

# VAYU

IV/2013

## *Aerospace & Defence Review*



**Heroism in the Hills**

**The Rotorcraft Scene**

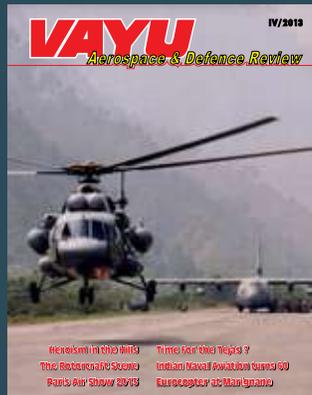
**Paris Air Show 2013**

**Time for the Tejas ?**

**Indian Naval Aviation turns 60**

**Eurocopter at Marignane**

CFM



# VAYU

## Aerospace & Defence Review

IV/2013

IAF Mi-17V5 takes off from Dharasu ALG, with C-130J at the background (photo courtesy PRO IAF).

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### 32 Hell & Heroism in the Hills

The last fortnight of June 2013 had scores of helicopters and aircraft engaged in what became one of the largest air rescue operations in the world. The IAF deployed 64 aircraft, mostly helicopters (in *Operation Rahat*) while Army Aviation (in *Operation Surya Hope*) supported relief operations with another 13 helicopters plus a mountain brigade, in addition to which were 12 civil-registered helicopters, evacuating over 52,000 people and transporting some 400 tonnes of relief stores.



### 38 'Fly Navy'!

60 years of Indian Naval Aviation were commemorated in May 2013 with commissioning of the Navy's first multirole combat aircraft squadron – INAS 303 'Black Panthers' – equipped with the MiG-29K/KUB shipborne fighter. Angad Singh of *Vayu* spent four days in Goa to bring readers this comprehensive overview of Indian Naval Aviation as well as on the commissioning ceremony.



### 44 Time for Introspection

Admiral Arun Prakash, former CNS, feels that it is time for introspection as Indian Naval Aviation turns 60. The proliferation of aviation assets in terms of aircraft carriers, helicopters, MR-ASW and AEW assets as well as UAVs is indicative not only of the growing salience of aviation in maritime operations, but also of the huge burden of responsibility on the air arm and its people.



### 52 Do we want the Tejas – or Not?

Air Commodore Parvez Kokhar puts it straight when he poses this question: after 30 years in the making and cost over runs, should the IAF now induct the Tejas LCA? The emphatic answer is both YES and NO! Read on!



### 61 The Rotorcraft Scene

This *Vayu* survey on the Global Rotorcraft Market looks at the near and mid-term future, with inputs from *Forecast International*. Despite various challenges including looming defence budget cuts, the industry is expected to grow in tandem with eventual economic recovery and global military expansion. In this context, 'Helicopters in the Indian Equation' reviews the requirement for large numbers of helicopters particularly by the Indian Navy and Army Aviation.



### 80 Braving the Economy – and Elements

The *Vayu* editorial team were on ground at Le Bourget in mid-June 2013 to cover the 50th Paris Air Show. Braving the rain, scores of companies were met, interviews held and conferences attended. Not unexpectedly, the 'big two' announced massive orders ('Devilish Haul'), with Airbus announcing commitments for 1000 new airliners and Boeing just a little behind. There was

not much 'Of Indian Interest' at the Show but HAL's Chalet was rendezvous for many.



### 102 Base Arieenne BA 118 at Mont-de-Marsan

Continuing *Vayu's* tour in France, courtesy the French Ministry of Defence, was visit to the *Armee de l'Air's* largest air base for briefings on air defence systems, space imagery and defence/intelligence telecommunications as also the Military Air Experiment Centre (CEAM). Included is the 'Pilot's perspective on MBDA weapons at BA 118 Mont-de-Marsan'.



### 111 Aviation Aficionado's Paradise

Thereafter, *Vayu's* Managing Editor visited Eurocopter at Marignane, which, as a location, does not get better. The Franco-German-Spanish Eurocopter Group is part of EADS which, with more than 11,800 helicopters in service in 148 countries, accounts for 33% present of world helicopter fleet in the civil and para public market.



**Also :**  
**Changing Dynamics, A Paradigm Change, State-of-the-A400M, First A350 XWB flight, Mediterranean Caimans, Yudh Abhyas 2013.**

### Regular features :

Commentary, Outlook, Viewpoint, Aviation & Defence in India, World Aviation & Defence News, *Vayu* 25 years back, Tale Spin

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**AIRBUS**

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## Airbus vs. Boeing at Paris

At close of the Paris Air Show 2013, Airbus emerged as the narrow victor over Boeing by unveiling deals valued at \$68.7bn to sell 466 passenger jets to airlines and leasing companies. This compared to Boeing's sales total of 442 aircraft valued at \$66.4bn, although the more important statistics are that Airbus has so far this year secured orders for 734 aircraft, while the US group has 692.

Apart from numbers that highlighted sustained demand for passenger jets, the show captured the escalating battle between Airbus and Boeing in the twin-engined widebody aircraft market, where the US group is intent on retaining its lead. It also highlighted Airbus' comfortable lead in sales of next generation narrow-body jets.

And while fighter jets performed deafening displays at the show, Paris had few significant announcements by the defence industry. Some groups – notably from the US – chose to stay away, such as Northrop Grumman. Fabrice Brégier, chief executive of Airbus, said his civil aerospace-focused company had an “excellent air show”, in spite of the poor weather, which included several spectacular thunderstorms. “I discovered air shows are like weddings – when it's raining we are getting lucky,” he added.

Furthermore, Airbus and Boeing included in their sales tallies at the show this year some deals that were already known before the event – for example, Singapore Airlines announced before the show that it planned to buy some of the manufacturers' jets. Boeing's tally also included some orders recorded on its books before the show.

Airbus secured orders for 65 A350s at the show, bringing the sales total to 678 for this airliner which involves a step-change in technology and materials because it is made mainly from lightweight carbon-fibre reinforced plastic rather than traditional aluminium, to reduce fuel burn. But A350 sales are running behind the jet it is designed to compete with – Boeing's 787 Dreamliner has attracted orders for 930 aircraft, partly reflecting how the US group launched its product earlier.

James McNerney, Boeing's chief executive, insisted that it could retain its lead in the wide-body twin engine market, partly because the group is planning five next-generation aircraft compared to Airbus' three versions of the A350. Boeing launched the third and biggest version of the Dreamliner at the show, and is planning two new models of its popular 777 wide-body airliner. He also insisted Boeing would not let Airbus secure a commanding lead in the narrow-body market – where the European company has so far obtained a 61 per cent share of sales of next generation short-haul jets featuring more fuel-efficient engines.

But the US group's challenges in this market pales in comparison to that of Bombardier, the Canadian manufacturer that is planning a narrow-body aircraft to compete with smaller versions of the single aisle jets made by Airbus and Boeing. Bombardier did not secure any orders for its new CSeries aircraft at the show, but Guy Hachey, head of the company's aerospace

unit, expressed confidence that deals would follow the jet's first test flight due shortly.

*Andrew Parker in Financial Times*

## Rescue Mission

In response to the Uttarakhand tragedy, the Indian Air Force may have mounted the biggest heli-lift in its history. The Indo-Tibetan Border Police has built helipads, vehicular routes and foot-tracks. Of course, the Army has also made a marvellous contribution to the evacuation effort. This is reminiscent of what has happened in numerous earlier cases like the Sikkim earthquake in 2011: our armed forces provide the most effective disaster response force.

And because their history of help has built a framework of trust, it is of genuine comfort to hear Air Chief Marshal NAK Browne promise that the IAF's helicopter rotors will not stop churning till it gets each and every pilgrim out. But massive reconstruction work lies ahead of the rescue mission. Roads, communication towers and power transmission lines have to be rebuilt. Local people, whose concerns have hitherto taken a backseat to the tourists, have lost their livestock, livelihoods, schools, shops, homes, farms and even their entire village in extreme cases. They will need sustained succour. Many of them relied on the annual yatra season to sustain them, and this is in limbo now. Kedarnath and various other revered temple sites need major restoration.

Although the armed forces have hitherto filled in the vacuum of civic management, this will not suffice in the coming days. Already there are signs that the confusion between various government agencies will impede relief work. The National Disaster Management Agency has failed us horribly. But we need it to reboot and take charge of coordinating the rehabilitation exercise. Unfortunately, its failure to acknowledge culpability does not really signal a turnaround any time soon.

For long-term reconstruction and recovery the Uttarakhand government will have to rethink existing policies - or more accurately the lack of them - in such areas as unregulated urbanisation, deforestation which triggers landslides, and ill-planned development projects which degrade the environment. The way forward is not clear yet. But Surat transformed itself into one of India's cleanest cities after the plague outbreak of 1994, and the 2004 tsunami moved India to go in for an early warning system that issues very reliable advisories these days. If Uttarakhand too learns from the current tragedy constructively, it can enter a new era of safer, sustainable development.

*From The Times of India*

## Right time at Tokyo

The Tokyo-New Delhi partnership should be one of the highest diplomatic priorities for India in the coming decades. There are three reasons why India should place its relationship with Japan on a special pedestal. One is that Japan, still the third largest economy and one of most technologically advanced nations in the world, has expressed a willingness to invest and

**BOEING**

develop India's economic wherewithal on a scale matched by almost no other country. The \$90 billion Delhi-Mumbai Industrial Corridor, a project that would enormously ease India's chronic infrastructure problems, is just one of many tangible signs of Japan's willingness to put its yen where its mouth is. Two is that Japan Inc is on the hunt for a new overseas home for its factories and plants. Japan has been too high cost and demographically constrained for the country's thousands of manufacturing firms. China has been their preferred site: Japan is the second largest foreign direct investor in China with a cumulative investment in the region of \$70 billion a year. But higher Chinese labour costs and a growing tide of anti-Japanese sentiment, partly whipped up by the Beijing government, has led many such firms to start looking elsewhere. India is one of the countries that Japanese companies are exploring as an alternative. If they were to move here, India would be a triple beneficiary in terms of jobs, exports and capital flows.

