manufacture a total of seven operational flight trainers.

ITT EW Defensive Systems for Pak AF

ITT Corporation has received a \$ 49 million Foreign Military Sales contract to provide a modern, digital radio frequency memory-based jamming pod for the Pakistan Air Force. The pod incorporates the identical hardware configuration from ITT’s Advanced Integrated Defensive Electronic Warfare System (AIDEWS), a proven, integrated digital receiver-based radar warning and jamming countermeasures system now flying with five international customers and can be used on any fixed-wing aircraft. The pod-mounted variant of AIDEWS will be fully qualified for F-16 flight under this contract and is the same form factor as ALQ-131 electronic countermeasures pods currently flying on US Air Force and international F-16s. This Pakistan FMS order will be performed at ITT’s Electronic Systems business in Clifton at New Jersey.

THAAD Weapon System achieves intercept of two targets



The US Army Test and Evaluation Command, the Missile Defence Agency and the US Army have conducted a flight test of the Terminal High Altitude Area Defence (THAAD) weapon system, challenging the system to track, detect and intercept two different targets utilising two THAAD interceptors, a first for the system. During the mission, the first THAAD missile intercepted an air-launched short-range ballistic missile target. The second THAAD missile intercepted a sea-launched short-range ballistic

missile target a short time later. Since 2005, the programme has completed 12 flight tests, with nine-for-nine intercepts.

EC135 T2 marks 10,000 flight hours

On 28 September 2011, Eurocopter celebrated the 10,000 flight hour milestone for the EC135 T2 helicopter, this being based at RAF Henlow, the Royal Air Force station in Bedfordshire. The Chiltern Air Support Unit, which provides operational air support to the Thames Valley Police, the Bedfordshire Police and the Hertfordshire Constabulary, currently operates two EC135s, with one based at RAF Benson and the other at RAF Henlow in Bedfordshire.

Saab avionics equipment for Talarion UAV

Saab has signed a frame agreement and received a first order from the EADS company Cassidian to supply safety-critical avionics equipment for the new advanced UAV system Talarion. The order includes design and development of the Aircraft Vehicle Management Computer (AVMC), Communications Computer (CC) and Mission & Payload Management Computer (MPMC) for the Talarion. The work will be carried out by the Avionics Division of Saab's business area Electronic Defence Systems, in Jönköping and Järfälla, Sweden, and deliveries of the first order will take place in 2012-2014. Talarion is a European development programme to fulfill functional and operational capability for in-theatre ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance).

Qatar Airways' 100th Aircraft

Boeing has delivered Qatar Airways' 100th aircraft, a Boeing 777-200LR (longer range), at a ceremony in Everett. The



Doha-based airline now operates 27 Boeing 777s of various types, including 16 777-300ERs (extended range), two 777 Freighters and nine 777-200LRs.

12 ATR 72-600s for Air New Zealand

Air New Zealand have announced an order for seven new generation ATR 72-600s, plus options for five additional aircraft. The first of the 68-seat ATR72-600 aircraft will be



delivered to Air New Zealand in October 2012, with deliveries completed by 2016.

GECAS orders six Embraer E190s

GE Capital Aviation Services (GECAS), the commercial aircraft leasing and financing arm of General Electric Company, has reached an agreement with Embraer for acquisition of six Embraer 190s with options for another six aircraft. Delivery of the first aircraft is scheduled for the fourth quarter of 2012. GECAS presently has 93 E-Jets of all models on lease with 15 airlines around the world.

Qantas order 110 A320 Family airliners

Qantas and Airbus have finalised a contract for 110 A320 Family aircraft, as part of the airline's fleet renewal and expansion plans in the coming years. The firm order for 78



A320neo and 32 A320s is the largest single order in Australian aviation history and follows a commitment signed in August. The A320neo is a new engine option for the A320 Family to enter service in 2015. It incorporates latest generation engines and large 'Sharklet' wing tip devices, which together will deliver 15 percent in fuel and carbon dioxide emission savings.

Lufthansa to expand with more Airbus aircraft

Lufthansa's Supervisory Board has approved the purchase of additional Airbus aircraft, comprising two A380s, four A320s and one A330-300, which "reflect the strong demand



across Lufthansa's network for an efficient family of aircraft". The Lufthansa Group are the biggest Airbus operator worldwide with more than 368 Airbus aircraft currently in service. These include 258 A320 Family, 37 A330s, 65 A340s and eight A380s. With this latest order for seven aircraft, the Lufthansa Group has an order backlog which includes 85 A320 Family aircraft, nine A330s and nine A380s.

Nordic AC to acquire 10 ATR 72-600s and 2 ATR 72-500s

ATR and Danish regional aircraft leasing company Nordic Aviation Capital (NAC) have signed a contract for the purchase of 10 ATR 72-600s and two ATR 72-500s, plus options for 10 additional ATR 72-600s. The total amount of the deal, including options, is valued at \$ 500 million. With the additional two ATR 72-500s unveiled, NAC will bring the total fleet of ATRs in its portfolio to 103. Deliveries of these two ATR 72-500s are scheduled before the end of the year. NAC will start receiving its ATR 72-600s next year.

CAE contracted for four simulators

CAE have sold four Level D full-flight simulators (FFS) to customers in South East Asia, the Middle East, Eastern Europe and Australia. The four FFSs include an Airbus A380 for Thai Airways International, an Airbus A330 for Gulf Aviation Academy (GAA), an Airbus A320 for Russian aviation equipment company NITA (New Information Technologies in Aviation) on behalf of the Ministry of Transport of Russia, and an Embraer Phenom 100 for CAE Global Academy Perth, a joint venture flight school with China Southern Airlines located in Australia. CAE has also signed contracts with various customers for updates of CAE-built simulators, the contracts worth more than \$70 million which bring the total number of FFS sales during fiscal year 2012 to 15.

Boeing and ANA in first 787 Dreamliner delivery

Boeing celebrated the delivery of the first 787 Dreamliner on 26 September 2011 to launch customer ANA during a ceremony adjacent to the factory where the airliner was assembled. More than 500 employees representing the 787



programme walked alongside the all-new jetliner, witnessed by a crowd of thousands. Made from composite materials, the Boeing 787 Dreamliner is the first mid-size aircraft capable of flying long-range routes and will allow airlines to open new, non-stop routes preferred by the travelling public. In addition to providing airlines "with unprecedented fuel economy and low operating costs, the 787 features a host of new technologies that greatly enhance the passenger experience".

Air France-KLM to acquire 60 A350 XWBs

The Air France-KLM Group has announced its intention to order 60 A350 XWB aircraft, of which 25 A350-900 will be firming shortly. "The aircraft will become an essential pillar in the group's long-haul fleet modernisation strategy".



Société FCL takes delivery of a GrandNew Helicopter

Société FCL of France has taken delivery of a GrandNew light twin engine helicopter, handed over at a ceremony held at AgustaWestland's Vergiate facility in Italy on 23 September 2011. The helicopter will be used for private and charter services from its base in Paris and also along the Côte d'Azur.



FAS orders GrandNew and AW169 helicopters

FAS (Falcon Aviation Services) of Abu Dhabi (United Arab Emirates) have signed a contract for a GrandNew light twin and a preliminary sale contract for two AW169 helicopters. These latest contracts were signed at the delivery ceremony held at AgustaWestland's Vergiate facility in Italy for their first VIP transport-configured GrandNew.



Blueway AS order another AW139

Blueway AS of Norway has signed a contract for one more AW139 medium twin helicopter to be used for offshore transport operations. This order follows an initial contract for three AW139s placed in 2010 and one for a fourth unit



signed earlier this year as part of a Framework Agreement for the purchase of a total of five AW139s plus options for an additional four.

United Technologies acquires Goodrich

United Technologies will acquire Goodrich at a 16% premium to the stock's latest close, the deal totalling \$18.4 billion, including \$1.9 billion in net debt. United Technologies expects to finance the deal with debt and equity issuance, with the equity component likely to be 25% of the total. United Technologies is an industrial systems and aerospace giant with a market cap of around \$68 billion. The company manufactures a wide range of products from elevators and escalators to helicopters and fuel cells. Goodrich is primarily an aerospace company and manufactures aircraft landing systems and electronic systems.

Qinghai order two AW139s

Qinghai Zhingao Natural Gas and Chemical of China has placed an order for two AW139 medium twin helicopters. The aircraft, configured for VIP transport purposes, will be used to support operations of a new general aviation subsidiary.



TRIP Linhas Aéreas world's largest operator of ATRs

On 8 September 2011, TRIP Linhas Aéreas, the south American leader in regional aviation announced the



acquisition of 18 new ATR 72-600, plus options for 22 additional ones. Nine ATR 72-600 will be directly ordered from the French-Italian manufacturer. In addition to this contract with ATR, TRIP will lease nine ATR 72-600 with the lessors ALC (Air Lease Corporation) and GECAS. The first aircraft of this new model -600 entered into service in October this year.

EC155 helicopters for Dalian police

The Dalian Municipal Public Security Bureau in northeast China is acquiring two EC155 helicopters from Eurocopter



for policing missions, with the initial rotary-wing aircraft deployed during an upcoming meeting of the World Economic Forum.

Japan NPA order AW139 helicopters

The Japan National Police Agency (JNPA) has signed contracts for three AW139 medium twin helicopters. These helicopters will be used by the Tokyo Metropolitan Police,



Nagaono Prefectural Police and Hokkaido Prefectural Police to perform multi-role law enforcement missions.

Taiwan's UNI orders 10 ATR 72-600s

Taiwan-based UNI Air, a subsidiary of EVA Air, has signed a contract with European regional turboprop manufacturer ATR to purchase 10 ATR 72-600s. Deliveries are scheduled to



start in third quarter 2012. The contract was formalised with a ceremony in Taiwan on 9 September 2011.

Skymark selects Rolls-Royce Trent 900 for Airbus A380

Rolls-Royce has signed a letter of intent with the Japanese airline Skymark Airlines to provide Trent 900 engines to power six Airbus A380 aircraft, including TotalCare long-term engine service and support. The aircraft will enter into service in 2014. Skymark is a new customer for Rolls-Royce, and the airline is the first in Japan to order the Airbus A380. Trent 900 engines powered the very first A380 to enter service in 2007 and have now been selected by 11 of 16 airlines who have ordered the aircraft.

Singapore Airlines signs for 15 A330-300s

Singapore Airlines has signed the final agreement to acquire 15 more A330-300 aircraft. The signature confirms an announcement of 29 June 2011. The A330 Family, which spans 200 to 400 seats for the passenger variants and also includes freighter, VIP, and military transport/tanker variants, has now attracted over 1,150 orders.

A350 XWB's Trent in initial flight tests

Airbus has completed installation of the first Rolls-Royce Trent XWB flight-test engine on the A380 'flying-testbed' aircraft MSN 001 (the aircraft depicted is at Airbus' Jean-Luc



Lagardere site in Toulouse where the engine was mounted). The aircraft and engine will be prepared for the flight-test campaign commencing soon. The Trent XWB engine, which is the largest Rolls-Royce turbofan with a 118-inch diameter fan, has been specially designed to power all members of the new Airbus A350 XWB Family "with maximum efficiency".

"Potential commonality between Comac and Bombardier"

Comac and Bombardier have identified seven areas for potential commonality as the Chinese and Canadians move closer to agreements on their C919 and CSeries narrowbody programmes. "We're now working toward some definitive agreements, but the timeline has yet to be determined," said Ben Boehm, Bombardier's vice-president of international business. In March, the two companies agreed to examine potential



co-operation on their in-development aircraft. The co-operation framework covers customer support, marketing, new product derivatives, systems, materials, suppliers, technology and processes.



Boehm added that the CSeries and C919 share 10 suppliers, including Liebherr (landing gear), Honeywell (auxiliary power units) and Rockwell Collins (avionics). "The benefits of commonality focus on how we can mutually become more competitive," said Boehm. "The seven elements of the framework are focused on subject areas where customers see a benefit if there is some similarity between Bombardier and Comac aircraft. If, for example, we both use the same specification of aluminium lithium, it could lower costs and alleviate an airline's supply challenges." He dismissed the view that the CSeries and C919 were rivals, because the minimum capacity of the C919 (160 passengers) is well above the maximum (145) the CS300 can seat.

Meanwhile, Bombardier are to reduce output of its CRJ regional jets from January 2012, in the face of an orders slump that has seen its backlog diminish to just over one year's worth of production.

Airbus sales bonanza

Announced at Dubai Air Show 2011 was Qatar Airways' firm order for 50 A320neo aircraft, marking a step in the Doha-based airline's decision to form the backbone of its future single-aisle fleet with Airbus' A320 product line. Another Middle East customer, Kuwait's ALAFCO, signed a firm order for 50 A320neo Family aircraft and took options for 30 more, with these aircraft to complement the aviation lease and finance company's existing A320 portfolio. Completing the A320neo's firm transaction activity in Dubai was the US-based Aviation Capital Group's purchase agreement for 30 jetliners, which will be made available for the aircraft leasing company's global customer base.

Spirit Airlines of the US signed a memorandum of understanding for 45 A320neo jetliners and 30 A320s, marking an additional market commitment in North America from an existing A320 operator. The new A320s to be acquired by Spirit will be equipped with Airbus' Sharklets™ wingtip devices that cut down on aerodynamic drag for lower fuel consumption and reduced carbon emissions, which are optional on A320s and incorporated as standard fit on the A320neo.

Also included in the Dubai Airshow's business volume was Qatar Airway's firm contract for five additional A380s, along with three options. It doubles the airline's A380 firm order total to 10, and raises overall firm bookings for Airbus' 21st century flagship jetliner to 243 from 18 customers.

Emirates Airlines order 50 Boeing 777s

Emirates Airlines has ordered 50 long-range Boeing 777 passenger jets worth a combined \$18 billion dollars, the Dubai-based carrier's chairman and chief executive said at the Dubai Air Show. "Emirates has placed an order for an additional 50 Boeing 777-300 ER" airliners, in addition to 20 Boeing 777-300ER as an option, Sheikh Ahmed bin Saeed Al-Maktoum said at the Dubai Airshow.

Sheikh Ahmed put the total value of the firm order and options at \$26 billion, adding that the latest announcement brings Emirates' orders of the long-range aircraft to 90 from 40 units. Emirates, which is one of the worlds fastest growing carriers, last year placed an order for 30 Boeing 777s worth \$9.1 billion at the Farnborough show. The airline is the largest single operator of the twin-engined 777 planes with 95 units in service.

First 125-class frigate at Blohm + Voss

Attended by numerous guests and representatives from the Government, Navy and Industry, as well as the Blohm + Voss workforce, the laying-down ceremony for the 125-class (F125) frigate took place at building dock 12 at the Hamburg



shipyard on 2 November 2011. The ceremony was organised by the F125 Work Group (ARGE F125), consisting of ThyssenKrupp Marine Systems AG, who commissioned Blohm + Voss Naval GmbH to complete the order and Friedrich Lürssen Werft GmbH & Co.

The building contract signed in June 2007 stipulates the production of four 125-class frigates, which are to be delivered by the F125 consortium between spring 2016 and 2018. The German Navy's frigate programme has a key role to play not only in ensuring the retention of the innovation-driving expertise possessed by German shipbuilding and the suppliers to this sector, but also in maintaining job security for what is one of Germany's key industries.