Third, which is the strategic leg of this triangle, is a common concern about the increasingly erratic and unpredictable international behaviour of China. Beijing, after decades of encouraging Japanese investment, has revived the dormant Senkaku Island dispute and made Japan-bashing part of its public discourse. If China is seeking to pander to a new urban nationalism, then it is focusing much of this ire on Japan, though Vietnam, India and the Philippines have also been on the receiving end. If Japan were to succumb tomorrow, there is a strong likelihood that China would turn its belligerence towards India.

The new Shinzo Abe government has a clear sense that building up India, economically and militarily, is in its national interest. It has not always been clear that New Delhi shares this vision fully, perhaps out of concern for Beijing's sensibilities. Prime Minister Manmohan Singh's forthright speeches in Japan have helped clear the air somewhat. But what should be abundantly obvious is that India should feel no inhibitions about its relationship with Japan, especially those born from the strident opinions of third countries. Tokyo is one capital that is offering India more than friendship, it is offering a genuine willingness to quantum leap India into a higher level of economic development. This is a less than rare opportunity that should not be missed.

*From Hindustan Times*

## Flying East

If all goes according to plan, the upgrade of the Imphal and Agartala airports to international status will help end the physical isolation of India's landlocked Northeast. Currently, Guwahati is the lone international airport in the eight northeastern states, including Sikkim. Given the region's dire need for better connectivity—with the rest of India and neighbouring countries—an integrated airports development project that upgrades and connects the dozen or so northeastern airports, including Bagdogra in West Bengal, will help build Imphal into a regional hub for international flights to Southeast Asia, and facilitate domestic movement and commerce. Road and rail connectivity for the economically deprived Northeast has remained a festering absence since Independence.

While an international flight hub will likely stimulate road projects, the upgraded airports will need better road and rail links. Manipur, for instance, is a state that sits at the ends of NH 39 and NH 53. As the protracted 2010-2011 Manipur blockades brought home, it's all too easy to cut the state off from the rest of the Northeast, to say nothing of the country, by blocking these two arteries. Meanwhile, Arunachal Pradesh shares a 1,000 km border with China, a border that Beijing can reach faster than Delhi, even as the people of the state languish in rugged and remote terrain.

Imphal is a good choice for the hub, given Manipur's close links with Myanmar, India's only gateway to ASEAN states by land. But to develop the region, its linking with Myanmar's Sittwe port, via NH 54 and the Kaladan river, and with Bangladesh's Chittagong port, must be speeded up. As should connecting Manipur with the trans-Asian highway system and the Imphal-Mandalay bus service. The long-awaited rail corridor through Bangladesh would reduce the distance between Kolkata and Agartala to 550 km from 1,700 km. The needs of the Northeast necessitate integrated, long-term thinking. The Imphal hub cannot be an exception.

*From The Indian Express*

## Kiss for every hiss

India's logic behind yielding whenever the People's Liberation Army (PLA) violates its sovereignty is not just preposterous but defies the rules of geopolitics. With 600 incursions by the PLA in the last three years and India's submissive attitude towards its neighbour, fear seems to be the only reason why New Delhi kisses and makes up with Beijing every time a PLA patrol party erects a bunker inside Indian territory, or flexes its muscles in some way or the other.

Before the government could forget the Daulat Beg Oldi (DBO) violation, the 17 June Chumar incursion surfaced when PLA troops intruded inside the Line of Actual Control and vandalised Army observation posts and a camera.

While couching India's anger in carefully selected words, Salman Khurshid had said after the DBO slap that India is not scared of China. However, the disconnect between the minister putting up a brave face and India demolishing bunkers in Chumar to end the DBO stalemate exposes his claims. Despite the Chumar aggression, NSA Shiv Shankar Menon and defence minister A K Antony jettied to our northern Big Brother to make sure it does not trample on our territorial claims again.

Undoubtedly, the Indian Army is respected for its war skills and toughness - 1948, '65, '71 and '99. And Army chief General Bikram Singh wants a Strike Corps to contain any spark in the Northeast powder keg that could stoke Chinese aggression. But neither do we have brilliant officers like General K. Sundarji, who thwarted further Chinese muscle-flexing in Sumdorong Chu Valley in 1986-87, nor a Congress led by Indira Gandhi.

India's submissive posture sends wrong signals to the US and other nations. If India continues to lag China militarily and economically, several Chumars are waiting to strike.

*From Mail Today*

**DASSAULT**



## The Thinking Man And The Fighting Man

23 May 2013, may well go down in the history of the Indian Republic as a day when the first rays of a new dawn began to shed light on the culture of barren strategic thought within the national security establishment. On this day, the prime minister of India laid the foundation stone for the proposed Indian National Defence University (INDU) at a two-hundred-acre site in Binola village, on the outskirts of the national capital. The idea of the university is one that had been hanging fire for four decades, then given a push after the Kargil Review Committee's recommendations and finally given conceptual shape by a committee chosen and guided by Arun Singh, a strategic mind rarely associated with the political corridors of South Block. The committee, chaired by noted strategist, K. Subrahmanyam, submitted its report to the defence minister back in 2001.

As if to mock the indifference with which the Indian electronic media treated this historic event, on this very day, the president of the United States of America was making the first major counter-terrorism address of his new term in office, laying down new policy guidelines. The forum he chose was none other than the US National Defence University at Fort McNair, Washington, from where presidents have enunciated important national security policy objectives in the past. The difference in the approach to strategic security between what is



arguably the oldest, and the largest, democracies in the world—which consider themselves to be natural allies—could not have been starker.

*The Economist*, in a recent article titled 'India as a great power: Know your own strength', highlighted the fact that on gaining independence, the Indian political elite, which had a strong pacifist bent, was determined to keep the generals in their place—and succeeded in doing so. The cost of this success was that India exhibited a striking lack of what might be called a strategic culture and its political class showed little signs of knowing or caring about how the country's military clout should be deployed. According to the article, this, along with the distrust between civilian-run ministries and the armed forces, had also undermined military effectiveness by contributing to a procurement system that was dysfunctional.

It was the late George K. Tanham, the strategic analyst who, after a comprehensive study—which included numerous interviews with Indian thinkers, policymakers and those in the armed forces—produced a monograph, 'Indian Strategic Thought: An Interpretive Essay'. This US government-funded research project was published by the internationally respected US think tank, the Rand Corporation, in 1992. Tanham's broad conclusion that India has always suffered and continues to suffer from a lack of strategic thinking drew the attention of many strategic writers nationally and internationally and elicited considerable debate at that time. But the cocooned Indian security establishment was not listening.

In this sombre background, the message emanating from Binola must gladden the hearts of a small tribe of students of national security, whose future otherwise was destined to follow that of the vanishing Indian tiger. During the foundation laying ceremony, Air Chief Marshal Norman Anil Kumar Browne, the current chairman of the Chiefs of Staff Committee, said that there is a need to cultivate and develop a select cadre of policy advisors and politico-military thinkers, who, through their operational experience, academic record and application of domain knowledge, can conceptualise and formulate national strategy as well as provide critical analysis in areas of joint responses to varied security threats.

Speaking at the occasion, the prime minister reflected on the security challenges and opportunities and said that these should prompt a reorientation of our strategic thinking and a reappraisal of our higher defence organisation. He exhorted defence professionals to remain abreast of the complex challenges we face and the avenues that are available as a result of the enormous transition taking place in India. He said that he was reminded of a late 19th-century observation by General Sir William Francis Butler that "the nation that will insist upon drawing a broad line of demarcation between the fighting man and the thinking man is liable to find its fighting done by fools and its thinking by cowards".

The prime minister further said that the INDU would ensure that "our country, our government and our armed forces benefit from the best military advice that is available and will provide an avenue for our soldiers to think beyond the physical

**SAAB**

art of warfare. It would also allow our thinkers and policy-makers to understand the complexities of war and conflict. It will provide our defence professionals with a deep understanding of the interplay between all attributes of national power.”

And finally, being conscious of the recent scandals that have accompanied defence procurement and resulted in monumental delays in the modernisation of the armed forces, the prime minister said, “We have also been guided by the objective of making our defence acquisition transparent, smooth, efficient and less vulnerable to unethical practices. We will continue to seek the highest standards of probity in defence acquisition.” Implicit in this observation was the distrust between civilian-run ministries and the armed forces that ultimately undermines military effectiveness, as was alluded to in *The Economist* article.

Whilst writers and commentators have for long been pleading for the realisation of many of the sentiments expressed on the occasion, it is the first time that we hear a COSC calling for a select cadre of policy advisors and politico-military thinkers, of the formulation of national strategy and of the joint responses to varied security threats. This is far removed from the distinct compartmentalisation that exists in the national security domain between the elected representatives and the bureaucracy on the one hand and the uniformed fraternity on the other.

It also signals a departure from inter service turf battles within the military, covering not just roles and missions but every conceivable pie that needs to be shared. Perhaps the very thought of a dedicated university for national security practitioners where thinkers, advisers, planners and doers all think and conceptualise for the nation’s future is an idea that softens the hearts of even the toughest of warriors.