P-8A launches first MK 54 torpedo

On 13 October 2011, the P-8A Poseidon prototype successfully launched the first MK 54 torpedo during a test event in the Atlantic Test Range. "The P-8A is advancing along a rigorous test schedule," said Tony Schmidt, P-8A assistant programme manager for Test and Evaluation. "The



success of the first separation test of the MK 54 moves us one step closer to delivering the P-8A to the fleet on time." PMA- 290 conducted initial torpedo release tests to verify safe separation of the MK 54 weapon from the P-8A. Future testing will include delivery accuracy, weapon integration, and end-to-end test. In addition to the MK 54 lightweight torpedo, Raytheon also equips the P-8 with its AN/APY-10 maritime, littoral and overland surveillance radar.

IAI Airborne SAR/GMTI payload

Israel Aerospace Industries (IAI)'s new ELM-2054 radar system, developed by ELTA Systems Ltd provides a cutting-edge solution for all-weather, air-to-surface Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) applications. It features modular, open architecture and can be easily configured into small tactical unmanned aerial vehicles (UAVs), light reconnaissance aircraft, tactical aerostats and more.



Advanced CFM56-7BE “performing well”

The first CFM56-7BE-powered Boeing Next-Generation 737 was delivered to China Southern Airlines in July 2011. Since then, more than 120 aircraft have been delivered to 34 operators worldwide, the fleet logging more than 125,000 flight hours through 31 October without a single engine-related issue. The CFM56-7BE-powered Next-Generation 737 enhanced airplane/engine combination will provide a 2 percent improvement in fuel consumption, which, in turn, equates to a 2 percent reduction in carbon emissions. Additionally, the enhanced -7B will provide up to 4 percent lower maintenance costs, depending on the thrust rating. CFM executed an extensive certification programme that included a 60-hour certification flight test programme aboard GE’s modified 747 flying testbed in Victorville, California. In addition, the CFM56-7BE completed a grueling 150-hour block test at Snecma facilities in Villaroche, France, during which it operated at what is referred to as ‘triple redline’.

Full-scale Leap Fan Blade-Out Rig Test Results

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 very positive results.

In August, CFM completed endurance testing of the fan, with the hardware logging more than 5,000 cycles. The demanding test was designed to evaluate fan behavior within a real thermal and vibratory environment. “The preliminary 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 on the Airbus A320neo and COMAC C919 in 2016, following by the Boeing 737 MAX in 2017. To date, CFM has received orders and commitments for more than 2,450 Leap engines to power these three aircraft types.

Garuda Indonesia MoU with CFM

Garuda Indonesia, Indonesia’s national airline, has signed a Memorandum of Understanding with CFM International for the long-term support of the CFM56-7B engines powering the airline’s fleet of 63 Boeing 737-800 aircraft. Under the terms of the potential 15-year Rate Per Flight Hour (RPFH) contract, CFM would provide comprehensive engine maintenance service and guarantee maintenance costs on a dollar per engine flight hour basis. As part of the proposed contract, CFM and Garuda’s Maintenance arm, GMF Aero Asia will jointly develop overhaul capability for the CFM56-7B engine. Once capable, Garuda’s CFM56-7B engine overhauls

will be undertaken by GMF as part of the RPFH agreement. The development of CFM56-7B overhaul capability by GMF and CFM will increase the competency of the Indonesian aviation industry in supporting the country’s significant domestic air transportation growth.

ICBC Leasing, CFM sign MoU for \$450 million order

ICBC Financial Leasing Co., Ltd, a subsidiary of Industrial and Commercial Bank of China (ICBC) have signed a Memorandum of Understanding with CFM International to purchase CFM56-5B engines to power a new fleet of 22 firm Airbus A320 family aircraft. The firm engine order, which includes three spare engines, is potentially valued at more than \$450 million at list price and the leasing company is scheduled to begin taking delivery in 2012. All of ICBC’s new engines will be the CFM56-5B Performance Improvement Package (PIP) configuration. The -5B PIP completed extensive ground testing and more than 26 hours of flight testing on the A320. The engine, which will become the new production standard, is on schedule for certification and entry into service by the end of 2011.

Record CFM orders in 2011

CFM International will register the second highest orders-year in its history as by October, the company had orders for nearly 2,200 commercial, military and spare engines at a value of \$24 billion. The highest record occurred in 2007, when CFM received orders for more than 2,700 engines. Jean-Paul Ebanga, president and CEO of CFM International stated that “We have had solid orders for more than 1,200 CFM56 engines, which would make it a good year in its own right. But the orders for the current product line have nearly been matched by requests for LEAP engines, with 910 orders logged for the LEAP-1A to power 455 Airbus A320neos. In the coming months, we anticipate many of the nearly 600 commitments for the new LEAP-1B powered Boeing 737 MAX to be finalised.” CFM has also achieved record production rates for the CFM56 product line. The company has built more than 1,000 engines per year since 2006, and the rate has grown steadily. In 2011, CFM is on track to deliver more than 1,300 engines following a rate of 1,250 in 2010. Current plans are to reach more than 1,600 engines per year by 2014.



'Gold' for Recaro Aircraft Seating

Recaro Aircraft Seating of Germany has received the 'Focus in Gold' award for their BL3520 economy class seat. The award was presented to the Schwaebisch Hall-based aircraft seat developer and manufacturer in Ludwigsburg on 14 October 2011. The design quality of the Recaro BL3520 "convinced the panel of experts to choose the seat for top honours in the 'Transport/Traffic' category". The BL3520 is the latest Recaro Aircraft Seating innovation for the economy class cabin, this new design, being successful since late 2010 in fleet aircraft operated by several different Lufthansa Group airlines, combines several features. The short-haul seat weighs "far less than its predecessor".



Saab's Giraffe ordered by USA

Defence and Security company Saab has received an order for the Giraffe AMB multi-mission radar system and related services from the US Department of State, the order valued at \$ 23.7 million. The programme will involve both Saab's newly acquired subsidiary Saab Sensis located in Syracuse at New York, as well as Saab in Gothenburg, Sweden. Deliveries will take place during 2012 and 2013. The Giraffe AMB is a world leading Multi-Mission Radar System that detects enemy threats from Rocket, Artillery and Mortar attacks while simultaneously conducting Air Surveillance.



Elbit Systems debuts the Engager

On 5 October 2011 Elbit Systems debuted the 'Engager', a new advanced remote reconnaissance gathering system. Designed for day and night operations, the 'Engager' is highly suited for missions such as intelligence gathering and tracking of long-range targets and laser guided weapon designation. The system has high camouflage capabilities and is remotely operated, enabling intelligence gathering while avoiding contact with enemy forces operating in the area.



Elbit to supply Cardom Systems

Elbit Systems and TASE have been awarded a contract by the Israeli Ministry of Defence (IMOD) to supply Cardom systems to the Israeli Defence Forces (IDF). Manufactured by



Elbit Systems' subsidiary Soltam Systems Ltd., Cardom systems were initially supplied to the IDF in 2007 and are considered among the most advanced of their kind in the world. The systems are to be supplied over a period of four years. The Cardom systems integrate a 120mm mortar with innovative fire control, navigation, automatic aiming and propulsion systems.

Cobham pod for KC-390 tanker

Cobham has been selected to develop and supply the Wing Aerial Refuelling Pod for the KC-390 tanker aircraft under development by Brazil's Embraer and has received an order with



an initial contract value in excess of \$60 million. Air refuelling operations will be a key tactical role of the KC-390 following its introduction into service, scheduled to commence in 2015. Cobham will supply Embraer with one of its state-of-the-art air refuelling pods, specially modified to fit the KC-390. The system architecture will be tailored to meet the aircraft's air-to-air refuelling capability requirements, and enable refuelling of a range of fixed and rotary-wing aircraft.

Pratt & Whitney PW1500G engine in first flight test

The Pratt & Whitney PurePower PW1500G engine, the PW1524G engine for the Bombardier CSeries aircraft, completed its first flight test programme logging 25 flights with 115 flight hours. The PW1524G engine has been flight testing on Pratt & Whitney's 747SP flying test bed at Pratt & Whitney Canada's Mirabel Aerospace Centre, in Quebec (Canada) since 20 June 2011. Final production assembly and test will also occur at the Mirabel facility for both the PW1524G and P&WC's advanced PW800 family of PurePower engines for the next generation of large business jets. In addition to more than 800 hours of full engine testing, Pratt & Whitney has performed critical part level and engine sub-system testing to validate designs for the PurePower engine programme, including hundreds of hours of core and rig testing, design validation of the fan drive gear system, bird ingestion and fan blade containment and compressor performance for the advanced PW1000G core.

Rockwell Collins systems on Boeing 787 Dreamliner

Rockwell Collins' next generation avionics systems have been certified by the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) on Boeing's 787 Dreamliner aircraft. The company provides and serves as systems integrator for the aircraft's flight deck displays and crew alerting system, pilot controls, communication and surveillance systems, and the aircraft's common data network.

Among the advancements included on Boeing's 787 airplane is an integrated display system featuring five 15.1-inch diagonal LCD displays, four displays across the console and one in the control stand, as well as standard dual head-up displays (HUD). The system utilises cursor control devices and multi-function key pads to provide a fully interactive system for pilots. Rockwell Collins also provides a newly developed Integrated Surveillance System (ISS) for the 787.

Elbit to supply CV-22s with colour HMDs

Elbit Systems' US subsidiary, Elbit Systems of America, has been awarded a contract to supply Boeing Military Aircraft with the CV-22 Colour Helmet Mounted Display (HMD) for the Air Force Special Operations Command (AFSOC). Elbit Systems of America will provide



the US Air Force with a colour HMD that includes full helmet tracking capability and effectively meets AFSOC objectives in the near and long term. The colour HMD is based on the proven Elbit Systems ANVIS/HUD system which has been in use by US Army, US Navy, US Marines, US Coast Guard and US Air Force rotary wing/tilt rotor pilots for many years.

SELEX Galileo's two new compact high-energy lasers

SELEX Galileo has launched two new lasers: the Type 163 Ultra Lightweight Laser Designator (ULD) is the smallest lightweight NATO STANAG 3733-compatible laser designator product available on the market and generates 80mJ from a lightweight, compact unit and will be used by ground-based forward air controllers to designate targets. The Type 158 is a flexible, modular laser designed for integration into a range of small and medium-sized turret systems such as those on Unmanned Aerial Systems (UAS). The Type 158 laser also provides a second wavelength, allowing it to provide active Burst Illumination Ladar (BIL) capability.

STOP PRESS

Switzerland selects the Gripen



Saab JAS-39D of the Swedish Air Force.

The Swiss government has announced selection of the Saab Gripen as future multirole fighter aircraft for the Swiss Air Force. "The Swiss type-selection confirms that Saab is a market-leader in the defence and security industry and that Gripen is a world-class fighter system that provides the best value for money", said Håkan Buskhe, President and CEO Saab. "The Gripen programme will create a long-term partnership between Switzerland and Sweden. Saab assures Switzerland a long-term strategic industrial co-operation aimed at creating sustainable high tech jobs, transferring technology and generating export business. We stand prepared to start negotiations and await the next steps of the process". Switzerland plans to purchase 22 Gripens.

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E-mail: vayuaerospace@lycos.com

Vayu on-the-spot report

DSEi 2011



The now familiar Lockheed Martin JSF F-35 mock-up was situated in a prime location at the exhibition entrance.

September had London hosting the Defence & Security Equipment International Exhibition 2011 – the largest international defence supplier show of the year.

Richard Gardner reports on some of the key air-related developments on show.

The UK Ministry of Defence used to hold two separate defence equipment shows, one featuring Army equipment held at Aldershot, and the other hosted by the Royal Navy at Whale Island, Portsmouth. A few years ago the decision was taken to amalgamate the Army and Navy elements into a combined defence equipment showcase and opened up to international participation, with the new venue at the Excel Exhibition Centre in London's Docklands, which was considered a more convenient location, with the bonus of a deep-water quayside right alongside, allowing ships up to frigate-size to be displayed. More recently, the show content has been expanded to include air systems and also security products and services, thus it has grown to become an extremely large and comprehensive event, attracting worldwide exhibitors and visitors.

Held in mid-September 2011, there were nearly 30,000 visitors, up 16% on the previous show. There were official delegations from 55 nations, a 12% increase on 2009, with 1,391 exhibitors from 46 countries, with 30 national

pavilions. India was well represented, with a large HAL stand displaying models and programme information.

Also this year there was a marked increase in air related weapons, systems and platforms, including helicopters,



The show included warships and hovercraft, such as this Griffin hovercraft, which has been ordered by the UK's Royal Marines for high speed assault duties and can be carried aboard assault landing platform / helicopter ships.

UAVs and missiles. Underlining this trend was the presence of the well-travelled Lockheed Martin F-35 Joint Strike Fighter mock-up, located right outside the western show entrance, with a BAE/Dassault Telemos UAV and Agusta Westland Lynx Wildcat at the eastern entrance. Many of the exhibitors held detailed briefings on existing and new programmes, plus other innovative developments, and we shall take a closer look at some of these in future issues of *Vayu*. In the meantime, this report takes a broader look at some of the exhibits at the show to give a flavour of its extensive coverage of all things relating to systems, equipment and services in the international defence sector.

Thales had a large stand at DSEi 2011 and provided an update on the British Army's WK450 Watchkeeper, Europe's largest military UAS programme, with 54 air vehicles on order. Development testing has included over 270 flights with the most recent trials and evaluations conducted from QinetiQ's UAV Centre at Parc Aberporth in Wales, which has been extended to include the UK's first cross-country UAV corridor to the inland Sennybridge training area. One test flight achieved a 14 hour sortie, reaching an altitude of 16,000ft, with the air vehicle landing with enough fuel remaining for another four hours of flight. The dual mission payload included an EO/IR camera and synthetic aperture radar, with ground moving target indication and a real-time data downlink. Operational trials are now commencing over the Salisbury Plain, flying from Boscombe Down and after a crew training period, Watchkeeper is due to be deployed in British Army service in Afghanistan before the end of this year. As deliveries build up during 2012, Watchkeeper will replace the dozen or so leased Elbit Hermes 450 UAVs which have been managed and supported by Thales. These operations have seen Thales providing "fly-by-the-hour" ISTAR cover for the Army and over 4,000 sorties had been flown by early September, with 50,000 hours surveillance cover. The high intensity Afghan mission using the Hermes 450 is an excellent lead-in to full Watchkeeper service, which will introduce a greatly enhanced payload capability.

ISTAR helicopters

Thales also displayed a representative mock-up of the two-place onboard Cerberus mission system, based on that in the Royal Navy's Sea King Mk.7 AEW/ISR helicopters now in service in Afghanistan. These Searchwater radar equipped flying sensor platforms were originally used for carrier based AEW duties, but their additional role as ISTAR assets, with overland MTI capabilities, offers opportunities to adapt the system for the RN's Crows' Nest SK7-replacement programme, based around a Merlin helicopter platform. Another Searchwater radar-based proposal, with a similar onboard mission centre, could provide an interim Hercules C-130J long-range maritime patrol capability.

BAE Systems announced an update on its new class of Royal Navy general purpose frigate, now given the designation of Type 26. Also known as the Global Combat Ship, the new class, presently



These innovative tiles, part of BAE Systems Adaptive electronic camouflage project, seen here fitted to an armoured personnel carrier can also be produced for other vehicles, and could later be adapted for use on warships and helicopters. Small video cameras monitor the background IR signatures and the tiles can be programmed to reproduce a similar signature, creating an effective masking cloak that makes the vehicle invisible to other IR sensors on the battlefield.



This demonstration image shows an APC fitted with the Adaptive system tiles. On the left is the usual IR signature of the vehicle, making an easy target for an enemy using IR sensors, such as in an electro-optical turret or night vision helmet or within a precision IR anti-armour weapon. On the right is the same vehicle with the Adaptive system in operation, showing how the vehicle can disappear completely against the background.



DSEi featured several different developments that aim to provide a precision attack capability for 2.75in rockets that are in widespread use, but which are not suitable at present for operations where their spread after launch can cause high collateral damage, such as in an urban location or where the target is within a village. This model shows a BAE Systems laser-guided precision rocket that can be tube-launched from an Apache or other attack helicopters.



Another similar precision weapon, based on a rocket is the ATK GATR, seen in its launch pod (left) and on its own (right).



Raytheon has developed an anti-GPS jamming system with wide applications for land, sea and air platforms. This ensures that the platform is not rendered inoperative by hostile GPS jamming.

at the contracted assessment phase, will incorporate modular features to be adaptable for air defence, anti-submarine and anti-surface ship tasking, as well as providing a platform for anti-piracy and anti-smuggling operations, and disaster relief. The rear deck would be capable of operating a Chinook-size helicopter, and allowance is being made for the integration of missile silos and a medium calibre fast-firing gun. There will be a hangar for light and medium size helicopters, such as the Lynx Wildcat and Merlin, with provision for operating unmanned air vehicles to deliver improved over-the-horizon intelligence, surveillance, targeting and reconnaissance capability. The Royal Navy is anxious to gain experience in such VTOL UAS activity in advance of firming up a funded operational requirement, while QinetiQ and Northrop Grumman are offering a low-cost development that would combine the mission systems from the US Navy's MQ-8B Fire Scout in a modified unmanned conversion of the UK Gazelle light helicopter.

A futuristic BAE Systems innovation is a system under development called *Adaptiv*. This is an electronic camouflage cloaking system that can create a thermal image of the target that effectively allows it to completely blend into the background, when looked at through thermal imaging sensors, or can appear with a false IR signature as an "innocent" tractor or bus or shed, or even a pile of rocks. A series of "before and after" visual demonstrations showed just how the cloaking could be used to deceive helicopter crews using IR systems and missiles with IR target-seekers. The technology could also be adapted to have application on helicopters, aircraft and ships. Developed jointly with Sweden's Defence Materiel Administration (FMV), the patented technology is based on sheets of hexagonal 'pixels' that can change temperature very rapidly. Onboard cameras detect background scenery and display the infra red image on the vehicle allowing even a moving target to match its immediate surroundings. Alternatively it can display covert identification markings to reduce the risk of fratricide. BAE Systems has focused initially on the infra-red spectrum, but engineers have combined the pixels with other technologies to provide cloaking in other parts of the electro-magnetic spectrum to provide all-round stealth. Project manager Peder Sjolund said, "We can re-size the pixels to achieve stealth for different ranges. A warship or building, for example, might not need close-up stealth,

so could be fitted with larger panels". Using such panels might enable a frigate to look like a fishing boat to an IR sensor or FLIR system aboard a patrol aircraft. Also, attack or smaller battlefield helicopters might also be fitted with side sheets that electronically mask the helicopter's true shape, making it hard to identify.

Countering brownouts

Another innovative announcement from BAE Systems at the Show concerned its new Brownout Landing Aid System Technology (BLAST), a situational awareness solution that helps helicopter pilots to see in degraded visual environments, such as is experienced every day in



The extensive Thales stand at DSEi featured a Watchkeeper MALE UAV overhead, Europe's largest UAS programme to date.



The largest unmanned air vehicle at the show was the BAE Systems Mantis, which is now being developed jointly with France as the Telemos project for future adoption by UK and French air forces to replace existing armed UAVs.

desert conditions or such locations as in Afghanistan. This uses off-the-shelf technology and is designed to reduce the number of accidents caused when pilots lose their visual references due to sand, dust or snow circulating during take off and landing. Pilot training alone cannot

successfully counter this phenomenon, and the BLAST trials in Yuma, USA, have demonstrated effective real-time 3-D visual landing-zone representation with overlaid flight symbology information to a pilot in brownout conditions. The flight symbology provides all relevant

flight critical information, allowing the pilot to easily judge the height, speed, and drift of the helicopter. It combines proven millimetre wave technology with advanced situational awareness capabilities and its light weight, flexible architecture and ruggedised features allow it to be installed on new and legacy helicopters. Fitting this equipment could greatly reduce the number of helicopter accidents owed to pilots' temporary loss of visual orientation.

Italy's Finmeccanica stand featured many air systems, from the Falco Evo UAV and military versions of the ATR turboprop transport/special mission aircraft and C-27 tactical transport, to the diverse sensor systems of Selex Galileo. SkISTAR is a new open architecture concept for Medium Altitude Long Endurance (MALE) UAVs and is to be flight tested early next year on the Falco Evo. This is designed to integrate different sensors and mission system elements into a single integrated mission system. It is platform agnostic with many applications, although as well as the Falco Evo, it is planned to evaluate it aboard the General Atomics MQ-9 Predator B/Reaper.



The Bluebear iSTART was one of the smaller UAVs at the show and can fit, with its laptop-size control console in the boot of a car. It can also be fitted with different payload packages. Once launched by hand, the mini-UAV operates autonomously and distributes a live image back to the operator.



MBDA displayed its new Perseus ramjet-powered Mach 3 stand-off attack missile.

Agusta Westland is making steady progress with AW159 Lynx Wildcat flight trials, which have clocked over 350 hours, with ship trials due to start soon. Initial deliveries to the British Army are due next year, with a naval version following in 2014. Both versions share a very high level of commonality in onboard systems, allowing such features as radar and rescue winches to be added or removed as required without major modification. Marínisation of both versions will allow

Army helicopters to operate from ships, adding to mission flexibility. A total of 62 are on order for the UK and it is intended that the Future Anti-Surface Guided Weapon will be an important new weapon with the Thales Lightweight Multirole Missile (LMM) expected to be part of the firepower options for Army use against vehicles and fixed targets as well as in the anti-small boat naval role and for self-defence against other helicopters and aircraft.

New missiles

European missile supplier MBDA also had a large stand with missile models ranging from the silo-launched Viper, the primary fleet and area air defence weapon aboard the Royal Navy's Type 45 destroyers and in French Navy service, to a mock-up of the next generation vehicle launched anti-armour missile. There was also a prominent large scale model of the CVS401 Perseus Mach 3 stealthy next generation cruise missile, designed around an advanced AESA RF seeker, but with a dual mode sensor package. The ramjet-powered missile is being proposed for multiple naval and land attack applications and will feature two ejected payload modules in addition to the main missile warhead. When used in the anti-ship mode, this lethal package would strike three different parts of the target vessel simultaneously. In an air-to-surface attack, it could cripple a command post or other tactical and strategic targets.

Compared to existing stand-off missiles as Storm Shadow and Tomahawk, Perseus would be more compact and much lighter (800kg) as well as flying to the target at higher speeds, minimising the risk of interception. MBDA also displayed the Dual Mode Brimstone missile, which has been battle-proven in Libya, proving to be highly accurate and reliable. The UK MOD has recently re-ordered a large number of Brimstone missiles to restore stocks following their success in the NATO operation against ground targets in Libya.

Northrop Grumman presented its HART battlespace data management system which allows soldiers at unit level to request imagery of what is hidden from immediate view (such as around the next corner, or over a hill). With a few taps on the keyboard the system will alert the Tactical Operations Centre, search the data base for the most recent and appropriate imagery from manned or unmanned sensor platforms and will either download that imagery, or direct a UAS to fly to the area and obtain new images. HART receives the imagery, geo-registers it and re-directs it back to the requesting unit. The system has been successfully trialled in the US by the Army and Marines.

Turkey has an expanding missile sector, and DSEi saw a large model of the new Tubitak Sage SOM (Modular Stand Off Missile), which is a long-range turbojet powered 1,300 lb weapon, intended to be integrated in due course onboard Turkish Air Force F-16s and F-35s. It has been tested over a range of 100 miles. Turkey's Roketsan brought to DSEi small air-launched missiles, including the OMTAS medium-range anti-tank missile, UMTAS, long-range all-weather, day and night fire-and-forget anti-tank missile and the CIRIT, a 2.75in laser guided missile, intended for attack helicopters to fill the gap between unguided pod-mounted rockets and guided air-to-surface missiles. This is an area that is attracting intense competition, for the concept transforms standard high velocity air-launched pod mounted rockets (which cannot be used where collateral damage is likely) into affordable precision weapons. A typical attack helicopter can carry up to 19 individual rockets in each pod and two or four pods can usually be carried on



Raytheon showed its Small Tactical Missile (STM) intended for use on small UAVs and light helicopters. It can be carried in pairs, one behind the other, within a single launch tube.

a mission. Converting these with laser seekers is highly cost-effective and gives helicopters, light attack aircraft and UAVs considerable precision firepower against such targets as enemy individuals, small groups, vehicles, small boats and buildings, at a fraction of the cost of using much larger and heavier missiles such as the Hellfire, Maverick or Brimstone. Raytheon and BAE Systems (North America) have their own precision-guided rocket products (Raytheon's Talon LG rocket and BAE's LG rocket for the US Marines) under development or entering production, as does ATK, a US company that has also now ventured into the special mission aircraft market, having received an order from the Jordanian government for two highly modified CASA/Airbus Military 239 transports, to be fitted with the company's STAR integrated mission system, electro-optical and laser targeting systems, self-defence aids and an M230 30mm chain gun (as carried on the Apache attack helicopter), with provision for 2.75in rockets and Hellfire missiles.

Canada had a large number of exhibitors and great interest was generated in a highly innovative new tactical, redeployable, expanding container (TRECC) shelter system from Weatherhaven that can be shrunk to fit inside the cabin of a CH-47 Chinook. This enables the helicopter to fly at higher speed, and with more agility than when carrying containers as underslung external loads, presenting a less vulnerable target. The shelters can be unloaded and quickly expanded within ten minutes to create a field hospital or command centre, greatly extending the operational capability of Chinooks in Canadian and NATO service. The TRECC-H unit has a payload volume of 418 cubic feet, with enough space to stow a medical triage unit, and it incorporates the latest fibre-optic communications technology. The roof rises to eight feet and the sides unfold to provide 255 sq ft of working space, enough for a fully equipped medical centre. The unit comes completely self-contained and already filled with the necessary equipment that can be moved swiftly into position to begin saving lives. The company has identified many other uses apart from medical and command posts. Similar units can be deployed to form ablutions units,



The MBDA Sabre loitering munition can be fitted with dual mode sensors and can remain in the air for an extended period.

catering units, tactical mission rooms and sleeping accommodation. Complete camps can be set up very quickly by flying in the individual units inside Chinook helicopters. This enables them to be positioned in remote areas with minimum exposure to en route threats. The task of moving units to new deployed sites by surface convoy is often highly dangerous and takes time, while underslung loads have to be handled with extreme caution in the air, to avoid inducing unwanted load momentum (which might lead to jettisoning the load altogether) and loading and unloading underslung containers can place the helicopter in a vulnerable position for too long if hostile forces are

operating in the area. The availability of the Weatherhaven TRECC could transform tactical field operations by providing greatly speeded up base facility building and increasing safety for all personnel involved.

UAVs

Amongst the many exhibits in an expanded UAV area at the Show was the Centaur Optionally Piloted Aircraft, from Aurora Flight Sciences, based on the Diamond DA42 twin engine ISR platform. Offering extremely low life-cycle costs, it can remain airborne in the unmanned mode for 24 hours with a 200lb payload, and is self deployable to remote locations and certified



Turkey's new Stand Off Missile, SOM, was seen at DSEi for the first time and is aimed at providing a new generation attack weapon for Turkey's F-16s and later, F-35s.

for operations in controlled airspace in the manned configuration. With a typical cruise speed of 150 kts, it can fly at up to 27,500 ft and has a range of 2,000 nautical miles. The aircraft uses heavy fuel and has a very small operating footprint as the ground control equipment easily fits within the existing DA42 cargo space.

Bluebear Systems Research is a UK company specialising in research and development projects leading to rapid development of systems to meet tight deadlines, introducing innovation while reducing risk and cost. With a substantial background of UAS activity, the company offers a range of technologies and expertise that includes modelling and simulation, autonomous systems, payload integration and testing and ground control systems. At DSEi, Bluebear displayed its iSTART hand-launched lightweight UAV, primed by a rechargeable battery, and which can stay aloft for 40 minutes. Small interchangeable payload pods click-in under the fuselage moulding and can carry video cameras or an IR sensor. It has a point and click interface for mission planning, and the rest is automatic, requiring no further human intervention

other than a 'look at this' function, if required, up to landing. The system can be deployed by one person and the vehicle and control station fits into a car boot. The company's Nexus control station itself fits into a small case and contains a ruggedised laptop hosting the batteries and datalinks. It supplies situational awareness to remote users, transmitting video direct from the ground station.

From Insitu comes the new Scan Eagle Dual Bay variant, based on the widely used Scan Eagle UAS platform, but fitted with a spacious payload compartment in the mid section. Upgrading existing Scan Eagles is quick and inexpensive and special payloads, including a Synthetic Aperture Radar or Long Wave IR imager, can be swapped from platform to platform for maximum availability. A new rotary wing mini-UAV is the Insitu Inceptor, aimed at police, fire and rescue services and which can act as an incident scene management tool, as well as acting in the search role. It can be carried in the boot of a police car.

An interesting new technology from Raytheon has been launched as the *Silent Guardian* non-lethal defence system,

designed to disperse hostile groups of people, ranging from rioting mobs to terrorists and pirates. Based on millimetre wave techniques, this system aims a beam at the target and instantly heats the water molecules under the skin to an unbearable level, so the target has no option but to move location to escape the intolerable sensation. Tests have shown that operating at ranges of up to 250 metres, there is no health damage caused by the system, which is very effective in achieving its aim. The compact system can be mounted on suitable military or paramilitary vehicles, ships and even helicopters. It could have a big impact on reducing pirate attacks on commercial and private shipping, and has already been ordered by military and civil customers.

DSEi 2011 provided a very comprehensive showcase for new military products and services and with increased participation by air systems exhibitors, is fast evolving into a genuine tri-service show. It also provided an opportunity for companies to describe how best to address the growing problem of cyber attacks, and this will be looked at later.



Weatherhaven has developed an innovative expanding container system, TRECC, which can be carried inside a CH-47 Chinook and which can open up to provide a field medical centre or combat HQ. This allows safer and faster air mobility by helicopters compared to conventional underslung loading of containerised shelters and other equipment.