This is for the national good. But more importantly, it is what the prime minister has had to say that must be music to the ears of those who genuinely cherish the goal of India taking its rightful place amongst the comity of nations by inculcating amongst our security practitioners a strategic mindset from which will flow strategies to build national power. Does, for example, one find the hope of a revamped higher defence organisation, one where there is no dividing line between the civilian

### The Committee on Indian National Defence University (INDU)

K Subrahmanyam	Chairman
Dr PL Malhotra	Member
Prof J Saha	Member
Prof RS Sirohi	Member
Air Marshal (Retd) BD Jayal	Member
Rear Adm (Retd) Raja Menon	Member
Lt Gen (Retd) S Nambiar	Member
Prof Madhavan K Palat	Member
Tarun Das	Member
Prof R Narasimha	Member
Rajul Roy Chaudhury	Member
Dr Sanjay Baru	Member
Falguni Rajkumar	Member Secretary
[Joint Secretary (Trg. & CAO) Ministry of Defence]	

Lt Gen BM Kapur, then Director-General, Defence Planning Staff (DG, DPS) was co-opted to the Committee after the Committee’s discussions with the Chiefs of Staff Committee.

policymaker and the military professional, where the armed forces’ headquarters do not remain isolated pockets outside of the ministry of defence but become integral to it? Do we see a political consensus developing over the concept of a permanent chairman, Chiefs of Staff? Can we see a cadre of civil servants who specialise in national security issues and contribute accordingly? Will there be greater integration between the MoD, the armed forces and external affairs? Will the armed forces begin to practice joint warfare rather than pay lip service to jointmanship? These and many tantalising thoughts come to mind from the extremely forward-looking speech that the prime minister made at the foundation laying ceremony.

It is possible that being an intellectual and thinker in his own right, leaving the politics and the grind of the capital behind as his convoy sped along National Highway 8 towards Binola, Manmohan Singh the Doctor, could in his imagination picture a campus, better than what he has seen anywhere in the world, where academics, soldiers, thinkers and administrators breathe the free air of a university campus and use their collective intellect for the larger good of national security, and where, to use Rabindranath Tagore’s words, “the clear stream of reason has not lost its way into the dreary desert sand of dead habit...” Who knows, he may even have imagined himself post-retirement, browsing in the INDU library,

engaging in serious discussions with students and faculty alike or war-gaming, all in the academic environs of Binola!

To those tasked with the mission of bringing the INDU to fruition by 2018, as announced by the defence minister, the easy bit comprises setting up the campus, buildings and associated issues. The bigger challenge is to organise and plan for the software, namely the faculty and the academic content. Precisely because national security is a neglected subject, finding the ‘right staff’, especially among both the civil and uniformed fraternity, is going to be far more challenging and this includes finding a meritorious president. One hopes that to lay strong foundations, the organisers will have a free hand in finding the right people. Equally, much needs to be done to encourage more academics and uniformed officers to gravitate towards national security studies.

As the prime minister’s motorcade retraced its way to Delhi, agents of the status quo within the system, both civil and military, must already have been planning to nip in the bud the message of change that emanated from Binola. One can only hope that those who were part of this historic and auspicious beginning and who spoke with conviction and optimism to the nation from Binola, will strive to put every word spoken into practice, failing which, the nation will be condemned to continue with its fighting being done by fools, and its thinking done by cowards.

*Air Marshal (R)Brijesh D. Jayal*

# Blatant Chicanery

**A**K Antony has been the longest serving defence minister of the country. Sadly, we cannot say that he has been the best. Brought in to signal the need for integrity in defence purchases, and to speed up the delayed modernisation of the armed forces, his term has been one of failure and missed opportunities.

The VIP helicopter scam represents only the tip of the iceberg of the corruption that continues to dog defence deals.

As for modernisation, the Antony term has seen a further slippage in the *Scorpena* submarine project and an inability of the Army to push through the urgently needed artillery modernisation, to name just two of the key projects that remain mired in delays fostered by the defence ministry.

Relations between the armed forces and the civilian bureaucracy remain poisonous and break out into periodic spats, the most spectacular one being the Gen. V K Singh age issue.

In such circumstances one would imagine that Antony would be an enthusiastic supporter of reform and restructuring of his ministry. But far from it.

He maintained a reputation for indecisiveness and caution and, according to news reports, has tamely followed his bureaucracy to block the significant proposals made by the Naresh Chandra Task Force on defence reform. This has manifested itself most clearly in the opposition of the ministry to the creation of the office of a permanent chairman of the Chiefs Of Staff Committee (COSC).

## The Committee

The committee, which laboured for a year, comprised former service and intelligence service chiefs and was chaired by a person who had himself been Defence and later Cabinet Secretary.

To term the recommendation of the committee on the permanent chair for the COSC as “unwarranted” can only be termed as self-defeating impertinence. Actually, according to news reports, the MoD has declared that not only is there no need to appoint a permanent COSC chairman, there is no need for any reform anywhere, period.

In a way this sums up the arrogant selfcertitude of the bureaucracy and harkens to Lord Kelvin’s famous 1900 statement that “There is nothing new to be discovered in physics now.”

Across the world, joint functioning or integration of the various arms of the services has been the trend since the time of World War I. Modern war, it was soon realised, could not be fought by individual services efficiently.

In the 1950s most countries appointed Chiefs of Defence Staff (CDS). In India, the Group of Ministers which looked into defence reforms after the Kargil war suggested that a CDS post be created, along with the integration of the armed forces headquarters with the Ministry of Defence.

However, this was sabotaged by the bureaucracy which raised all manner of objections to the proposal. They did create a Tri-service Integrated Defence Staff, but being headless, its influence has been sub-optimal.

Then, in an act of blatant chicanery, the babus relabelled the service headquarters as Integrated Headquarters of the Ministry of Defence (Army/Navy/Air Force) and declared that integration had taken place!

They were able to do this by playing up to the fears of the politicians that the CDS would be a “super general” and so powerful that he could threaten the system with a coup. Coming in a country where the last military coup probably took place in 185 BC when Pusyamitra Sunga overthrew the Mauryan dynasty, this is a bit rich.

Their actual concern, however, was that the new organisation would cut into the power that the civilian bureaucracy wields by manipulating the Transaction of Business Rules in its own favour, a power that is wielded in an inexpert, incompetent and corrupt manner.

## The COSC

The Naresh Chandra Committee took all the contrarian views into account and by recommending a permanent chairman of the chiefs of staff committee emphasised that the new general would be a coordinator, rather than a commander.

In its view, there was an urgent need for a high ranking officer who would assist the government in drawing up a national security doctrine and national security strategy and provide single point advice on issues that concern more than one service.

The permanent chairman COSC would also be the key functionary in the nuclear command chain. In the decade following the nuclear test of 1998, India has steadily built up its nuclear arsenal. It will soon have a ballistic missile-carrying submarine to anchor its arsenal, as well as long range missiles. Developments in Pakistan and China suggest the need for a much tighter nuclear command chain than has been the case till now.

## Next Crisis

Equally important, he would play a key role in integrating the three services, a process that needs to take place in the coming decades, if India is to have a credible military force. Already, the cost of maintaining the armed forces has become hugely expensive.

There is need to integrate the training, logistics, acquisition and some war-fighting functions of the three services to obtain the biggest ‘bang for the buck’. This can only be done with a specialised institution which will focus on promoting that integration beginning with helping generate the annual, the five year and long term integrated plans for the three services.

There was a time when the smaller services—the Navy and Air Force—were leery of a figure like the Chief of Defence Staff. But now they have realised the importance of the appointment and it is no surprise that in the briefings to the Naresh Chandra Committee, they strongly supported the creation of CDS-like figure because they accept that if India has to have a credible military posture in the coming decades, it needs such a figure.

It is simply not possible to go on with the haphazard coordination that the country has gone along with for so long to its own cost. It is an unfortunate fact that India usually commits itself to reform after it is hit by a crisis. That is why the two periods of reform and restructuring followed the 1962 defeat at the hands of the Chinese and the Kargil war.

We don’t know what the next crisis will be like, but you can be sure that if we do not change the way we do things in relation to our defence system, we will be the losers. And we will know who is responsible for it.

*Dr. Manoj Joshi*

# First IAF Boeing C-17



The Indian Air Force received its first Boeing C-17 Globemaster III on home soil when the first of this new heavy transport aircraft (CB 8001) landed at Air Force Station Hindan on 18 June 2013. The second C-17 was handed over to the IAF at Boeing's Long Beach facility on 22 July. The C-17s are to equip the newly raised No. 81 Squadron which will receive four more C-17s this year and another five in 2014. This first aircraft was flown to India after completion of its flight test programme at Edwards Air Force Base in Palmdale, California, which began after the aircraft was formally handed over to the IAF on 22 January 2013 (see *Vayu* Issue V/2012 *Riveting the Relationship*).



On 31 July 2012 *Vayu* had been specially invited by the Boeing Company to the massive C-17 Globemaster final assembly hangar at Long Beach in California, when the Indian Consul General at San Francisco, along with the IAF Air Attache, senior Boeing officials

and California politicians, participated in the 'major join' ceremony, pneumatically driving in rivets to symbolically signal final assembly of the IAF's first C-17 Globemaster III (*'India 1'*).

The IAF's first C-17 later made its maiden flight on 11 January 2013 with handover to the IAF following for "shake down flights". Ten sets of IAF flight crews (two pilots and a load master each) have received conversion training with the USAF at Altus AFB in Oklahoma.

In a flashback of history, the very first C-17 Globemaster III flew to India in May 1995, to commemorate 50th anniversary of the 'Over the Hump' operations in the



# Globemaster III arrives



Assam-Burma-China (ABC) theatre. That aircraft (0603) belonged to the USAF 17th Airlift Squadron of the 437th Airlift Wing at Charleston AFB, South Carolina. Amongst the distinguished group on board were World War II legends including some of the original 'Flying Tigers'. That C-17 flew into Delhi on 26 May 1995 and after ceremonies at India Gate, departed to Kalaikunda and thence to Dum Dum (Calcutta) before 'Flying over the Hump' to Kunming in China. Amongst the three Indians specially invited was *Vayu's* editor (see *Vayu* Issue III/1995).

In the years thereafter, C-17s of the US Air Force participated at various air shows at Yelahanka before being formally evaluated by the Indian Air Force in June 2010, with flights to Leh and various IAF advanced landing grounds where its remarkable short field performance was dramatically demonstrated. On a particularly hot day that summer, when the contemporary IAF fleet was virtually grounded, the C-17 flew in and out of the short airstrip at Gaggal in Himachal Pradesh with its 4620 foot runway at an elevation of 2525 feet.

The C-17s of No.81 Squadron IAF will be based at Air Force Station Hindan, just north of Delhi where they will operate alongside the C-130Js of No.77 Squadron. "The C-17 will equip the Indian Air Force with one of the world's most advanced humanitarian and strategic capabilities," said Air Vice Marshal SRK Nair, Assistant

Chief of Air Staff Operations (Transport and Helicopters). "We have looked forward to this day when the Indian Air Force flies the first C-17 at its new home in India."

As Air Chief Marshal NAK Browne, CAS later said "our first C-17 Globemaster III not only signifies a tremendous boost in our strategic airlift capability, but also is poised to form a major component in the IAF's modernisation drive". Further, "because it was delivered mission-ready, it soon undertook its first strategic mission to our Andaman & Nicobar Command at Port Blair. I wish to place on record my appreciation to the U.S. government, the U.S. Air Force and the Boeing team for the timely delivery of the aircraft that makes the IAF the world's second-largest operator of the C-17 after the US".

The Boeing Company is to support the IAF's C-17 fleet through the Globemaster III Integrated Sustainment Programme

(GISP) Performance-Based Logistics contract. The GISP 'virtual fleet' arrangement ensures mission readiness by providing all C-17 customers access to an extensive support network for worldwide parts availability and economies of scale.

A key issue is the looming closure of C-17 production in 2014 should further orders not be forthcoming as this will impact on local employment. Boeing has so far delivered some 250 C-17s, most of these to the US Air Force which deploys them at 12 air bases but also to the RAF, RAAF, RCAF, Qatar, UAE and the 12-nation strategic airlift consortium of NATO. The Indian Government ordered 10 C-17s for \$4.12 billion to be delivered in 2013-14 but could augment this by another 6 aircraft after the first batch has "demonstrated capability and reliability". This means that any additional Indian orders will be confirmed in early-2014 at the earliest.



## C-17's maiden flight to Port Blair

Some two weeks after its arrival at Air Force Station Hindan, the IAF flew its first C-17 Globemaster III to Port Blair in the Andaman & Nicobar Islands on 30 June 2013. Flying at an average altitude of 28,000 feet and having an unrefueled range of 2400 nautical miles, the aircraft landed at Port Blair carrying support equipment towards rotational movement of Infantry Battalion at the Andaman & Nicobar Islands. The C-17 has a maximum all up weight of 265,350 kg, with an ultra modern palletised cargo handling capability.



the HS 748, Ilyushin Il-76 and Dornier 228, making repeated sorties to the Jolly Grant airport in Dehra Dun which became the forward hub for air operations.

HAL Dhruv ALHs of the Indian Army's 205 AA Squadron plus some Cheetahs were in support of the relief operations, while on the ground, battalions of the Indian Army's 9th Mountain Brigade alongwith troops from the Special Forces and paratroopers, alongside personnel from the ITBP and other paramilitary organisations carried out rescue operations. Also helilifting stranded persons out from the area of devastation during the first days were a dozen civil registered helicopters, which are routinely chartered for pilgrimage purposes in this area (see article *Hell and Heroism in the Hills*).



C-130J of No.77 Squadron which flew in fuel bowzers to Dharasu ALG

## Massive air effort in Uttarakhand

In what has arguably been the most extensive use of aircraft for relief and rescue operations in the history of India, took place after the 'Himalayan Tsunami' in the Uttarkhand hills during the second fortnight of June 2013. Some 90 aircraft, mostly helicopters, of the Indian Air Force, Army and civilian operators evacuated thousands of stranded pilgrims and local inhabitants. These included 37 Mi-171V/Mi-17V5s, 14 HAL Dhruvs, 3 HAL Cheetahs and a lone Mi-26 heavy-lift helicopter of the Indian Air Force from various helicopter units including Nos. 116, 153 and 157 HUs, based at different locations in northern and eastern India. Three C-130J Super Hercules of No. 77 Squadron carried out spectacular operations from extremely short ALGs in the mountains to fly in fuel and essential supplies. These were supplemented by three Antonov An-32s and single examples of



The massive Mi-26 heavy lift helicopter with paratroopers in Uttarakhand

## Counter Naxal operations by IAF

According to Air Chief Marshal NAK Browne, "the IAF will send the latest Mi-17V5 helicopters," to assist in counter Naxal operations in eastern India. "These have night flying capability, better radar, latest avionics and carry weapon pods underneath". However, the CAS clarified that the existing "rules of engagement will not change".



A new helicopter unit, with some 6-7 Mi-17V5s, will be based at Nagpur which will augment the existing fleet that is spread across Ranchi, Raipur and Jagdalpur, virtually doubling the helicopter force in the Maoist-dominated area, where dense forests preclude ground movement and allow for rapid insertion of troops at specified locations. The CAS further stated that "Naxal

operations will need greater technical inputs to get information” and sources have confirmed that these include some systems which are not in the public domain and could include new thermal imagers, sensors and even advanced UAVs. The NTRO already operates UAVs which have ability to penetrate tree foliage, while the CRPF has expressed interest in the DRDO-developed Nishant UAV.

## An Indian civil airliner project

It is learnt that Prime Minister Manmohan Singh chaired a meeting on 9 July at New Delhi to review the proposed national project to design, develop and produce a ‘futuristic’ civil airliner. This would involve creation of a special purpose vehicle (SPV) to include Hindustan Aeronautics Limited (HAL) along with the National Aerospace Laboratories (NAL) and involvement of an array of DRDO labs as well as the scientific and industrial community. The SPV would also invite expertise from international groups and is estimated to cost Rs 4355 crores (US \$ 730 million), which would be financed from the proposed National Investment Fund.



Initially mooted as a 50-70 seat turboprop airliner, differing perceptions changed this to a 90-110 seat turbofan jetliner and the nodal design responsibility was vested with the National Aerospace Laboratory. However, after further studies, in December 2012 the project was recast as a 70-90 seat turboprop airliner, with HAL designated as the systems integrator and production agency, NAL as the design and technology partner, with inputs from the Civil Aviation Ministry and various airlines. Private sector partnership is sought for involvement at every stage, while select international OEMs would be invited to be part of a joint venture company.

## Cost concerns on Indo-Russian FGFA

Senior executives from HAL reportedly visited Russia in mid-July to review a number of issues including joint development of the fifth-generation fighter aircraft (FGFA), which primarily concern financial matters. An initial amount of \$295 million was transferred from India to Russia in December 2010 for the preliminary design contract (PDC) phase, for which a number of Indian designers and scientists were seconded to Russia. There have since been several changes in the numbers and configuration of the FGFA, the IAF initially projecting a requirement for 166



single-seat and 48 twin-seat aircraft but now reportedly reducing this to 144 aircraft, all single-seaters.

According to global sources, the FGFA’s design and development cost was initially estimated at \$11 billion, with India and Russia contributing equally to the programme. To this figure (\$5.5 billion) HAL would have to factor in the cost of new infrastructure and upgrade of existing facilities at Ojhar (near Nasik). As per earlier plans, IAF test pilots were to familiarise themselves with this futuristic fighter once the first of three prototypes was received in 2014, followed by two others in 2017 and 2019. However, Indian sources opine that it is very unlikely that the FGFA’s detailed design contract will be concluded during FY 2013-14 as the Russians have meanwhile indicated considerable escalation in design and development costs.

“The timeframes will now have to be revised. MoD has established a committee of specialists and finance officials to verify the increase in costs. An internal contract negotiation committee is also in progress,” according to reports from New Delhi.

## Raising of Mountain Strike Corps

On 17 July 2013 the Cabinet Committee on Security (CCS) cleared the creation of a special Mountain Strike Corps of the Indian Army at an estimated cost of Rs 65,000 crores. Chaired by Prime Minister Dr Manmohan Singh, the CCS meeting was attended by senior cabinet ministers as also the COAS and CAS apart from senior secretaries in the government. According to sources, the new Corps headquarters will be located at Panagarh in West Bengal with formations based at various forward locations, primarily in north eastern India.

Raising of integral Mountain Strike Divisions, with special equipment including appropriate armour and artillery plus assault and attack helicopters will take an estimated seven years. The IAF is also to base a second C-130 J Super Hercules squadron at Panagarh for special operations, even as several existing ALGs are being upgraded in both the north east and Ladakh.

There was measured reaction to this from the Chinese Government which played down significance of the Indian move, merely suggesting that they were “willing to join hands with India to safeguard peace and tranquility of the border areas”. Chinese strategic analysts have also played down raising of the new Corps, in part because official approval was long-expected and overdue, mired in bureaucratic delays, and hence were “hardly surprised”.

## AK Antony visits China

Defence Minister AK Antony made an official visit to China from 4 to 7 July, the first by an Indian defence minister to this country since 2006. The visit was also to reciprocate last year's visit of Chinese Defence Minister Gen Liang Guanglie to New Delhi, which took place after a gap of eight years. Antony's delegation included Defence Secretary RK Mathur, Lt. General Dalbir Singh Suhag GOC-in-C Eastern Command and Vice Admiral Satish Soni, FOC-in-C Southern Naval Command,



AK Antony with his Chinese counterpart seen with V/Admiral Satish Soni and Lt Gen Dalbir Singh in Beijing.

accompanied by several other officers of the Ministry of Defence. AK Antony met with his counterpart Chinese Defence Minister Gen Liang Guanglie, and was expected to call on Premier Li Keqiang besides visiting a military unit and a command centre.