Debut at DSEi



RUAG and Sand-X MoU for military version of the tracked Sand-X ATV

Sand-X was founded by Urs Eiselin in 1994, a former Swiss snowboard champion. An unusual idea and fortunate circumstances led the company to quick success. In less than 10 years 400 vehicles of the civil version were sold at which point Urs Eiselin realised that there was a market for a military version. In RUAG was found a strong partner.

The advantages for Sand-X are clear: RUAG's military knowledge regarding logistics, documentation, quality and marketing are outstanding. RUAG on the other hand gains a state-of-the art niche product that serves the needs of special and armed forces.

Sand-X ATV is a tracked all terrain vehicle that can be used under extremely demanding conditions by various authorities. The huge advantage of the Sand-X ATV is the combination of wheels and tracks, which enables a slow and silent running on sand, dunes, mud, ice and so on, for patrolling border controls a

contributing factor because Sand-X ATV can take the direct way over the dunes without losing traction. Sand-X ATV is a faster and safe all terrain vehicle.

Based on the business case, RUAG could be in the function of a general

contractor to take responsibility for the assembly of the military version.

The DSEi in London was the first international joint appearance of the cooperating partners and an opportunity to feel the pulse of the market.



“A long history of Anglo-Indian partnerships”

VAYU Interview with **Gerald Howarth MP, Minister for International Security Strategy, UK MoD**



In this exclusive interview, Vayu’s UK editor, Richard Gardner, speaks with Gerald Howarth MP on the DSEi, the success of Britain’s defence sector in the global export market and the importance of a shared history and continuing close defence links between Britain and India.

RG: DSEi 2011 was the largest ever defence and security exhibition of its kind to be held in the UK. What was your overall impression of the show, and do you think it achieved its aims?

GH: DSEi was a huge success. Attendance was up by 16% over 2009. And with 75 international delegations from 55 countries, not the least India, it was a tremendous opportunity to showcase the UK Defence and Security sector. I visited the Indian pavilion and met representatives of the Indian Ministry of Defence and Defence industry. I was struck by the clear vision for a self sustaining defence industrial sector, as we have in Britain.

RG: How important are defence export sales to the UK economy and Britain’s defence commitments worldwide?

GH: For me, it’s the other way round. First and foremost, responsible Defence exports play a key role in promoting our foreign policy objectives as part of our approach to national security. By helping other nations with whom we have close relations to build up their own Defence and Security capabilities, we can contribute to regional security and help tackle threats to our own security closer to their source. Defence exports also leverage more influence in bilateral relations with our friends and allies

than any other area of trade – not just through equipment, but through doctrine and training. Equipment programmes becoming increasingly collaborative in nature, which can only serve to reinforce alliances and partnerships.

On top of this, Defence Exports make a significant contribution to the UK economy. The UK has maintained its position as the second largest exporter of new defence equipment for the last 10 years, and last year we had a 22% share of the global defence export market – contributing £6 billion to our balance of trade. Exports also help to maintain over 300,000 British jobs, many of which are highly skilled.

RG: What UK defence programmes do you think will be of most importance over the coming years if defence exports are to be sustained, or increased?

GH: I see opportunities in all three domains. The Typhoon aircraft really came of age over Libya. Nothing beats proven operational capability, and we’re seeing that reflected in a surge of interest world-wide. I am also excited about the Global Combat Ship and we are actively in discussion with nations who may wish to work with us on this programme, not necessarily to buy the ship but to cooperate, exploit, influence and possibly adapt the design. There have also been

huge advances in recent years in protected mobility, personnel protection, and soldier systems – which again come with a “battle-tested” label. The new light protected patrol vehicle is essential in the fight against the IED threat.

RG: The UK economy is facing a number of challenges resulting from the financial situation that is affecting Europe and North America in particular. Is the UK government committed to supporting long-term R&D investment through such difficult times?

GH: The UK is a world leader in scientific research which gives us a critical advantage over potential adversaries. It is saving lives on a daily basis. It can also help to deliver better value for money and is vital to our future economic success. That’s why the UK Ministry of Defence commits £400 million a year to Science and Technology, a figure I expect will rise in cash terms in the coming years.

Science and technology is also one of the foundations of our bilateral relationship with India. So I was delighted that the UK’s Defence Science and Technology Laboratory and India’s Defence Research and Development Organisation recently signed an agreement for research co-operation.

RG: The UK has developed and introduced some of the world's best-selling military aircraft of all time. With fewer new manned aircraft types in production today, do you see UAVs playing a growing part in future export activities?

GH: In Britain, we have recognised the growing operational contribution of Remotely Piloted Aerial Systems (RPAS) for some time. RPAS related spending has increased dramatically since 2005, largely in response to burgeoning requirements in Afghanistan. We will continue to invest in an increasing number of diverse RPAS projects to meet our enduring capability needs. Industry has a crucial role to play, and I expect that British industry will rise to the occasion by providing innovative solutions to ever increasing global demand for RPAS.

RG: How important are the Royal Navy's new shipbuilding programmes to future exports?

GH: The UK has a world-renowned ship-building tradition. We're seeing the fruits of that cumulative expertise in the Type-45 Destroyer and *Queen Elizabeth*-Class Carrier programmes, as well as the next generation of Royal Navy frigate, the Type 26 Global Combat Ship (CGS), which I mentioned above. GCS will draw on the expertise in design and manufacture of those programmes to deliver a world class maritime capability. GCS will also adopt modular design techniques, open system architectures in a flexible and adaptable core design which will offer a range of opportunities for international partnership. It will be truly cutting-edge.

RG: You have been to India recently and taken a close interest in the MMRCA competition and the sale of Hawks to the IAF. What is your vision for the future of Anglo-Indian cooperation and partnership on defence and industry matters?

GH: I have already talked about the significance of the Letter of Arrangement for future collaboration on Science & Technology, which provides an excellent sign post for future co-operation. I feel that we can build on the existing strong relationship through this and promote even greater co-operation in developing

new equipment and capabilities for both our countries. Not only will this benefit our Armed Forces, it will further strengthen the ties between our respective defence industries. More widely, the British government is committed to an enhanced partnership with India as a global power, one that reflects our deep and historic ties but in a modern context of open democracy, liberal economies and effective international institutions.

RG: The Eurofighter Typhoon has been actively supported by the UK government in the sales campaign to re-equip the Indian Air Force. With a long and strong track record in supplying UK designed aircraft to the IAF through partnerships with HAL, do you anticipate new opportunities to expand Anglo-Indian partnerships and technology co-operation if Typhoon is selected for MMRCA?

GH: Yes. There is a long history of successful Anglo-Indian partnerships and technology co-operation. The most recent example is last year's decision by the Indian Air Force to order an additional 57 Hawk Advanced Jet Trainers. The MMRCA competition offers an outstanding opportunity to build on this. The Typhoon partnership is made up of India's four largest European trading partners, the UK, Germany, Italy and Spain and each is committed to the development of that relationship through increased inward-investment and partnership activity.

The procurement of Typhoon would offer an unprecedented opportunity for Technology Transfer and Industrial Participation, and would ultimately support India's aspiration to be self reliant in the aerospace sector. For example the high tolerance advanced manufacturing techniques developed for Typhoon and F-35 could be used to develop future generations of indigenous aircraft. The recent agreement I just mentioned between DSTL and DRDO offers a solid foundation for such a relationship.

RG: Should new initiatives be supported to encourage greater cooperation between UK and Indian companies down through the defence sector supply chain?

GH: Most certainly. I believe there are opportunities throughout the supply

chain for Indian and UK companies to partner with one another. I am looking forward to leading a Defence & Security Trade Mission to India in early February 2012, when I plan to take around 20 – 30 companies to Delhi, Bangalore and Mumbai to learn more about doing business in India and encourage partnerships. It will also enable me to learn more about India following the wonderful visit my wife and I enjoyed earlier this year.

RG: The British Forces, and in particular the Royal Air Force, have a long tradition of working closely with their Indian counterparts, and indeed share a common history. In what ways are you looking to strengthen that relationship?

GH: I am immensely proud of Britain's Defence relationship with India, and we are committed to enhancing the breadth and depth of our partnership between our armed forces. We continue to develop close working relationships through a variety of ways: personnel exchange, regular dialogue on a broad spectrum of defence issues and a comprehensive programme of bilateral exercises. In the last year alone each service has successfully exercised with their Indian counterparts, including exercise *Indra Dhanush* which saw the UK deploy 6 Typhoons, an E-3D, and 250 personnel to India.

RG: DSEi was a truly international showcase for defence and security products and services, and Indian industry was well represented, with HAL and Land Rover both represented. Is the government actively encouraging Indian inward investment into the UK?

GH: Economic growth can be enhanced by inward investment which we welcome. One of the British government's priorities is to attract more Indian companies to the UK. India is the third largest investor in the UK, which is a strong endorsement for the UK as an investment destination.

Equally important though is India as a destination for UK investment. India's projected growth means there will be plenty of business opportunities for UK companies, and UK Trade & Investment continue to help business unlock the opportunities which exist.

The 'Blue-Green' Navy :



The USS Bataan is a Wasp class Landing Helicopter Dock (LHD) amphibious assault ship. The design is based on the Tarawa class, with modifications to operate more advanced aircraft and landing craft. The Wasp class is capable of transporting almost the full strength of a United States Marine Corps Marine Expeditionary Unit (MEU). In total eight Wasp-class ships have been built since 1989.

In April 2011 the USS *Bataan* (LHD-5) with its Amphibious Ready Group (BATARG) arrived in the Mediterranean Sea three months ahead of schedule. They relieved the USS *Kearsarge* and the 26 MEU (26 Marine Corps Expeditionary Unit) from tasks as part of the continuous presence of the US Navy Sixth Fleet in the Mediterranean Sea. The BATARG supported the 22 MEU and its marine medium tilt rotor squadron VMM-263 (reinforced) for the second time with the MV-22B Ospreys. In 2009, the USS *Bataan* became the first United States Navy ship to host an operational squadron of this type and VMM-263 is the MV-22B Osprey squadron that serves as the Air Combat Element (ACE) of the 22D Marine Expeditionary Unit.

The Bataan deploys

The BATARG/22nd MEU is deployed to support the Maritime Security Operations (MSO) and Theatre Security Cooperation (TSC) efforts in the U.S. 5th and 6th Fleet areas of responsibility. The BATARG assumed responsibilities as Task Force 62 and conducted MSO and support as required for coalition forces assigned to the Operation' Unified Protector' which started on 23 March 2011. The mission was to reduce the flow of arms, related material and mercenaries to Libya, as called for in UN Security Council Resolution 1973. This was part of NATO's contribution to the broad international effort to protect civilians in Libya from violence committed by the Ghaddafi regime.

The USS *Bataan* is a Wasp-class Landing Helicopter Dock (LHD) amphibious assault ship. The design is based on the *Tarawa*-class, with modifications to operate more advanced aircraft and landing craft. The *Wasp*-class is capable of transporting almost the full strength of a United States Marine Corps Marine Expeditionary Unit (MEU). In total, eight *Wasp*-class ships have been built since 1989 and as of 2011 all eight are active: USS *Wasp* (LHD-1), USS *Essex* (LHD-2), USS *Kearsarge* (LHD-3), USS *Boxer* (LHD-4), USS *Bataan* (LHD-5), USS *Bonhomme Richard* (LHD-6), USS *Iwo Jima* (LHD-7), USS *Makin Island* (LHD-8). The USS *Bataan* had made its maiden voyage to the Mediterranean in 2000.

'Transformers' in the Mediterranean Sea



“With this combined blue-green (Navy and Marines) team together on the USS *Bataan*, we become an extremely flexible force capable of a wide range of missions,” said Capt. Steve Koehler, USS *Bataan* Commanding Officer. “The mission can include Tactical Recovery of Aircraft and Personnel (TRAP), Vessel Board Search and Rescue (VBSS), Non Combatant Evacuation (NEO), Humanitarian Assistance Disaster Relief (HADR) and ofcourse full scale beach landings with our Landing Craft Air Cushion (LCACs) and Utility Landing Crafts (LCUs)”.

The 22nd MEU Aviation Combat Element (ACE), Marine Medium Tilt Rotor Squadron 263 (VMM-263, Reinforced), consists of the following: ten MV-22B Ospreys, four CH-5E Super Stallions, four AH-1W Super Cobras, four UH-1N Hueys and six AV-8B Harriers to support the MEU’s deployment to the Mediterranean Sea.

“The key mission for the MEU and the BATARG as a whole is to focus on the Marines on the ground” as Capt. Strickland PAO of 22MEU explains. “All material we have brought onboard allows us to deploy in any combat theatre or human relief operation such as *Hurricane Katrina* (2005) or the earthquake in Haiti (2010). We train for each mission and are ready to deploy anytime”. Next to 900 personnel the Amphibious Ready Group(ARG) consists of over 1100 Marines deployed aboard at any time. “This is the main difference with operations on a US carrier which has a more aircraft centric approach, furthermore we are closer to the action and we have much more lifting capacity” as Capt. Koehler states, who has served as an Executive Officer of the Aircraft Carrier USS *Carl Vinson* (CVN-70) before taking over command of USS *Bataan*. “You can see it as a three legged stool the way we operate’ Capt. Koehler

The name USS *Bataan* goes back to World War II when US forces and Filipino troops fought against the Japanese Army. This was after the attack on Pearl Harbor and involved the Philippine Islands, Luzon and Corregidor. After heavy fighting the “Battling Bastards of Bataan” had to surrender in April 1942. Two and a half years later, under the command of General MacArthur, the Philippine Islands were taken back from the Japanese. LHD-5 is preceded in name by USS *Bataan* (CVL-29), a light carrier, which earned twelve battle stars in service during late World War II and in the Korean Conflict. The ship was decommissioned in April 1954.

Currently the BATARG consists of the USS *Bataan* (LHD5), USS *Mesa*

Verde (LPD 19), and USS *Whidbey Island* (LSD 41). The 22nd Marine Corps Expeditionary Unit (22MEU) comprises of a Command Element, Ground Combat Element, Battalion Landing Team (BLT), Aviation Combat Element (ACE) and the Logistics Combat Element /Combat Logistics Battalion (CLB) 22.

Orbat Aviation Combat Element June 2011

VMM-263	10x MV-22B	Osprey
HMH-366	4x CH-53E	Super Stallion
VMA-231	6x AV-8B	Harrier
HMLA-167	4x UH-1N	Huey
HMLA-167	4x AH-1H	Super Cobra
VMGR-252	2xKC-130J (stationed at NAS Sigonella, Italy)	



The MV-22 Osprey is capable of folding its wing and tilt the rotors in order to fit on the deck of a Landing Helicopter Deck. The maximum capacity onboard USS Bataan is limited to ten Ospreys mainly owed to the weight of these aircraft.