Antony's visit came just after the 16th round of border talks between National Security Advisor Shivshankar Menon and his Chinese counterpart Yang Jiechi during which the two sides had discussions on mutual concerns especially the incursion of Chinese troops into the Depsang Valley in mid-April.

Though no agreements were signed during the visit, the two sides carried out advanced negotiations on the Border Defence Cooperation Agreement (BDCA), a new mechanism suggested by China last year for improving security at the borders, pending the final settlement of the territorial dispute. The BDCA which has several facets has been discussed extensively between the two sides, including during the June 28-29 border talks. Later, Shiv Shankar Menon said "We are making progress steadily. I think the proof is in the successful way we handled Depsang and in the way we are discussing a new BDCA, which was proposed by China to better manage the situation at the border". Besides BDCA, the two sides were expected to finalise dates to resume military exercises which would focus on anti-terrorism drills and are likely to be held at Chengdu. The first one was held in 2007 at Belgaum (Maharashtra) and the following year at Kunming in Yunnan province.

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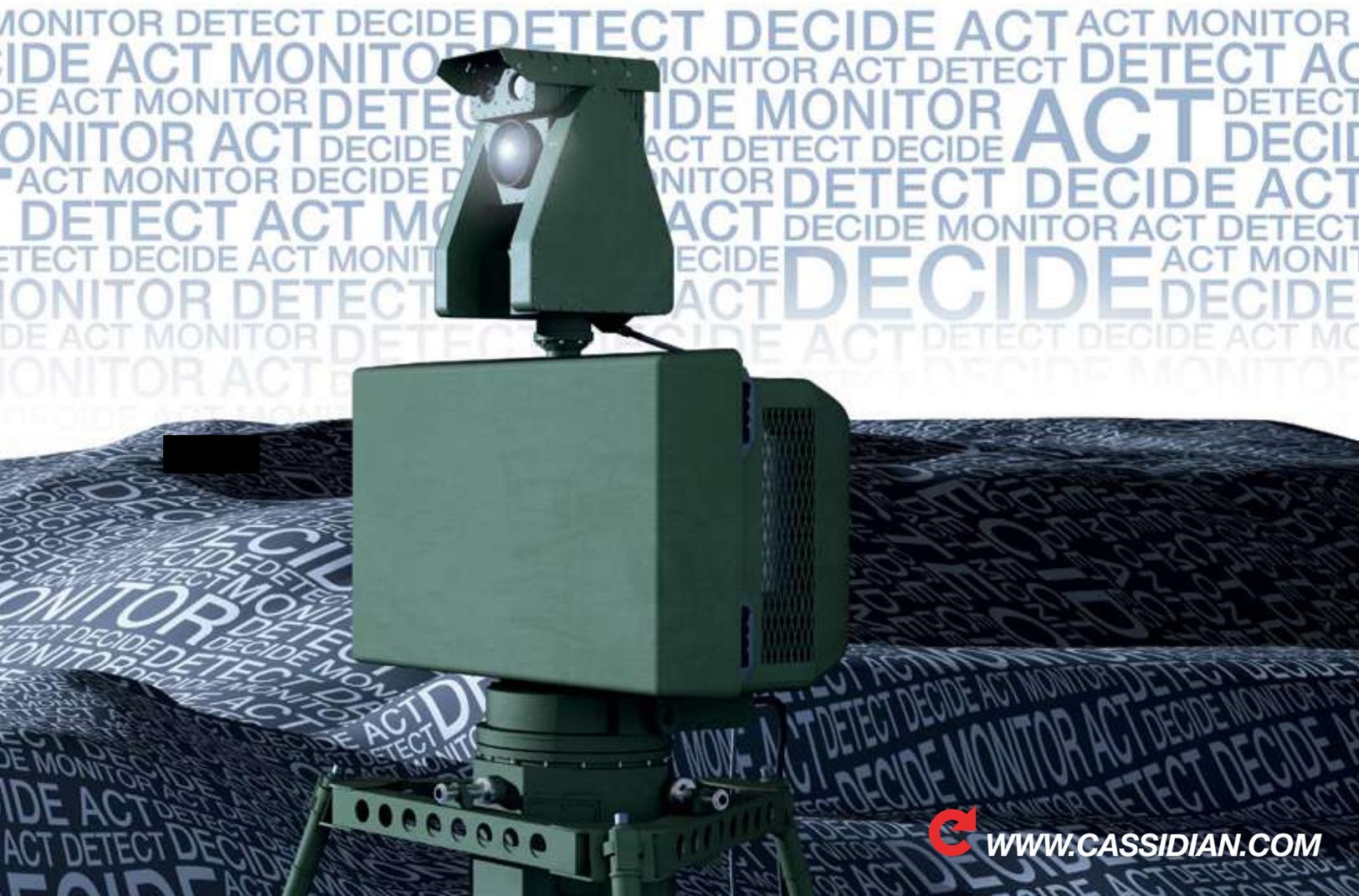
## “Perform or Perish” : Antony to the DRDO

While lauding recent achievements of the DRDO at their annual awards function, Defence Minister AK Antony stressed on need for the government agency to become competitive, saying the only choice left to DRDO was to “perform or perish”. In particular, he referred to the indigenous LCA programme, which has been marred by continual delays, and said that it was vital that the agency adhered to deadlines.

Antony highlighted that India could not afford the luxury of remaining dependent on foreign arms forever and encouraged the Indian defence sector to develop technologies through joint initiatives. “Our experience has been that foreign vendors are reluctant to part with critical technologies. There are delays in the supply of essential spares and exorbitant price increases,” he said, re-emphasising the need for indigenous development.



There have recently been a number of high level review meetings on the LCA programme, AK Antony chairing one himself on 24 June 2013 where he was reportedly assured that the IOC (actual and not tentative) would be achieved by December 2013 and that HAL would prepare for series production, leading to manufacture of 16 aircraft a year from 2016 [Meanwhile, the Tejas LCA has completed over 2300 flights including repeat armament trials with three LSPs in the past month].



### India–Vietnam talks on South China Sea

Notwithstanding growing Chinese assertiveness in the South China Sea, the Government of Vietnam has stated that “India has every right to carry on with “exploration and exploitation” work it was undertaking in the blocks allotted to it by Hanoi in the disputed sea. Our position is that we need to respect the UN Convention on the Law of the Sea (UNCLOS) to resolve any issue arising in the South China Sea,” Vietnam Foreign Minister Pham Binh Minh reiterated during his meeting with Indian External Affairs Minister Salman Khurshid at the 15th meeting of the joint commission on 11 July.



Khurshid emphasised that India’s activity in the South China Sea was “purely commercial in nature” and it had been undertaken at the insistence of Vietnam. He was of the view that any contentious issue in this regard be settled through peaceful talks.

### Aircraft spares for Mauritius

The Government of India has “gifted” three new aircraft engines and critical spares for the Mauritius National Coast Guard which operates a pair of HAL-built Dornier 228s and a lone Islander aircraft as also some other Indian-origin equipment. A ceremony was held at Port Louis on 12 July on board the INS *Sukanya* with High Commissioner TP Seetharam handing over the equipment to Arvin Boorel, minister of foreign affairs, regional integration and international trade of the Republic of Mauritius. This is perceived as part of India’s overall policy to build strong maritime alliances with Indian Ocean Region countries.



### RFP for nine multi-mission aircraft

During a recent meeting of the Defence Acquisition Council, approval was given for an Indian Air Force proposal to purchase nine multi-mission, signals intelligence (SIGINT) and communications (COMMINT) aircraft at a cost of \$200

million. A request for information (RFI) for aircraft to meet the requirement had earlier been issued in April 2012, with offers submitted thereafter.

Two of the aircraft are required as dedicated SIGINT platforms, the other seven to be a multi-role aircraft for survey and target towing missions and also for passenger and cargo transport. Three of the seven will also have communications jamming equipment installed. The RFI specifies that despite the different roles, all nine are to be based on the same aircraft platform and fully certified to FAA/EASA or equivalent standards. The type must be “a modern turbofan type, with minimum capacity for ten passengers and two crew, provision for five operator workstations for its special mission roles.”

### Indian Navy Boeing P-8I at Visakhapatnam

The Indian Navy’s Boeing P-8I Long Range Maritime Reconnaissance and Anti Submarine Warfare (LRMP/ASW) aircraft made its maiden landing at INS *Dega* at Visakhapatnam on 17 July. Piloted by the Squadron Commander-designate, Commander HS Jhajj, the aircraft (IN 321) was received by Vice Admiral Bimal Verma, Chief of Staff, Eastern Naval Command. This aircraft, which first arrived in India in May 2013 (see *Vayu III/2013*) is the first of eight Boeing P-8Is that have been procured under a contract signed in 2009 and is based at INAS *Rajali*, Arakkonam, Tamil Nadu. They will operate under the administrative and operational control of Eastern Naval Command.



Indian Navy P-8I of INAS 312 on landing at Visakhapatnam

### IAF inducts Pilatus PC-7 Mk.II BTA

The Pilatus PC-7 MkII basic trainer aircraft was formally inducted into IAF service at the Air Force Academy, Dundigal on 31 May 2013. The ceremony had three PC-7 MkII aircraft airborne in a ‘vic’ formation led by Gp Capt RS Nandedkar putting up a brief flying display which was followed by handing over of technical documents of the aircraft by Air Commodore Nagesh Kapoor, Chief Instructor (Flying) to Minister of State for Defence Jitendra Singh. In attendance at the event were the CAS Air Chief Marshal NAK Browne, along with AOC-in-C Training Command Air Marshal Rajinder Singh and the Ambassador of Switzerland Mr Linus Van Castelmur.