HSC-28 has deployed two MH-60S Seahawk helicopters as part of Detachment 2. It is not the first deployment onboard Bataan, during 2009 HSC-28 was onboard the Bataan when it was supporting operation 'Unified Response' in Haiti. It is the first time the unit has deployed with the new procured "Armed Helo Kit". A so-called 'batwing' can be fitted to which can accommodate Hellfire, Hydra 70 2.75 inch rockets, or larger guns/ cannons.

continues. "We, as USS *Bataan*, are always in support of Commodore Steven Yoder and Colonel Eric Steidl, Commander of 22MEU, and decide together how to conduct our operations the best way in order to deploy the MEU. Of course the Commodore has the final saying as being responsible for the BATARG. The ARG concept has shown great value over the last decade and by combining forces (Navy and Marines) we can provide a lot of value operating in the Mediterranean".

'Transformers' deploy to the Mediterranean

Currently VMM-263 is deployed with the MV-22B Ospreys on board the *Bataan*. The process of transitioning from CH-46 operations started back in June 2005 when the unit stood down

to begin the process of transitioning to the MV-22B. The unit was reactivated during March 2006 as the first MV-22B squadron in the US Marine Corps and was re-designated VMM-263. The MV-22 reached Initial Operational Capability (IOC) with the U.S. Marine Corps during June 2007. Being the first squadron operational with the MV-22Bs, VMM-263 was deployed to Iraq during September 2007 onboard the USS *Wasp* (LHD-1).

The Osprey has been replacing the CH-46 Sea Knight on a squadron-by-squadron basis since 2007. This process has to be completed by the year 2019, as of then the remaining Sea Knights will be retired. Currently all eight squadrons on the East Coast have made the transition to the MV-22B.

"The MV-22s are the basis of our VM-263 reinforced squadron which is complemented with a number of additional aircraft" as Lt. Col. Nelms explains. He is the current Air Combat Element (ACE) Commander onboard the USS *Bataan*. "We have a predetermined set up of aircraft onboard based on the missions to be conducted; in this case a mixture of MV-22Bs, CH-53Es, UH-1s, AH-1s and AV-8s". The Lt. Col. continues "We are starting to work up six months ahead of deploying, bringing all personnel under the command of VMM-263. The additional aircraft, aviators and mechanics are sourced from the 2nd Marine Wing, in this case from the units based at Cherry Point and New River. The composition of the Air Combat Element started in January 2011. We started with basic training and had all our assets working together in one squadron. Next step was to start integrating into the 22MEU. For this we had a seven week training period at the Marine Corps Air Ground Combat Centre (MCAGCC), also known as 29 Palms in order to prepare for our deployment".

"The final part of preparation was to start cooperating with the ship. This is the normal procedure. As we deployed three months ahead of schedule, for this mission we had to finalise some training components during our journey to the Mediterranean. This did not cause any difficulties as our service personnel are used to work in mixed forces and can rapidly adapt to changing situations." Lt. Col. Nelms concluded.

"We currently deployed with the following numbers of aircraft on board: ten MV-22Bs (VMM-263), four CH-53s (HMH-366), six AV-8s (VMA-231), four AH-1Ws (HMLA-167) and four UH-1Ns (HMLA-167). We have decided to deploy the AH-1s and UH-1s onboard the USS *Mesa Verde* (LPD 19) in order to have more space available onboard the *Bataan* for the ten MV-22s. These aircraft are much heavier than the predecessor CH-46E and need more spacing on the deck as well. By moving them over to the *Mesa Verde* we have a less complex situation on the flightdeck which makes daily operations easier with the MV-22Bs" the Lt. Col. explained. "The negative side is that we currently have split tasks over two ships, but when needed we are able to redeploy the 'skids' back onto the *Bataan* quickly".

During the author's visit, the USS *Mesa Verde* deployed with the AH-1Ws and UH-1Ns to Greece to conduct training with the Greece Navy out of Naval Air Station Souda Bay. Main missions included overland training flights, shooting at the platoon range and lifesaving courses. The rest of the mission in Greece was 'Morale, Welfare and Recreation' (MWR) for the troops.

The aviators of the Air Combat Element are hand selected, based on experience. "For us there are two basics to qualify for being deployed in a MEU". Lt. Col. Nelms details, "All our aviators have to be night vision and carrier qualified". The latter qualification has to be renewed every fifteen days by all aviators. "The qualification is specifically important for the Harrier aviators" Capt. Zalewski, one of the AV-8 pilots onboard explains. "We conduct day and night missions ranging from close air support to reconnaissance missions".

The transition from the CH-46 to the MV-22B has not been so easy. "We had to make the transition from a tandem rotor to a tilt rotor aircraft" Lt. Col. Mitalski, Executive Officer of VMM-263, explains. The aircraft is more complex than any other type. For outsiders they look like 'Transformers'. The MV-22B has the ability to tilt its rotors, sweep its wing and then change from a helicopter into a transport aircraft within a couple of minutes with the flying characteristics of a turboprop". The ACE Commander has over 1500 flying hours on the CH-46E. "In a way the MV-22B is a turboprop aircraft with the ability to hover and therefore requires new skills from our aviators. With the introduction of the MV-22B into service we have some new concepts to work with; what is specific to the MV-22B is the Throttle Control Level (TCL) which is different to the collective being used with helicopters"

He further stated, " We have seen a phenomena called 'collective dyslexia' with our aviators. This means mixing up the TCL with the normal collective. Instead of pulling up the collective in a helicopter the MV-22B utilises the TCL and needs to be pushed forward to lift and gain speed". The TCL will have the rotors tilted when the MV-22 is changing from hovering position into flight. "Our experience when transferring to the MV-



VMM-263 based at NAS River was the first squadron to transfer from CH-46E to the MV-22B. It was also the first operational squadron to deploy to Iraq during September 2007 onboard the USS Wasp (LHD-1).



The Air Combat Element (ACE) component of 22MEU has its own crews to support flight operations. The yellow shirts are either Flight Deck Officers or Plane Directors. Aviation ordnance crews are wearing the red shirts, and are sometimes referred to as "BB Stackers", or "Ordies".

22 is that for new pilots who just graduated it is much easier to start flying the MV-22 compared to a CH-46 or CH-53 pilot who will be confronted with this collective dyslexia. The training of new MV-22B pilots differs a lot from the training on for example the CH-46E, CH-53E, UH-1N. The flight training is taking place both with helicopters and turboprop aircraft over a ten week period. And due to the fact the 'Osprey' is more a turboprop aircraft than a helicopter, part of the flying training is conducted on the C-12 King Air at NAS Corpus Christi. The final transition to the MV-22B takes place at NAS Pensacola. Out of 100 training hours over two-third is being conducted at the simulator. We have excellent simulators capable of training

for each scenario; the aviators will be confronted with the same situations as when they would be deployed abroad. The total training time varies between four and five months pending on the background of the student". In the Transition Programme for the Osprey pilots from various aircraft have joined so far; there are now two F-18 Hornet pilots, a KC-130 pilot, a Harrier pilot, some CH-53 pilots and even an EA-6 Prowler pilot is to convert to the MV-22B".

Currently only three pilots from the first deployment to Iraq are with the squadron aboard of the *Bataan*. The others are all new to the squadron or only have had one deployment with the MV-22B. Building the US Marines MV-22B community



Members of 22MEU sending a message back home.



CH-53Es of HMH-366 'Hammerheads'



Deployed under control of VMM-263 are four CH-53Es of HMH-366 'Hammerheads', the squadron is based at Marine Corps Air Station Cherry Point. The CH-53E is mainly used for heavy lifting missions as the MV-22B has fewer capabilities.

is still in progress. "We are still gaining new experiences and insights to conduct operations with the Osprey" Lt. Col. Mitalski elaborates, "In terms of size the MV-22 is almost the same size as the CH-46E, however the weight of the Osprey is higher. Therefore currently only ten MV-22s can operate out of the LHDs. Normally we have 12 MV-22s in the squadron when we are land-based. Luckily we need less MV-22s to conduct the same missions as with the CH-46s before. Also the MV-22 has given us much more capability in terms of distance. We can now have long range operations of about 200-300 miles. What we also had to conclude is that we have to revise the way we conduct missions with the MV-22s, as they have much longer range than any other helicopter type onboard" ACE Commander Nelms details. "The MV-22 is very well executing middle weight transport missions and does it fast; however SAR missions, fast roping and in surgeon missions are less capable when conducted with the MV-22" according to Lt. Col. Mitalski. "Finally we have more crew on average deployed to support MV-22 operations in order to support the systems. The MV-22 needs more flight preparation compared with helicopter operations".



In order to have the operations onboard as smooth as possible Bell-Boeing has assigned two of its engineers to the ACE. "It is my second deployment with VM-263 on the *Bataan*" says Willy Abril from the Bell Corporation. "Representatives of Bell-Boeing will remain connected to the ACE up till the year 2014 when our contract with the US Department of Defence ends. The Bell Corp. is responsible for the Wing and Boeing for the airframe of the MV-22B. Our goal is to streamline the identified technical issues; we specifically focus on the issues which are not covered in the manual". Willy Abril continues "From 2000 onwards we have come a long way; the Marines nowadays only come to us with a few questions which shows the Support System has been successful". Willy continues "Our major challenge when introducing the MV-22 to the US Marines was not the technical part, but the negative publicity that the MV-22 got in the press. We have proven to the general public that Osprey is a fine aircraft which allows the ACE nowadays to move more people and cargo than ever before" Willy Abril concludes. Presently over ninety V-22 Ospreys have been delivered to the U.S. Air Force and U.S. Marines.

Article & photos: Carlo Kuit and Paul Kievit, Bronco Aviation



Air to air refueling is an exercise which takes place weekly. For this purpose two KC-130Js from VMGR-252 are deployed to Naval Air Station Sigonella (Sicily, Italy).



AV-8B. training missions include Close Air Support and Reconnaissance. In total 25 aviators are onboard the USS Bataan to operate the Harrier.



The USS Bataan can simultaneously conduct Air Operations and utilise its welldeck to deploy Landing Craft Air Cushion (LCAC's) and Utility Landing Crafts (LCU's) for naval operations. Both are part of the inventory of 22MEU. The only limitation operating the well deck is that no operations can be conducted with the AV-8B as the stern will be lower in the water.

The global naval vessels and surface combatants market

Despite the high fiscal deficits of North American countries, this region is expected to account for the largest share of the naval surface combatants market during the forecast period, with a share of 48.4%. Demand in Europe is expected to decrease marginally during the forecast period, accounting for 22.1% of the total market during this time while Asia has a share of 24.2% of the total naval surface combatants market during the forecast period.

The main markets, including the USA and some countries in Europe and Latin America, are expected to modernise their naval fleets which were neglected during the past two decades. Europe has borne main brunt of the economic crisis, with countries currently facing deep fiscal deficits and demand is, therefore, expected to decrease marginally. Conversely strong economic growth, territorial disputes, domestic unrest and modernisation programmes will create significant demand for naval surface combatants in Asia.

Defence ministries across the world are giving increased importance

to small and economical surface combatants such as frigates and corvettes, demand for which has increased owing to their low cost, low displacement and multi-tasking capabilities. The advanced weapons and communication systems integrated on these small combatants facilitate the effective performance of multiple tasks such as search and rescue operations, destruction of enemy combat ships, search and destruction of enemy submarines, anti-air warfare and destruction of ground targets.

Maritime threats have evolved from conventional surface and air strikes to more advanced asymmetric threats such as from mines and submarines. Modern maritime threats are more prevalent in shallow waters, and countries are increasingly investing in ships which are fast and capable of operating in littoral waters. These ships are capable of countering asymmetric threats such as anti-submarine warfare and mine countermeasures.

The costs of naval surface combatants have increased substantially and are

expected to increase still further. Defence ministries around the world have realised that developing naval platforms individually results in expensive procurement costs. When a joint development project is undertaken, however, the research and development costs are shared by the countries in the consortium, with almost all member countries procuring such vessels, resulting in lower unit costs. Joint development projects also increase export opportunities as more than one country is involved.

Forecast: The next generation of surface combatants will be smaller in size, capable of operating in shallow waters and generally have embarked helicopters among their combat capabilities. The helicopters on these surface combatants are needed to land in potentially risky areas, and to avoid these risks, most small surface combatants such as frigates and corvettes are installed with mobile deck handlers which are capable of rapidly moving helicopters and fixed-wing aircraft from the landing deck to the hangar.

The DCNS Gowind OPV *L'Adroit* was officially delivered to the French Navy on 21 October at a ceremony attended by Bernard Huet, Executive Vice President and Deputy Managing Director of DCNS, and Vice Admiral Xavier Magne, commander of France's naval action force (FAN). Over the next three years, the French Navy will be extensively testing the new ship and its advanced equipment and systems: UAV, commando boat launch ramps, panoramic bridge and single enclosed mast for 360° visibility, teleconferencing facilities, long-range acoustic devices, etc. With these high-tech systems, the ship is ideally equipped for current and emerging maritime safety and security missions, including fisheries surveillance, counter-piracy, drug interdiction, environmental protection, humanitarian aid, and search & rescue.

DCNS Gowind OPV now delivered to French Navy



German Navy receives RBS 15 Mk.3

The official debut of the RBS15 Mk3 ‘heavy’ anti-ship missile for the German Navy has taken place at a ceremony of the Federal Office of Defence Technology and Procurement.

Diehl will deliver the RBS 15 Mk3 anti-ship missile as the main weapon system of the German Navy’s new K130 corvette. A special feature of this German-Swedish missile is its additional capability enabling precise engagement of land targets. The launch customers include the German Navy as well as Poland which is equipping its ORKAN class speedboats with RBS15 Mk3 missiles. The delivery of the first missiles began in March 2011.

The long-range, all-weather capable ‘Fire-and-Forget’ missile tracks its target directly above the water surface over distances of more than 200 kms. By means of programmed way points, the missile’s trajectory and flight altitude can be altered several times. The RBS15 Mk3 is extremely resistant to countermeasures, providing high penetration capability against air defences with guided and tube-fired weapons. The RBS15 Mk3 version is an upgrade of Saab’s RBS15 Mk2 well proven in the Swedish Navy and other naval forces. Diehl and Saab have been cooperating in production and marketing of the RBS15 Mk3 programme since 2000.

In the photograph on the right Jürgen Simon, First Development Director at the Federal Office for Defence Technology and Procurement, receives a missile model from Diehl board member Claus Günther.



Saab Sea Giraffe AMB for USN LCS programme

Saab and its American subsidiary Saab Sensis Corporation has been awarded contracts for supply of the multi-role naval surveillance radar Sea Giraffe AMB as part of the US Navy’s Littoral Combat Ship Programme. Saab Sensis manages the US baseline of the Sea Giraffe AMB and will provide US based programme management hardware and software adaptations, system integration, testing and total lifecycle support to General Dynamics Advanced Information Systems in support of the LCS programme. As the platform system engineering ‘agent’, General Dynamics is responsible for the design, integration and testing of the ship’s combat and seaframe control systems. The General Dynamics combat and seaframe control systems are based on an open architecture computing infrastructure, known as OPEN CI.

The Sea Giraffe AMB (Agile Multi-Beam) 3D naval surveillance radar provides medium-range, multi-mission capability including 3D surveillance of simultaneous air and surface targets and weapons. The Sea Giraffe also provides the capabilities for periscope detection and splash spotting. Advanced signal processing allows the system to repeatedly demonstrate highly reliable detection of very small targets such as sea skimmers, anti-ship and anti-radiation missiles, small UAVs, mortars and swarming small craft.