## IRKUT



The PC-7 MkII at the AFA, Dundigal will be used for basic training of pilots of the Indian Air Force, Indian Navy and Coast Guard. A total of 75 aircraft have been contracted from Pilatus, the procurement having been approved by the government in late May 2012. The first batch of PC-7 Mk.IIs arrived in India in February 2013 as part of accelerated induction plan and the first such aircraft was also on static display at Aero India 2013. The first batch of cadets will start training on the PC-7 Mk.II from July 2013.

The IAF's PC-7s sport an unusual paint scheme which is in radical departure from earlier practice and seems to follow the scheme adopted by Pilatus for its demonstrator aircraft.

## HAL HTT-40 development begins

During a recent Board meeting, it is learnt that HAL have cleared development phase of the HTT-40 turboprop trainer, with some Rs 150 crore being allocated for design & development and including manufacture of two prototype aircraft. Metal cutting has reportedly begun and the first aircraft is scheduled to make its maiden flight in 2015. The Indian Air Force is however opposing the HTT-40 programme and the CAS has himself been outspoken on the matter, initially at Aero India 2013 in February when the first Pilatus PC-7 Mk.II had just arrived from Switzerland.

## First HAL-Hawk for Navy

The first HAL-assembled BAE Systems Hawk for the Indian Navy (IN 001) made its maiden flight at Bangalore on 11 June 2013, being airborne for over an hour.

The Indian Navy have ordered 17 Hawk Mk.132s, five of which will be delivered during the current financial year, the first in July 2013. The Hawks will supplant the HAL Kirans of INAS 551 at Dabolim in Goa.

## Indian interest in US-2 amphibian aircraft

Even as the Governments of India and Japan are taking their bilateral relationships to greater levels, an Indian interest in the ShinMaywa US-2 amphibian was reportedly articulated during high level meetings between Prime Minister Manmohan Singh and his Japanese counterpart Shinzo Abe when they met in

Tokyo in late May. Amongst a host of agreements signed were references to the expanding bilateral defence ties and agreement to further cooperate on maritime issues "to ensure freedom of navigation and unimpeded commerce". The Indian Navy is understood to have an interest in acquiring long range amphibian aircraft capable of operating in high sea states.

After signing the joint statement along with Abe, Dr Singh said that India and Japan are "natural and indispensable" partners for advancing prosperity in the two countries and for "a peaceful, stable, cooperative and prosperous future for the Asia-Pacific and Indian Ocean regions". Dr Manmohan Singh said that India



attaches particular significance to intensifying political dialogue and strategic consultations and progressively strengthening of defence relations, including naval exercises and collaboration in defence technology. He said that cooperation in high technology, space, energy security and rare earth minerals will also "add rich content to the strategic relationship between the two countries".

Not unexpectedly, reacting to the evolving Indo-Japanese relationship, the Chinese *People's Daily* has cautioned India to be wary at a time the Chinese are locked in maritime disputes with Japan over certain Islands in the resource-rich East China Sea. "India's great wisdom lies in dealing with ties with China in a calm way, undisturbed by internal and international provocateurs," the paper opined.

## BSF to evaluate helicopter options

The Border Security Force (BSF) have expressed their intention to evaluate competitive helicopters to meet their requirement for 12 utility helicopters for operations in Jammu and Kashmir, the north east and against Naxal extremists. The Ministry of Home Affairs wants the BSF to include other OEMs in the bidding process, with the view that inclusion of global companies with helicopters similar to the ALH would result in selection of the right type. "We want more manufacturers to participate so that we can buy a better product. There are recurring problems and high maintenance issues with the ALH. In some cases, it takes more than a year for HAL to return the aircraft sent for maintenance," a BSF official said.

## **Textron Bell**

### Air India in MRO for CFM56

Air India have signed an OnPointSM overhaul engine services agreement with GE Aviation and for material related to the maintenance, repair and overhaul of its 96 CFM56-5B\* engines that power the Airbus A320 aircraft fleet. “This agreement will ensure Air India receives a fully customised solution with quality OEM parts and component repair to keep its engines in excellent operating condition, maximising time-on-wing and efficiency,” said Paul McElhinney, president and chief executive officer, GE Aviation Services. “We are pleased to extend our excellent working relationship with Air India to include maintenance of its CFM56-5B engine fleet.”

In 2011, GE Aviation had granted its first GENx TRUEngine™ designation to Air India’s GENx-1B engine fleet, the airline receiving its first GENx-1B-powered Boeing 787 Dreamliner in October 2012. In 2011, Air India signed an OnPointSM solution agreement covering its GE90 engines, with GE providing comprehensive material support, training and assistance on overhaul work scoping.

Air India has a relatively ‘young’ fleet of 127 aircraft which includes GENx-1B-powered Boeing 787s, GE90-powered Boeing 777s, CF34-powered Bombardier CRJ700s and CFM56-5B-powered A319s and A321 and CFM56-7B powered B737-800s.

### Air Asia India’s Chennai hub

Air Asia India, a joint venture between the AirAsia group, Tata Sons and Telestra Tradeplace, is to launch its Indian operations by October, with its hub at Chennai. Initial services will begin with four A-320s and “ten additional airliners will be added every year”. Air Asia is awaiting approval from the Civil Aviation ministry to start flights for which the MHA is currently awaiting security-clearance for board members. Tony Fernandes, AirAsia’s founder, said that his key goals were “to offer low ticket prices in a country where most airlines are increasing them”.

It is not coincidental that some Indian carriers have reduced fares on announcement of AirAsia’s entry into the Indian market. On the ticketing front, AirAsia India has tied up with online travel agencies *Makemytrip* and *Yatra* even though AirAsia has traditionally avoided travel agents, but has now reviewed its policy since majority of air tickets in India are purchased through online travel agents.

### Afghan Army training in India

As part of its ongoing efforts to support the Afghan Government after pull out of the coalition forces in 2014, the Government of India will step up training of Afghan National Army cadres and is also re-considering the supply of military equipment to this nation. An increase in the number of ANA personnel trained in Indian Army establishments will go up from 574 to over 1000 whose training includes counter-terrorism operations, military field craft, intelligence, counter-improvised explosive devices (IEDs), information technology, battlefield nursing assistance and, of course, proficiency in the English



language. Afghan personnel are also attached to the Infantry School at Mhow, Artillery School at Devlali and Mechanised Infantry Regimental Centre at Ahmed Nagar for specialised courses. In addition, several Indian officers have been posted to Afghanistan to teach basic military and language skills, while Indian military doctors have been assigned to Afghan hospitals. Also under consideration is the training of Afghan pilots for operating Mi-35 gunship helicopters, with the Indian Air Force operating this type for over three decades.

### HAL Cheetals for Afghanistan Air Force

Hindustan Aeronautics Limited is to shortly supply three Cheetal helicopters to the Afghan Air Force. The Cheetal is a re-engined version of the Cheetah, which has been manufactured by the HAL Helicopter Division for more than four decades and is a development of the French Aérospatiale SA315 Lama. Compared to the Cheetah, the Cheetal has improved hot and high performance and can operate at altitudes up to 22,965 ft (7,000m), with a range of 400 miles (640km) and a three-and-a-half hour endurance.



### Air India "alters" operating norms for Airbus A320s

In a move to increase fuel efficiency and engine life, Air India's operations planning directorate have altered the acceleration altitude during the take off segment for its Airbus A320 fleet. The new norms, the management cites, is operated by many reputed airlines worldwide including Lufthansa. The Indian Commercial Pilots Association (ICPA), the union of former Indian Airlines



pilots, have however opposed the change, saying it violated safety guidelines. "We would like to state that even the manufacturer (Airbus) specifies that if the company decides to set all engines acceleration altitude to 800 ft and select a higher one-engine inoperative acceleration altitude, a detailed study needs to be performed by the company's flight operations engineer," the ICPA challenged.

### Air Costa to launch with ERJs

Air Costa of Vijayawada has reportedly acquired three E-Jets for launch of its scheduled regional airline services in India. Two Embraer 170s have been arranged from ECC Leasing, Embraer's wholly-owned subsidiary and the new carrier has also purchased one new Embraer 190 from Embraer. Air Costa will initially connect cities in southern India such as Bangalore, Chennai, Hyderabad and Vijayawada, as well as key secondary cities in the north and northwest of the country.



### AW119Ke helicopters for Kestrel Aviation

Two AW119Ke single engine helicopters have been received by Kestrel Aviation, a privately owned helicopter operator based in Mumbai. The AW119Ke helicopters, both in VIP configuration, will be delivered to Kestrel Aviation during the last quarter of 2013 and will join two others of the same model already in service. Nearly 50 AgustaWestland commercial helicopters have been sold to Indian operators in the last six years comprising the AW119 Koala, AW119Ke, AW109 Power, Grand, GrandNew and AW139 models. OSS Air, an AgustaWestland Authorised Service Centre, provides local support including maintenance, spares and training services from its main bases at Delhi, Mumbai and Bangalore.



### Air Works agreement with Gulfstream

Air Works India, the country's leading third party MRO have signed an exclusive spare parts consignment agreement with Gulfstream under which Air Works will arrange for parts warehousing, custom clearance and delivery to customers while Gulfstream positions frequently needed aircraft replacement parts at Air Works' warehouse adjacent to Bengaluru International Airport.

Gulfstream began stocking parts at Air Works' warehouse in April 2013, the inventory including rotatable and consumable parts for all in-production Gulfstream business jets along with out-of-production models such as the GV, GIV and G200. The Gulfstream fleet in India has grown from five aircraft in 2001 to more than 20 presently.