Sagem navigation systems on South Korean KSS-I submarines

Sagem has been selected by the South Korean Defence Ministry’s Defence Acquisition Programme Administration (DAPA) to modernise the navigation system on the navy’s KSS-1 *Chang Bogo*-class submarines. Each KSS-1 will be fitted with two Sigma 40XP inertial navigation systems, integrated in the ship’s combat system. Developed and produced by Sagem, the Sigma 40XP is an inertial navigation system, combining high-performance laser gyros and advanced digital filtering techniques. “Modernising the KSS-1 class submarines’ navigation system, will significantly enhance operational capabilities to meet the evolving needs of the South Korean Navy.”



Fire Scout unmanned flight on biofuel

The US Navy has reached a milestone in its quest to gain energy independence when an MQ-8B Fire Scout successfully flew the first unmanned biofueled flight. The Unmanned Aircraft Systems Test Directorate piloted the helicopter, fueled with a combination of JP-5 aviation

fuel and plant-based camelina. The biofuel blend reduces carbon dioxide output by 75 percent when compared to conventional aviation fuel.

The MQ-8B Fire Scout VTOL tactical Unmanned Aerial Vehicle provides critical situational awareness, intelligence,

surveillance, reconnaissance (ISR), plus targeting data. Fire Scout is designed to operate from all air-capable ships and is currently providing ISR support during its first-land based deployment in the US Central Command area of responsibility.

R.O.K. Navy selects Raytheon's Phalanx

Raytheon has signed a \$65.5 million contract to deliver five Phalanx Block 1B Close-In Weapon Systems to the Republic of Korea Navy for the new *Ulsan-1* class FFX ship programme. The systems will be installed on the 2,300-ton frigate-class ships starting in April 2013, and represents Phalanx's largest sale to the ROK fleet. Phalanx is a rapid-fire, computer-controlled radar and 20 mm gun system that automatically acquires, tracks and destroys enemy threats that have penetrated all other ship defences. More than 890 systems have been built and deployed with the navies of 25 nations. The Republic of Korea's new FFX ship class will replace the current Ulsan and other smaller frigates while Ulsan-1 is designed for anti-ship, anti-submarine and anti-aircraft warfare.

USS 'Spruance' commissioned as Navy's newest destroyer

USS *Spruance* (DDG 111) became the latest warship of the US Navy's Pacific fleet after being commissioned at Naval Air Station Key West on 1 October. The new destroyer honours legendary Adm. Raymond Spruance, "whose calm and decisive leadership at the Battle of Midway contributed to a pivotal American victory during World War II."

USS *Spruance* is the 61st *Arleigh Burke*-class destroyer and the second US Navy ship to bear the name, will conduct a variety of operations, from peacetime presence and crisis management to sea control and power projection. The *Spruance* will contain myriad offensive and defensive weapons designed to support maritime warfare and be capable of fighting air, surface and subsurface battles simultaneously.

Modernised P-3 Orions for Brazil

The first P-3 Orion aircraft to be modified by Airbus Military for the Brazilian Air Force was "baptised" by Brazilian Minister of Defence, Celso Amorim, in presence of the Air Chief General Juniti Saito, during an official ceremony at the airbase BASV in Salvador de Bahia.

The aircraft is first of nine undergoing major modernisation including installation of Airbus Military's Fully Integrated Tactical System (FITS). As well as the FITS, the aircraft will benefit from a powerful new suite of mission sensors, communications systems and upgraded cockpit avionics. Two more aircraft will be delivered this year, with the remaining six aircraft to be delivered in 2012. The Brazilian Air Force operate the aircraft for maritime patrol, anti-submarine missions and a range of civic missions including economic exclusion zone enforcement and search and rescue.

P-8A conducts tests at sea

On 15 September, a P-8A Poseidon executed low level surveillance at 500 feet of a speed of more than 300 knots, the first coordinated test evaluation and training conducted between a surface ship (USS *Laboon*) and the new anti-submarine warfare (ASW) aircraft.

The testing was part of establishing a maximum target detection range of various radar modes against a surface combatant. The Boeing Poseidon's main mission is ASW and will carry an armament of torpedoes, depth charges, anti-ship missiles, and



other weapons. The Poseidon is equipped with an APY-10 radar as well as an ALQ-218 ESM system along with high definition video camera.



On 3 October the F-35B Joint Strike Fighter (JSF) test aircraft BF-2 landed safely on USS *Wasp's* (LHD 1) flight deck, the first at-sea vertical landing for the Marine Corps' F-35 JSF version. The first vertical landing is part of the initial ship trials for the F-35B, the tests scheduled to record data on the aircraft's ability to perform short take-offs and vertical landings on a ship at sea, as well as determine how the aircraft integrates with the ship's landing systems plus deck and hangar operations. This test period, the first of three scheduled at-sea test periods over the course

of the development programme, will also collect environmental data on the deck through added instrumentation to measure the F-35B's impact to flight deck operations.

The F-35B is variant of the Joint Strike Fighter for the U.S. Marine Corps, capable of short take-offs and vertical landings for use on amphibious ships or expeditionary airfields to provide air power to the Marine Air-Ground Task Force. The F-35B will replace Marine AV-8B Harriers and F-18 Hornets and is undergoing test and evaluation at NAS *Patuxent River* prior to delivery to the fleet.

GE's LM2500 and LM500 for Japan's new 22DDH destroyer

GE Marine will provide IHI of Japan with LM2500 and LM500 gas turbines for the Japanese Maritime Self Defence Force's (JMSDF) new 22DDH destroyer. The GE LM2500 gas turbines will be equipped with integrated electronic controls (IEC). "We are partnering with IHI whereby they will design and package the propulsion modules and electrical generator sets powered by GE's LM2500 and LM500 gas turbines, respectively," said Brien Bolsinger, GE Marine general manager. "This is a unique project as the LM2500s will provide main propulsion power while the LM500s will supply onboard ship service electrical power. This project also marks two important milestones: it will be the first LM500 generator set application for military ships, and the initial use of LM2500s with IECs in a main power plant on a JMSDF ship."

Two more DDG 51 destroyers

The US Navy has awarded General Dynamics Bath Iron Works a \$680 million contract for the construction of DDG 115, the third ship of the Navy's DDG 51-class guided-missile destroyer construction continuation programme. The award also includes a \$665 million option for Bath Iron Works to build DDG 116 while DDG 115 is scheduled to be delivered in 2016.

The DDG 51 multi-mission guided missile destroyers operate in support of carrier battle groups, surface action groups, amphibious groups and replenishment groups, providing an array of anti-submarine (ASW), anti-air (AAW) and anti-surface (SuW) capabilities. Designed for survivability, the ships incorporate all-steel construction and have gas turbine propulsion. The combination of the ships' AEGIS combat system, the Vertical Launching System, an advanced anti-submarine warfare system, two embarked SH-60 helicopters, advanced anti-aircraft missiles and Tomahawk anti-ship and land-attack missiles make the *Arleigh Burke* class "the most powerful surface combatant ever put to sea."



Kongsberg simulator for Australian AWD programme

Kongsberg Defence & Aerospace will provide a Command Team Trainer Simulation Infrastructure contract for the Australian Navy's *Hobart*-class Air Warfare Destroyers Command Team Trainer.

The Simulation Infrastructure is based on the Proteus Naval Training Technology and will provide the exercise control and a common synthetic environment for integration of the Aegis Weapon System and other *Hobart* class sensors and effectors. The Simulation Infrastructure also provides Link 11/16 and DIS interfaces for external joint collaborative training. The contract is an extension of the Australian Tactical Interface (ATI) contract for the Air Warfare Destroyer (AWD) signed in June 2009 between Kongsberg and Raytheon Australia.

Wildcat makes first landing at sea

On 7 November, the Wildcat touched down on the flight deck of the Royal Fleet Auxiliary (RFA) aviation trials ship *Argus* off England's south coast, at the start of four weeks of tough trials for air and ground crew. Wildcat is the 21st century variant of the Lynx helicopter which has served the Navy since the 1970s. The landing on RFA *Argus* heralds four weeks of 'operating limit trials' for the Wildcat, which will lay the foundations for flying the new helicopter when it enters front line service. Some 62 Wildcats are being bought by the UK MoD, 34 for the Army Air Corps and 28 for the Fleet Air Arm. The Army variant is due to begin operations in 2014.



P&W F135 powers successful sea trials for F35

Sea trials have concluded for the F-35B Lightning II's Short Takeoff and Vertical Landing (STOVL) aircraft. Flying under the power of Pratt & Whitney's F135 propulsion system, two STOVL variants conducted 72 short takeoffs and vertical landings, for a total of 260 vertical landings in the programme. Key events included operating two F-35B aircraft on deck, at the same time, in both landing and takeoff operations. The tests were completed on schedule and demonstrated that the F-35B aircraft and F135 propulsion system "are meeting programme goals"

Navantia to build 12 FLCs for Australia



Navantia, the Spanish shipbuilder presently undertaking the construction of Australia's new Air-Warfare Destroyers (AWD) and two amphibious ships (LHD), will now build 12 new landing craft to complement the new *Canberra*-class landing helicopter

dock (LHD) amphibious ships, following a decision by the Federal Government to award the construction contract to Navantia. The decision, came just a fortnight after Navantia informed the Federal Government of the establishment of a wholly-

owned Australian subsidiary, Navantia Australia, which will have a permanent presence in Australia. Each LCM-1E landing craft weighs 110 tonnes and are already in service with the Spanish navy. The first four will arrive with the first of the new LHDs in 2014.



**USN's
3rd LCS
successfully
completes
builder's
trials**

A Lockheed Martin-led industry team has completed Builder's Sea Trials for the *Fort Worth*, the US Navy's third littoral combat ship. The trials - a coordinated effort between the U.S. Navy and the Lockheed Martin team including Marinette Marine Corporation (MMC) - were conducted in the waters of Green Bay and Lake Michigan, and included operational testing of the vessel's propulsion, communications, navigation and mission systems, as well as all support systems. The rigorous trial period included maneuverability tests; high-speed runs; power and navigation system checks; rescue boat launch and recovery; and tracking exercises, as well as other ship and system evaluations.

Following completion of Builder's Sea Trials, *Fort Worth* returned to MMC to prepare for Acceptance Trials. LCS 3 will be delivered to the Navy next year and its home port will be San Diego, Calif.

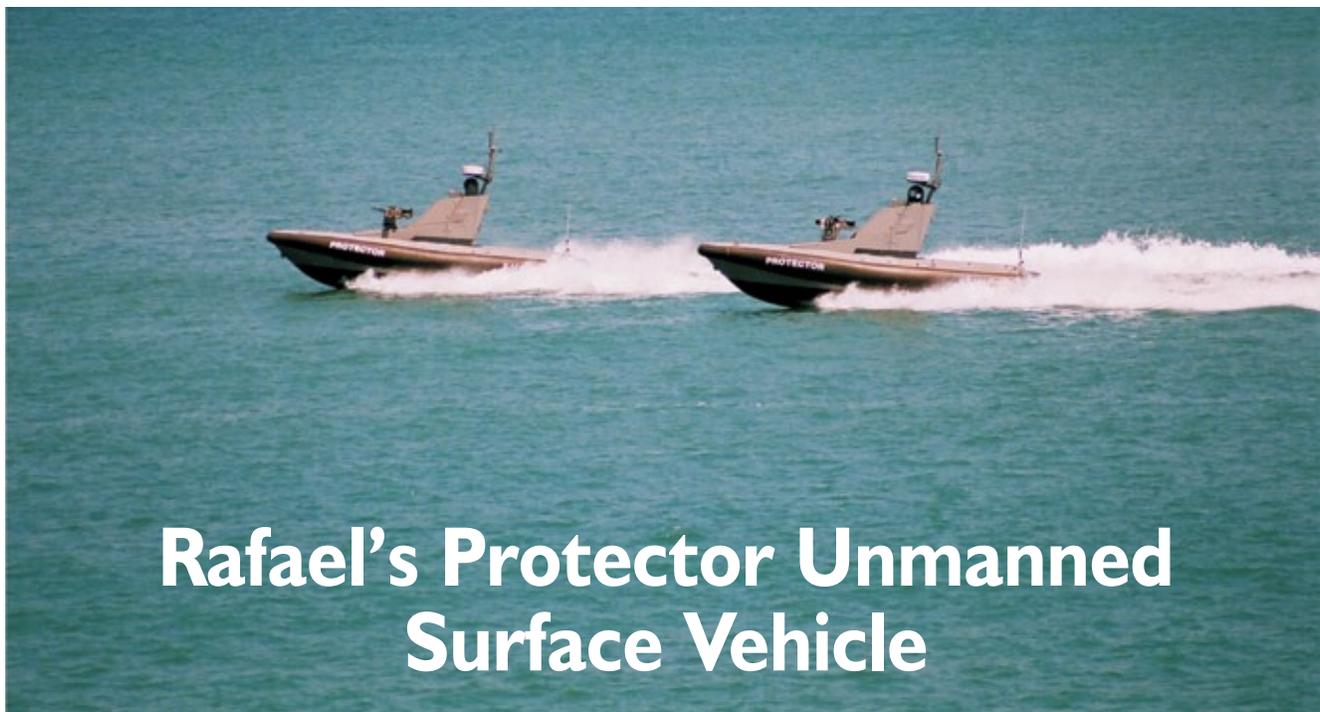


Rafael's Hard-Kill Torpedo Decoy Torbuster

The *Torbuster* is a fourth generation torpedo decoy for submarines providing defence against all types of acoustic homing torpedoes. Upon detection of an incoming torpedo (external to the system), the *Torbuster* system will launch a decoy from an external launcher. The decoy will

propel itself to a safe distance from the submarine and seduce the incoming torpedo by transmitting specific acoustic signals using a technology based on the Scutter, reactive acoustic decoy. As the torpedo homes in on the decoy, the decoy will sense when it is at the closest point of approach and self

explode, inflicting sufficient damage to the torpedo to neutralise it. The system is operated from a single console (Launcher Control Unit). The operator is able to monitor the decoys in the launchers, to monitor and activate the launchers, and to control the system's safety interlocks and devices.



Rafael's Protector Unmanned Surface Vehicle

Rafael's *Protector* is a naval system based on unmanned surface vehicle (USV). Remotely controlled and highly autonomous, *Protector* is able to conduct a wide spectrum of defence and maritime security missions. The *Protector* can serve for maritime security (MS) missions, such as coastal security, harbour security, commercial shipping security, and critical infrastructure such as oil and energy facilities. Performing these missions, the *Protector* will typically conduct various tasks such as collecting data about activities in the maritime domain, positive identification of targets, creating deterrence at sea

through its presence, providing targeting data for response action in case of unlawful event, and interdiction and/or other forms of interception of unlawful activities.

GD contracted for underwater mine countermeasure system

The US Navy's Naval Sea Systems Command has awarded General Dynamics Advanced Informational Systems a contract to design and build the Surface Mine Countermeasure Unmanned Underwater Vehicle (SMCM UUV) system. The system will initially be a part of the Littoral Combat Ship Mine Warfare mission package.

The SMCM UUV system will allow Navy commanders and sailors to reliably detect and identify mines in high-clutter underwater environments in a single pass, including mines that are suspended in the ocean, resting on the sea floor or buried. Additionally, it will gather environmental data that can provide intelligence support for other mine warfare systems.

“Mind is the best Defence”

The role of Elettronica (ELT)



Next Generation Electronic Warfare Systems

The term Electronic Warfare (EW) refers to any action involving the use of electromagnetic (EM) or directed energy (DE) to control the electromagnetic spectrum (EMS) with which to attack the enemy. EW includes three major subdivisions namely electronic attack (EA), electronic protection (EP), and electronic warfare support (ES).

RF spectrum is part of the battlespace and a RF COP (Common Operational Picture) is essential to enable the dynamic management of radio communications. Enhanced electronic warfare capabilities are required to support future network-enabled operations of coalition forces. Ultimately, the interaction between the collection, analysis, and re-tasking of sensors heavily relies on the preservation of real-time connectivity throughout the monitoring network. Modern military forces rely on the use of the electromagnetic spectrum for sensing (radar), navigation (GPS), and radio communications between remote and

mobile elements. The civilian world is becoming increasingly reliant on wireless communications and is, by far, the largest user of the EMS.

Certainly the manner in which the military procurement defines, develops, and funds Electronic Warfare capabilities has changed, moving beyond Cold War themes into realistic scenarios that accurately prepare for enduring expeditionary engagements, for irregular and asymmetric warfare against non-state actors, terrorism, for the safe conduct of peacekeeping activities, for high and low intensity ground conflict around the globe and for homeland defence.

The network centric paradigm in defining new capabilities, functions and tools has demonstrated the improved effectiveness also of EW systems in recent conflicts. The network-enabled capabilities to be provided to military forces represent a new dimension in warfare, i.e. *network centric warfare*. Enhanced situational awareness and rapid response times have enabled allied forces to succeed on the battlefield and significantly reduce friendly casualties. In doing so, at tactical level it is mandatory to grant use of the spectrum when the troops want to use it. Due to the advanced and secure intelligence networks in place today more information is shared on a timely basis than was during previous conflicts. This validates the significant investment in computer and radio communications technology needed to realise these network-enabled systems.

Cyber warfare is finally considered as the latest EW dimension, not only at strategic level but also on the tactical layer. As with the domains of land, naval, air, and space operations, it is expected that potential adversaries will be motivated to develop the means to counter and attack NCW systems. This will include C-EW and cyber attacks on friendly networks and also more conventional techniques such as espionage and sabotage of hardware and software systems that make up these networked capabilities. Although it is intended that NCW system designs be resilient to such attacks, it will not always be possible to defeat *all* attacks.

Towards this end, Elettronica have invested in R&D of modern EW emulators and simulators, for simulation and modelling of network integrated EW systems in operative scenarios, from accurate mission planning and preparation to post-mission EW data evaluation.

Moreover, the evolution and proliferation of the Radio-Controlled Improvised Explosive Device (RC-IED) that constitutes a low cost, highly adaptable and unpredictable threat has presented a new challenge to Radio Frequency (RF) countermeasure developers. A capability to counter this threat is perceived as evolutionary. IEDs design change or evolve and the potential for achieving efficiency in responding to them is possible though challenging.

The result is the pursuit of EW systems capable of inherently supporting very broad operational requirements through the combination of adaptable components and technologies within open and modular system architecture. The open architecture provides a means for an EW system to be rapidly reconfigured through software reprogramming or module replacement nearly as quickly as the threat itself adapts, and so avoid the time consuming acquisition of a new C-RCIED system with expanded capabilities. The modern C-RCIED systems will be equipped with responsive jamming emerging technology for electronic-warfare applications.

The potential for EW applications to support and enhance communications and vice versa is real. The attributes of the described



open architecture enables the unification of EW and communications within a single equipment and the integration of radar and communication passive sensors within software defined architecture in order to provide fully integrated EW capability onboard different platforms and for different missions. This offers several major benefits including built-in interoperability and optimal use of signal processing resources. A concurrent communications application allows multiple EW systems to interact and cooperate in such a way to improve EW effectiveness.

Finally, it is possible to subscribe that Electronic Warfare is and will be more and more significant in modern military operations. In order to fight jointly, the military assets (Army, Navy, Air Force) must have an Integrated EW (IEW) capability. The ability to detect active EW actions, including jamming, deception, and force protection, resides mainly with friendly C-EW functions, but also to some extent with the network and spectrum management functions. The ability to detect the passive C-EW functions of emitter location and message interception by an adversary poses a greater challenge on friendly forces as it requires determining what the opposing force is learning from our networks.

Elettronica counters to EW emerging threats

In relation to its traditional market segments, i.e. radar defence electronics, and in addition to producing EW systems

installed on platforms like the Tornado, AMX, Eurofighter Typhoon and Mirage 2000 aircraft, Horizon and FREMM frigates, *Garibaldi* and *Cavour* aircraft carriers, Elettronica is developing new technologies and innovative architectural solutions that make it possible to step from 'self-protection' of platforms to the 'force protection' of networked multiple platform. This involves ensuring performance and information in real-time, at different hierarchy levels. Elettronica is the design authority for EW capability for the largest Italian project for the Army called 'FORZA NEC'; the scope of this project being to provide for network centric ground EW systems (ES, EA and Command & Control).

The new threats and new roles of armed forces in modern scenarios has pushed the development of new EW solutions. For countering the RC-IEDa, ELT offers new reactive Counter RC-IED system, suitable for different platforms and able to work in operative areas minimising the so-called 'ring around' effect (a sort of mutual jamming among reactive C-ECM). Wide bands can be covered without excessive energy consumption.

ELT has also developed a new self protection suite for the infrared band, capable of defending fixed and rotary wing platforms from the so-called 'manpads threats', increasingly obtainable by terrorist groups.

In the Communication Intelligence field, ELT has developed different system solutions able to cope with the demanding task of spectrum dominance. ELT 332 family is designed for spectrum

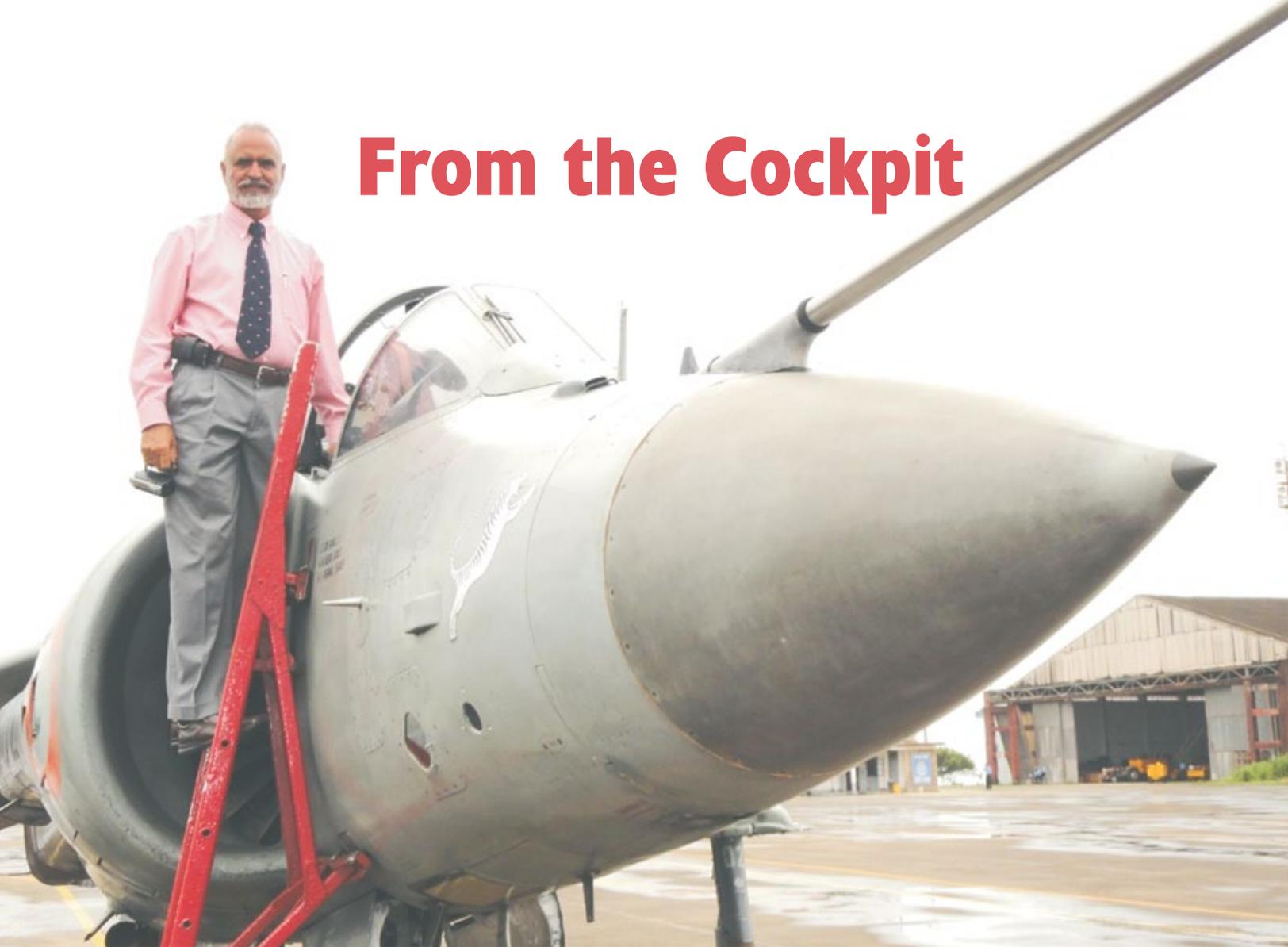
monitoring, direction finding, COMINT analysis and jamming of communication emissions, for naval and ground platforms. The airborne version of this family, named ELT 919 is suitable for UAV platforms.

Command and Control of modern EW systems is mandatory at the tactical level. Towards this, ELT offers the new ELT 950 C2-EW system, able to cope with radio spectrum awareness, a critical task especially in dynamic and challenging environments. The knowledge of the radio spectrum is crucial in conducting EW functions (especially Communication EW in order to avoid fratricide jamming). EW is a significant source of tactical intelligence and can often be conducted covertly, even against the most sophisticated military force. It is essential that armed forces maintain a detailed understanding of who is using which portion of the spectrum throughout the geographic area of operation. The ability to network distributed RF sensors would have performance benefits to DF and passive location applications. As network-enabled systems increasingly rely on wireless networks, they become more vulnerable to hostile EW but the ability to coordinate distributed jamming resources could better exploit available power and RF spectrum.

ELT investments in R&D are also in the field of homeland security and defence from asymmetric threats and/or terrorist attacks. These systems can provide spectrum surveillance and dominance for both Communication and Radar signals. Different system solutions are developed for this purposes, for different platforms, manned and unmanned, on the ground (networked PET stations) and onboard Maritime Patrol Aircraft. A new family of systems for spectrum surveillance and monitoring of communication and radar signals is represented by the ELT 819 family, based on the latest generation of digital receivers and modular, software defined architecture. Within a unique software defined architecture, the ELT 819 integrates the capability to DF and analyse the communication emissions as well as radar emissions, starting from very low band (VHF). The ELT/819 has been designed for airborne and land based platforms in order to cope with SIGINT mission functions.

Electronica

From the Cockpit



A new series by Commander Bagicha ‘Bill’ S Hothi (Retd.)

My love for flying started when very young and I used to watch formations of fighter aircraft take off from the nearby Adampur airfield. Despite my father’s staunch opposition, I got my PPL when I was seventeen years old and thereafter in my career was fortunate to fly many aircraft types including the unique VTOL Sea Harrier from the deck of aircraft carriers INS Vikrant and Viraat.

During my service of twenty one plus years I was fortunate to be associated with some of the best pilots in the Navy as also from the Air Force. Still it is unfair to leave out some extraordinary aviation persons from the civil sector. In fact, this column is the outcome of my extraordinary experiences and association with Pushpinder Singh who happens to be one of the foremost amongst them!



Marut Memories

Sometime in 1982 it finally became reality that the Sea Harrier would come to India and some of us lucky ones from the Indian Navy would go to the UK for conversion onto this magnificent VTOL fighter. The first batch of three pilots had already left for conversion and although we were slightly on the senior side, the Navy hardly had a choice in selecting pilots from the group of fighter pilots. However, most of us had not flown anything other than the subsonic Seahawk and were much in need of fast jet flying experience.

Vice Admiral Subhash Chopra, one of my most admired of naval aviators, was at naval headquarters then and he made it possible to get high speed experience for those of us who were to follow the first batch to the UK. Our condensed course was to be forty hours which would include low level flying, tactical flying and air to ground armament sorties. We were given orders to proceed to Jodhpur to be attached to No.31 Squadron of the Indian Air Force, then equipped with the HF-24 Marut. So, three of us naval aviators joined No.31 Squadron in early September 1982 and met up with some of our old instructors and course mates also posted at Jodhpur.

Arrival at Jodhpur was very friendly, many of those officers posted there

being course mates or those whom we had instructed at Bidar. There were two fighter squadrons on the base, No.220 which had just converted to the MiG-23BN commanded by Jimmy Bhatia (who eventually made me an honorary member of his unit.) Also with 220 was my cousin Saravjit Hothi who incidentally had been responsible of introducing me to his cousin Jasbir whom I eventually married.

We had plenty of aircraft in the Squadron but there was not much enthusiasm to fly, perhaps because the HF-24 Marut was to be phased out of service within a short while. The Flight Commander Squadron Leader Phiroz Irani took over the task of converting us onto the Marut. He had been one of our instructors at the basic flying stage. He was, and still is, full of cheer and there never was a dull moment with him around!

We finished our ground gen which was followed by dual checks. I flew my first solo on this wonderful aircraft on 14 October 1982 (D-1237) which happened to be my birthday too! As all three naval officers had completed their solos by then, celebrations were called for and the squadron reciprocated by generously drinking beer all that afternoon. Our flying progressed pretty fast as more than sixteen aircraft were available to the three of us but after having finished

basic manoeuvres and high level tactical sorties, our flying suddenly came to a halt. The reason was restrictions on low flying throughout the Air Force. If we could not fly low level, there was no way to carry out armament sorties as these armament workups were also at low level.

Sitting on the ground there was very little we could do. It was apparent that the Air Force would not risk changing their decision just for the three of us but there was no way to progress unless we did those mandatory low flying sorties. Our fellow squadron mates were feeling bad for us but could not help in anyway.

Phiroz, as usual, came out with a solution by quietly suggesting that I approach the Admiral who had been responsible to send us to No.31 Squadron in the first place. I liked his idea but had no way to get to Delhi to talk to the ACNS (Air). I could hardly ask for temporary duty so he arranged my trip to Delhi as a 'stow away' in the commandant's aircraft (not in the real sense). I thus had the opportunity to sit with the station commander Pinky Pillai, as he was fondly known by all in the Air Force; he did not enquire as to why I was going to Delhi and on the other hand I could hardly tell him the reason—that I was going to request my aviation boss to help us get through our predicament, so as to make us comfortable before the Navy's Harrier conversion course in the UK.