### PSLV-C22 launches Navigation Satellite IRNSS-1A

On 2 July 2013 ISRO's Polar Satellite Launch Vehicle PSLV-C22 successfully launched IRNSS-1A, the first satellite in the Indian Regional Navigation Satellite System (IRNSS), from the Satish Dhawan Space Centre at Sriharikota,



being the twenty-third consecutively successful mission of the PSLV. The 'XL' configuration of PSLV was used for the mission, while earlier the same configuration of the vehicle was used to launch Chandrayaan-1, GSAT-12 and RISAT-1 satellites.

After a flight of 20 minutes 17 seconds, the IRNSS-1A satellite, weighing 1425 kg, was injected to the intended elliptical orbit of 282.46 km X 20,625.37 km. After injection, the solar panels of IRNSS-1A were deployed automatically. ISRO's Master Control Facility (at Hassan, Karnataka) assumed control of the satellite, thereafter, five orbit manoeuvres were conducted from the Master Control Facility to position the satellite in its Geosynchronous Circular Orbit at 55-degrees East longitude.



IRNSS-1A is the first of the seven satellites constituting space segment of the Indian Regional Navigation Satellite System. IRNSS is an independent regional navigation satellite system designed to provide position information in the Indian region and 1500 km around the Indian mainland. IRNSS will provide two types of services, namely Standard Positioning Services (SPS) provided to all users and Restricted Services (RS) provided only to authorised users.

## Obsolescent Prithvi to be replaced by Prahar

The 150km range Prithvi I tactical ballistic missile in service with the Indian Army since 1994 is intended to be succeeded by the new Prahar TBM. The Prahar missiles are "more capable and have more accuracy", according to DRDO chief Avinash Chander. The gap in the 100-150 km strike range, created by the Prithvi's withdrawal, would be assumed by the Prahar, which solid fuel missile can be launched within 2-3 minutes and can also be fired in the salvo mode : four missiles from one launch vehicle and in various directions.



## MoS for Defence visits DRDO Labs

Visiting various DRDO establishments and HAL at Bangalore in the fourth week of July, Mr Jitendra Singh, Minister of State for Defence said that "the future weapons are going to be based on microwaves and lasers. Research & Development in the high end of technology is very complex and I am glad to



(Left to Right) Dr Lalitkumar Director MTRDC, Air Marshal S Sukumar, Minister Jitendra Singh, Anil Kumar, Dr.K Tamilmani CC R&D (Aero) & PM SoundraRajan, Director DARE

know that the thoughts in that direction is already underway”. He was presiding over release of the DRDO ‘Single High Band Transmitter’ for Airborne Applications during his visit to Micro Wave Tube Research & Development Centre [MTRDC]. The product was handed over by Dr Lalit Kumar to Mr Soundar Rajan, Director DARE and Dr K Tamil Mani DS & Chief Controller R&D (Aeronautics).

The Minister also visited the Gas Turbine Research Establishment [GTRE] and witnessed an engine run, the minister stressing that India should initiate the development of aero engines on ‘consortium basis’ to make the country self-reliant in this area.

The Minister also visited the Centre for Airborne Systems [CABS] and made a flight in the indigenous AEW&C aircraft.

## Agni-V to be test-fired twice in 2013

Mr Avinash Chander, SA to the RM and DG DRDO, has said that the 5000km Agni-V intercontinental ballistic missile will be launched twice in 2013 in preparation for its induction into service by end 2015. These tests will include launching the Agni-V from a hermetically sealed canister on a land vehicle to demonstrate its operational flexibility. The DRDO chief believes that six or seven trial launches are sufficient to demonstrate the Agni-Vs readiness for induction. “These surface-to-surface missiles have well-defined (parabolic) trajectories, unlike say air-to-air missiles. We conduct thousands of tests through modelling and simulation in our labs under different conditions. The actual flight trials are to validate what is predicted in simulation tests, match the algorithms,” stated Mr Avinash Chander.



## INSAT-3D delivered for Ariane 5 launch

INSAT-3D, built by the Indian Space Research Organisation (ISRO), was airlifted from India by a chartered An-124 cargo jetliner and then moved from Félix Eboué Airport near Cayenne to the Spaceport’s payload preparation facilities in mid-June 2013. The meteorological satellite will carry weather forecasting

payloads, along with a search and rescue relay system, and has a mass at liftoff of approximately 2,100 kg and offers 1,100 W of power.

Designated Flight VA214 in Arianespace’s numbering system, this upcoming mission represents 214th launch of an Ariane family vehicle and will be the 70th flight of the heavy-lift Ariane 5. INSAT-3D will be orbited along with its co-cargo, the Astrium-built Alphasat satellite, as another of Ariane 5’s trademark dual-payload missions.



## INS Vikramaditya begins sea trials

INS *Vikramaditya* (erstwhile *Admiral Gorshkov*) began final round of sea trials in the White Sea in early July. According to the Sevmarsh Shipyard, the aircraft carrier will be handed



over to the Indian Navy by November 2013, and that “all issues of concern after last year’s trials have been resolved”. However, asbestos is still used as insulating material in the boilers despite the Indian Navy’s reluctance but snags in the air conditioning and reverse osmosis plants have been rectified. “There were defects in various machinery of various origins. All these things have now been sorted out,” said Micheal Budnichenko, General Director of the Sevmarsh Shipyard. The *Vikramaditya* was to join the Indian Navy in 2008, but the programme has been plagued by price escalations and delays. If the final trials are completed by 15 September 2013 as Sevmarsh Shipyard intends, the INS *Vikramaditya* will enter the Indian Navy’s service by end-2013.

## Navy to induct another N-submarine ?

According to reports from St Petersburg, the Indian Navy is considering lease of another nuclear submarine from the Russians, in addition to the *Akula* II-class INS *Chakra* that entered service with the Navy in April 2012. The nuclear powered submarine is likely to be reconstructed around the hull of the *Iribis*, an *Akula*-class submarine whose development was suspended owing to lack of funding. The Malachite Design Bureau, primary centre for nuclear attack submarines in Russia,



remains optimistic that the negotiations proceed at a rapid pace and that the industry should have no difficulty in delivering what is required of it. Developments from the *Yasen* class submarine would also be incorporated into the Indian submarine, including a vertical launch system that allows the firing of a cruise missile from the deck of the submerged vessel. This would mean that the submarine will have capability to vertically launch Brahmos missiles from its deck.

## Submarine-launched version of BrahMos

The Indian Navy and DRDO have successfully carried out maiden test firing of the submarine-launched version of BrahMos supersonic cruise missile in the Bay of Bengal. According to BrahMos CEO A Sivathanu Pillai, "This is the first test-firing of an underwater supersonic cruise missile anywhere in the world and the missile travelled its complete range of over 290km". He added that the performance of the missile during the test launch was "perfect".



Surface ship and ground-launched versions of the missile have been successfully tested and put into service with the Indian Army and the Navy. "BrahMos missile is fully ready for fitment in submarines in vertical launch configuration which will make the platform one of the most powerful weapon platforms in the world," Pillai said.

## BrahMos test fired from INS 'Tarkash'

On 22 May 2013 a BrahMos supersonic cruise missile was successfully test fired off the coast of Goa from the Navy's latest guided missile frigate INS *Tarkash*. The missile performed the high-level 'C' manoeuvre in the pre-determined flight path and



successfully hit the target. INS *Tarkash*, which is an advanced *Talwar*-Class frigate was commissioned on 9 November 2012. This warship, along with two other frigates of the class, INS *Teg* and INS *Trikand* have been built as part of an Rs 8,000-crore contract signed between India and Russia in July 2006. INS *Teg* was commissioned on 27 April 2012 and the commissioning of INS *Trikand* is expected shortly. The weapons suite of INS *Tarkash* includes surface-to-air and surface-to-surface missile systems, 100 mm medium-range gun, close-in weapon system, torpedoes and anti-submarine rockets. All the three ships will be equipped with 8 vertical-launched BrahMos missiles as the prime long-range strike weapon.

## Coast Guard's all-woman crew on Do 228

On 19 June 2013, a Dornier 228 maritime patrol aircraft of Coast Guard Air Squadron 750, based at Daman, was operated with an all-woman crew comprising of Asst Comdt



Neetu Singh Bartwal (captain of the aircraft), Asst Comdt Neha Murudkar (pilot in command) and Asst Comdt Shristi Singh (co-pilot). During this mission, the crew flew a maritime mission for over an hour and landed back to a warm welcome by the Station Commander, officers and men of Coast Guard Air Station Daman.



*INS Trikand at Kaliningrad immediately on commissioning.*

## Stealth Frigate INS 'Trikand'

On 29 June 2013, INS *Trikand*, the last of three 'Follow On *Talwar-Class*' frigates built in the Russian Federation, was commissioned into the Indian Navy at Kaliningrad, Russia by Vice Admiral R K Dhowan, VCNS Indian Navy. "This marks culmination of a three-ship contract for this class built in Russia and is a milestone in Indo-Russian military-technological cooperation". Her sister ships INS *Teg* and INS *Tarkash* were commissioned last year and are now with the Western Fleet. The keel of INS *Trikand* was laid on 11 June 2008 and the ship launched on 25 May 2011, followed by extensive acceptance trials conducted in the Baltic Sea during April-May 2013.

weapons such as torpedoes and rockets and an advanced Electronic Warfare system. The weapons and sensors are integrated through the Combat Management System 'Trebovanie-M', which enables the ship to simultaneously neutralise multiple surface, sub-surface and air threats. The ship also incorporates innovative features to reduce radar, magnetic and acoustic signatures, which have made this a stealth frigate. The ship is powered by four gas turbines and is capable of speeds in excess of 30 knots. The ship embarks a Kamov Ka-31 AEW helicopter.