HAL HF-24 Maruts of No.31 Squadron at Jodhpur.



Marut (D-1256) at the Deutsches Museum near Munich in Germany.

I headed straight to Naval HQ from Palam airport and was ushered into the Admiral's office. Apart from being my first station commander (and also my golf instructor), he asked the reason for my sudden trip to New Delhi. He listened with keen interest even as he was simultaneously dialling a phone number. In a matter of minutes he had sorted out our low flying problem by talking to his Air Force counterpart. The cup of tea I had with him could not have been sweeter and I was feeling on top of the world. With a satisfying glance he told me to get back to Jodhpur, that everything would be 'hunky dory' by the time I landed. I left his office with happiness; this trip of mine to Delhi would remain in memory of a life time although the Admiral must have been taking such routine decisions daily, if not hourly.

It turned out that the orders to allow Naval officers to continue low flying were instantly issued but the file remained in circulation at SWAC head quarters. Unaware of such an order, I tried to remain unobtrusive when on board the Dakota flying back to Jodhpur.

We started our low flying the very next day and once again Phiroz made sure that we did not waste any more time in completing our syllabus. I am forever thankful to him for showing such enthusiasm in helping the sister service preparing for the Harriers.

Till the arrival of Harriers, Naval aviators were very accomplished in air to ground weaponry and attack but hardly did air to air firing or shall I say, that we did not have good enough aircraft to master the art of aerial combat. I happened to be one who was reasonably good at firing weapons on the 'splash target'.

It then happened that our station, Jodhpur, was to be directly involved with a planned fire power demonstration at the Pokhran range. Although I had not carried out any range sorties, I requested Phiroz to somehow slot me into the fire power team and assured him that I would be ready within a week and give No.31 Squadron a reasonable image during the fire power demo. He simply refused saying that the Air Force had plenty of talented pilots to carry out this task. That was undoubtedly true I said, but somehow doubted that No.31 Squadron, on the eve of phasing out the Marut, could deliver weapons with precision. I did not pursue this matter any further and decided to mind my own business in completing my short course and move on.

We started our dummy dives over the airfield, where Phiroz would be at the ATC to check us out during our solo dives. We carried out attack profiles with guns, rockets and practice bombs. Once we finished dummy dives and he was confident about us, he took us to the Pokhran range and showed the circuit pattern. Owing to fuel constraints, the Marut could only get one live pass, in addition to a safety height run and one dummy attack. As our live firing phase was about to commence, Phiroz reminded me that he would be watching my results "like a hawk," perhaps because I had once wanted to be part of the fire power demonstration team!

The HF-24 Marut was very steady in the dive and in fact, one could trim the aircraft and leave the stick, the gun sight would not move from its intended target. I was confident that Naval aviators were proficient in air to ground firing and wanted to prove this.

During the next few days we carried out gun firing against a 20 ft inclined target followed by rocket firing. Squadron leader Ranawat, fondly known as 'Randy', opted to be our RSO for a week. Being an outdoors man, he must have enjoyed his trip to Pokhran.

After our sorties, he was picked up by one of the Mi-8s and flown back to Jodhpur. Phiroz was the first to meet him and I overheard him asking for my score before anybody else could even have a look at the results. I knew that I had done well but was not sure as to how well. All indications of puffs of smoke etc had been promising.

It turned out that all my rockets (over the four days) were within eight yards the centre of the target. I had also put nine out of eleven cannon rounds on the target. Phiroz gave me a hard look but admitted that he should have put me in the fire power demo team! These were by far the best results of mine in weapons delivery and that too with the Marut.

I was both happy but also sad that this magnificent machine despite its low power



engines was to be scrapped prematurely. The Marut was capable of clocking 420 kts at low level even on a single engine. Escorting MiG-21s could not catch up at low level when the Marut was cruising on both engines, but instead had to pursue her at medium level and then dive to catch up. The Marut was a perfect platform weapons delivery at low level yet she was being phased out like an unwanted child.

Despite my short tenure of just about five months, I developed an exceptional fondness for this machine. I even hinted to higher ups that we should bid for getting Maruts to the Navy and assimilate high speed experience on this magnificent machine for surely HAL would have given us good support. But this was not to be and I went along with the decision as we did not want 'rejects' from the IAF on a continuous basis.

We thereafter had an easier time converting to Harriers as its control feel was virtually similar to that of the Marut. The very high acceleration and other attributes of the Harrier were better coped with by those of us who went to the UK via the Marut. In contrast, one of our ace



HF-24 Marut at Jodhpur.

pilots did not have an easy transition to the Harrier as he had gone virtually from Kirans, with very little Seahawk experience. Still, he came out with flying colours, primarily because of his true grit and hard work.

I cannot end this narrative without relating an incident during one of our farewell functions in the UK. An elderly gentleman from British Aerospace asked

whether the Marut was still operational. He had touched a sensitive nerve in me and sensed it! He went on to say that if the Marut had succeeded in getting better engines, there would have been little possibility for the sale of Jaguars to the IAF. I told him that I was perhaps the last pilot to fly the Marut with guns blazing and probably my name is somewhere in that scrapyard where the Marut is resting in peace.



Still looking resplendent, HF-24 Maruts at HAL Bangalore before phase out.

The Evolving Ensign

The Armed Forces of independent India took most of their customs, rituals and administration from the erstwhile British Forces. The ensign of the Indian Air Force was adapted from that of the Royal Air Force much the same as did the Air Forces of other Commonwealth countries including Australia, Canada, Sri Lanka, New Zealand and Rhodesia. While the RAF ensign had a field of Air Force blue with the Union Jack in the canton and the RAF roundel in the middle of the fly, the IAF ensign consists of the Indian National flag in the canton and the Air Force roundel. The current ensign was adopted in 1950 and has remained the same.



The Royal Air Force ensign.



The Indian Air Force ensign.

The Indian Naval Ensign was also inspired by the Royal Navy ensign. After the crusades, the red St. George's cross became the Royal Navy's emblem, but the background colours kept changing between blue, red and white till Britain's National flag was placed on the upper left. The White Ensign of the Indian Navy incorporated the Indian tricolour and remained thus for over fifty years till it was changed in 2004.

According to the Indian Navy, "A new Naval Ensign was adopted by the Indian Navy from 25 April 2004. A White Ensign, with a horizontal red stripe and a vertical red stripe intersecting at the centre of the flag, a golden yellow State Emblem was superimposed on the intersection, and the National Flag in the upper canton next to the staff."

It is learnt that in the interim, the red St. George's Cross was done away with in 2001 and the Indian Navy's crest placed on white background but many senior Indian Navy Officers objected, remarking that this looked more like a "duster"! The Navy then readopted the Red Cross with imposition of the National Emblem (the Ashoka lions).



The Royal Navy ensign.



The Indian Naval ensign adopted in 1950.



The Indian Naval ensign in the interim 2001-04.



The Indian Navy ensign presently.

25 Years back

From Vayu Aerospace Review Issue VI/1986

Light Combat Aircraft programme status

First prototype of the Indian Light Combat Aircraft (LCA) is expected to fly in April 1990 and production deliveries would start in 1996. This was stated at a seminar on the LCA programme organised by the Aeronautical Society of India at I.I.T. Madras. Dr Kota Harinarayana (the LCA Programme Director) has clearly stated that the LCA was a national project aimed to get different research & development organisations involved in the programmes. The US Administrations decision to take the LCA project very seriously comes on the heels of the Indian decision to place letters of intent on General Electric for the F.404 jet engines for the LCA in the development phase. In late September, an ADA team had reportedly visited General Electric to finalise the modalities of procuring the engine, modified for the LCA, and orders for eleven engines have reportedly been finalised.

MiG-29s for the IAF

The first batch of MiG-29s for the Indian Air Force will arrive in India sometime in December, 1986. The MiG-29s were originally scheduled to start arriving in April-May 1987 but the Soviets have since expedited the delivery programme. The MiG-29s are reportedly to arrive in semi-knocked down condition by sea and will be assembled at the Nasik Division of HAL before delivery to the IAF

Meanwhile, a team of eight IAF pilots and six maintenance engineers have been undergoing conversion training on the type at the Soviet Air Base at Frunze in the Central Asian Region.

The Army Air Corps

According to a MoD press release, helicopters of the Army Aviation Corps evacuated a number of persons stranded on the Leh-Srinagar highway in November. The newly constituted Army Aviation Corps were thus officially in the news with their helicopters, alongside Air Force units, carrying out rescue and evacuation operations in the Zojila pass area, north east of Srinagar in the third week of November. Over 500 persons stranded in the avalanches were evacuated in blizzard conditions.

All Chetak and Cheetah helicopter units on AOP and communication tasks were formally transferred to the Army from the Air Force on 1 November 1986.

IA 15-year perspective plan

Indian Airlines have requested additional investment of Rs.15.000 crores to meet the traffic requirements during 1986-2000 as per a perspective plan drawn up by IA's planning department.

If the present 11.5 per cent rate growth pattern persists, IA would acquire 38 Airbus A 300-type aircraft, 80 hundred and fifty-seaters and 75 hundred-seater aircraft by the turn of the century. The airline now has 10 Airbus A 300 aircraft, 25 Boeing 737s and 13 BAE

748/F.27 turboprops, soon to be phased out. It also has on order 19 Airbus 320s with 12 on option.

IA officials say that unless airfield facilities development keeps pace with the growth of demand for air traffic, IA would be hamstrung in its efforts. The plan, however, hopes that significant advances in technology such as satellite navigation and investment in instrument landing systems by 2000 will help overcome problems.

Foundation laid at Karwar

The foundation stone for India's largest future naval base was laid on 24 October 1986 at Karwar in northern Karnataka on India's western coast, by Prime Minister Rajiv Gandhi.

'Project Seabird', as the Karwar naval base project is coded, will involve an expenditure of Rs 350 crores (\$ 290 million) over the Seventh and Eighth Plan periods and includes a shipyard for the fabrication and maintenance of certain classes of naval vessels. The Karwar site, which is midway between the naval bases in Bombay and Cochin (and 60km south of the Vasco da Gama base in Goa) was selected by an expert committee as it provided an ideal location for the massive naval establishment envisaged to be operational by 1996.

Third batch of Sea Harriers

The existing letter of intent for the purchase of a third batch of Sea Harriers for the Indian Navy was converted into firm orders by contracts signed on October 16, 1986. The latest Sea Harrier order comprises seven FRS Mk.51 and one two-seat Mk.T.60 taking the total acquisition of the VTOL fighter by the Indian Navy to 27 aircraft. INAS 300 ('White Tigers') Squadron is operating the Sea Harrier embarked on board the carrier INS *Vikrant* with the second carrier, INS *Viraat* expected in India by the middle of 1987.

Pawan Hans (Helicopter Corporation of India) is operational

The Helicopter Corporation of India, renamed as Pawan Hans Ltd.' (PHL) became officially operational on October 1986 after a brief ceremony attended by the Prime Minister at Borbay's Santa Cruz airport. The first two Westland W.30 helicopters have been leased to the ONGC to service offshore oil operations these having been airlifted from Stansted in England to Palam in Delhi in September and ferried to Bombay after assembly of their main and tail rotors. By March 1987 PHL will have received 13 helicopters, including the SA 365N Dauphin from France.

Additional Sea King Commandos for Navy

The Indian Navy have ordered three more Sea King Mk. 42Cs at a cost of some £ 21 million. This Commando-assault version of the helicopter can transport 28 fully-equipped troops and sling loads of heavy military equipment. Although its primarily role is that of tactical troop transport logistic support, cargo transport and casualty evacuation, it can operate in the secondary role of air-to-surface strike and search and rescue after some change of equipment.

Tata Committee recommendations

The Tata Committee on 'Civil Aviation scenarios in 2000 AD' has suggested an increasing privatisation of the three airlines. To start with, the panel feels that all the three airlines should raise funds from the share market to finance their developmental plans.

The Ministry of Civil Aviation, is attaching considerable importance to the report as the major decision to merge Air India and Indian Airlines would be based on its recommendations. The panel, set up with the specific purpose of looking into civil aviation needs by the year 2000 also touched, in passing, the question of merger.

Chicken Tikka Masala versus Manchurian Chicken

In the growing 'rivalry' between the Indian and Chinese Naval Forces, a 'foodie' in England has wondered what the excellent galleys of Indian warships serve to their officers and sailors on the high seas these days. 'Chicken Tikka Masala' and 'Naan', he drools? Possibly, but also excellent fish and chips and all that the Indian Navy have traditionally imbibed from the senior service in Britain.



It leads to the tantalising thought as to what do the Chinese Navy get served from their galleys? There is no information but plenty of speculation: oodles of noodles but certainly not 'manchurian chicken' as the latter is a sub-continental invention! Perhaps we will know for sure when there are friendly joint exercises between the two Navies.

Help! Jets scrambled

An American pilot bound for New York inadvertently caused a mid-air terror scare when he accidentally locked himself in



the toilet and then sent a passenger 'with a Middle Eastern accent' to the cockpit for help. With the flight not far from landing, a spooked co-pilot refused to let the Good Samaritan in, but instead told the control tower at LaGuardia Airport of his serious concerns that an attack was underway.

The passenger continued to bang on the door for assistance and even offered the password but the co-pilot refused to budge, leading to fighters being scrambled. Next time

Get high – even if you can't fly

The Delhi Government have approved a liquor vend at DIAL's Terminal 3,



domestic side which will come as a much needed soother for victims of fog-delays.

Dilip Cherian on twitter

Act of Peace

The inadvertent crossing of the LOC by an Indian Army Cheetah light helicopter in Northern Kashmir in late October 2011 has evoked some light hearted ribaldry after the Pakistan Army allowed it to return following investigations and re-fuelling (not gift wrapped but in keeping with the MFN status?). The Cheetah is no 'trojan horse', what with its minimalist flight and navigation instrumentation. In fact this has only accentuated the need for the Service to get new light helicopters, which requirement has been prolonged for long enough.



The A380 sooner than later

Even when the concerned Ministry earlier disallowed Lufthansa Airlines from operating the A380 mega airliner to Delhi Airport (citing that there was no infrastructure to handle the super jumbo), what bureaucrats propose, the flying machines dispose! Sure enough, an Emirates Airline A380 on a scheduled flight from Bangkok to Dubai made an emergency landing at Hyderabad Airport. This unexpected bonanza stretched the airport facilities but all was well and hopefully the 410 passengers were treated to some legendary biryani of this city of the Deccan.

The ultimate CBM

In a special *Times of India* Report on Navy Day (4 December 2011), titled 'Guardians of the Sea', the masthead depicts an Indian Navy stealth frigate and a new generation fighter aircraft. And what a fighter aircraft! The trained eye immediately recognised the shape and markings of this Sino-Pak FC-1 fighter, already in service with the Pakistan Air Force.

Of course, the Indian Navy eagerly awaits new fighters for the slew of new aircraft carriers to be commissioned in the decade ahead and with protracted development of the LCA Navy, could this be an option? Well, if we are looking for 'out of the box' confidence building measures, the FC-1 could be the mother of all deals!

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