## Commissioning of ICGS 'Vaibhav'

Indian Coast Guard Ship *Vaibhav* ('Grandeur'), third in the series of 90 metres length offshore patrol vessels (OPV) was commissioned at Tuticorin by Vice Admiral Anurag G Thapliyal, DG Coast Guard on 21 May 2013.

This OPV of 1940 tonnes has been designed and built indigenously by GSL and fitted with state-of-the-art navigation and communication equipment, sensors and machineries. Features include an Integrated Bridge System (IBS), Integrated Machinery Control System (IMCS), Power Management System (PMS), High Power External Fire Fighting System (ABS Fi-Fi Class-1) and an indigenous Close Range Naval Gun (CRN-91) along with an optical fire control system. The ship will carry one helicopter and five high speed boats for search and rescue, law enforcement and coastal patrol. The ship is also capable of carrying pollution response equipment to combat oil spills at sea and is fitted with advanced Global Maritime Distress and Safety System (GMDSS).



*VCNS Vice Admiral RK Dhowan inspects guard of honour with INS Trikand in backdrop.*

INS *Trikand* has a state-of-the-art combat suite which includes the supersonic BrahMos missile system, advanced Surface-to-Air missiles *Shtil*, upgraded A190 medium range gun, electro-optical 30 mm Close-in Weapon System, Anti-Submarine



## FDI in Defence

Clarifying some confusion that arose after the 16 July meeting chaired by the Prime Minister on the increase of FDI in Defence, a subsequent Governmental note has it that the FDI up to 26 per cent in defence manufacturing would be through the Foreign Investment Promotion Board (FIPB). Any proposal involving FDI increasing 26 per cent to the 49 per cent upper limit, however, will be decided by the CCS if it entails induction of state-of-the-art technology.

“The finer details about what will constitute state-of-the-art technology and high-end technology will be spelled out after the Cabinet gives its formal approval to the proposal that is likely to happen next week. There is lot of confusion about various aspects of the FDI in defence. It is absolutely wrong to say that the limit can stretch up to 100 per cent. This is why the 49 per cent FDI upper limit will be reflected in the Cabinet note”, a senior official of the Department of Industrial Policy and Promotion (DIPP) clarified.

## Saab invests in Pipavav

In August 2012 Saab had announced that a Memorandum of Understanding (MOU) was signed on “strategic investment” in the listed Indian company Pipavav Offshore and Defence Engineering Ltd (Pipavav). The investment of SEK 250m has now been made in shares issued to Saab, which now holds approximately 3.3 per cent of the capital and votes in the company. The investment will be financed from Saab’s own readily available resources.

Pipavav is involved in the Indian naval domain “and has ambitions to grow in other areas of defence as well”. At the time the MoU was signed, Saab and Pipavav also concluded a Technical Partnership Agreement (TPA), being a continuation of an ongoing co-operation between the companies covering details about the format for continued relationships and relevant projects.

“We are pleased to announce this partnership and our strategic investment in Pipavav. The investment offers a solid platform for growth for us on the Indian market and Pipavav strengthens their competitive position through Saab’s technology. India is an important market for us and the investment will further reinforce Saab’s strong position on the global defence and security market,” stated Lars Olof Lindgren, Head of Market Area, Saab India.

Saab and Pipavav have previously jointly formed the Combat System Engineering Group, which analyses naval combat system design and architecture. The companies are also exploring next generation combat management systems for the Indian Navy and the Coast Guard.



Mr Håkan Buskhe, CEO of Saab seen with Mr Nikhil Gandhi, Chairman Pipavav after signing their Agreement.

## Atlas Elektronik subsidiary in India

Atlas Elektronik have established its subsidiary Atlas Elektronik India Pvt Ltd with headquarters in New Delhi. The company’s primary objective “is to intensify the existing partnership with the Indian government and to initiate and expand cooperative ventures with Indian industry”. This includes the creation and fostering of relationships with the research and manufacturing facilities of the Indian Ministry of Defence and local companies.



(Left to Right) : Jose P Antony, Office Manager, Focke Schwarzger, Chief Operating Officer, Khalil Rahman, Chief Executive Officer, Darshan Chikker, Senior Vice President.

The Company will carry out market research, analysis, supply chain management and provide technical and logistical support to customers and to the German parent company. Volker Paltzo, Managing Director of Atlas Elektronik, commented: “With its impressively dynamic economy and growing political influence, India is of key significance to Atlas. With our new subsidiary Atlas Elektronik India, we wish to deepen the cooperation with the Indian clientele that has already been in place for many years.” Since the 1980s, Atlas has worked closely with the Indian MoD and with the Indian Navy and have provided four command and weapon control suites for the submarines of the *Shishumar*-class.

Atlas Elektronik GmbH in Germany are currently “looking forward to be part of some ambitious Indian Navy programmes in areas of sonars and torpedoes apart from the long term expansion programmes such as Project 75 (India)”.

## Sagem Sigma 95 navigation systems for Indian Air Force

HAL has ordered 107 Sigma 95 navigation systems kits from Sagem (Safran) for Indian Air Force combat aircraft. Developed and produced by Sagem, Sigma 95 is an autonomous hybrid inertial navigation system combining laser gyros and GPS/Glonass\* satellite navigation, “to ensure high-precision navigation and broad operational flexibility for both combat and special-mission aircraft”.

Following supply of an initial batch, bulk of the systems will be manufactured in India by HAL at its Korwa Division. Sagem is already a major supplier of inertial navigation systems for IAF combat aircraft, warships and other systems. Produced at Sagem’s Montluçon plant in the Auvergne region of south-central France, Sagem’s navigation systems are deployed on some of the latest military aircraft, including the Rafale fighter, A400M military transport, NH90 and EC725 Caracal helicopters.

## Chinook components by Dynamatic

**B**oeing and Dynamatic Technologies Limited have issued the first supplier contract in India for Boeing's CH-47 Chinook helicopter, with Dynamatic to manufacture the aft pylon and cargo ramp assemblies for the helicopter. "This contract is another demonstration of our commitment to partnering with India's aerospace industry to bring the best local talent and technologies to Boeing and in turn to our customers," said Boeing India President Pratyush Kumar. "Together we will implement advanced manufacturing processes, backed with industry best practices, to enable partners such as Dynamatic to succeed".

Dynamatic's relationship with Boeing began in March 2010 with a contract award to supply mission-and-power equipment cabinets for the Indian Navy's P-8I maritime reconnaissance aircraft. "Boeing's high-quality products and unique processes make it a terrific customer for us to have," said Udayant Malhoutra, CEO and managing director, Dynamatic Technologies Limited. "This order gives us the opportunity to be involved in Boeing's global supply chain at a whole new level."

## "Flawless performance" of Javelins in Yudh Abhyas

**D**uring the Indian and US Army joint exercise Yudh Abhyas, the Raytheon Company and Lockheed Martin Corporation Javelin Weapon System "gave flawless performance as an anti-tank guided missile. In recent years, Indian and US gunners have fired a total of 16 Javelin missiles with 16 direct-hits in multiple *Yudh Abhyas* joint exercises; the results speak for themselves," exclaimed Duane Gooden, president of the Javelin Joint Venture and director of the Raytheon Javelin programme. "These warfighters experienced reliability and user friendliness first hand."

"Javelin provides a key opportunity to strengthen US and India relationship and the Javelin Joint Venture regards it as a high priority. We are prepared to comply with India's requirement for major defence procurements," added Barry James, vice president of the Javelin Joint Venture and Javelin programme director at Lockheed Martin.



## Appointments

### Avinash Chander new SA to RM and DG DRDO

**A**vinash Chander was appointed as the new Scientific Advisor to Defence Minister, Secretary Deptt of Defence R&D and DG DRDO on 1 June 2013. "As an eminent missile scientist and chief architect of the Agni Long Range Ballistic Missile System, he envisioned and evolved the strategies for long range missiles and led the design and development of Agni series of missile systems, including the Agni A1, A2, A3, A4 and A5 providing cutting edge, decisive strategic weapon systems to the Armed Forces, which have led to development of the '5000+ km range Agni 5 Strategic Weapon System".



His pioneering research in the *Innovative Energy Management Guidance Scheme* has enabled utilisation of solid propulsion, the main thrust and the backbone of Long Range Missile System. Under his leadership, DRDO carried out extensive research and indigenously developed critical technologies such as composite rocket motors, re-entry carbon composite heat shield, advanced high accuracy navigation systems, flex nozzle control system, high-end real-time computing techniques. His expertise has provided necessary thrust for programmes of national importance such as underwater missiles, BrahMos cruise missiles, the Nag anti tank missile and various air defence systems. He laid the 'Technology Roadmap for Missile Complex Laboratories' and led R&D in the advanced Navigation Systems, Onboard Computers, Servo Valves and Seekers. In recognition of his "immense contributions towards strengthening the National Defence", Government of India has recently honoured him with the Padma Shri Award.

### Air Marshal Arup Raha is VCAS

**A**ir Marshal Arup Raha took over as Vice Chief of the Air Staff (VCAS) at Air Headquarters on 1 July 2013. The Air Marshal has flown an array of aircraft during his service career, has nearly 3400 hours of flying mainly on fighter aircraft, is a Qualified Flying Instructor and has served as Directing Staff



at Flying Instructors' School, Tambaram as well as at the Tactics and Combat Development Establishment of the IAF. He has functioned as an Inspector in the Directorate of Air Staff Inspection at Air Headquarters and as Staff Officer to the Chief of the Air Staff. In 1999 he was deputed as the Military and Air Attache at Kiev, Ukraine.

Air Marshal Arup Raha has held several operational assignments having been Commanding Officer of a fighter Squadron, Station Commander, AOC of frontline bases and Advance HQ Western Air Command at Chandimandir. He has also served as Deputy Commandant Air Force Academy, Hyderabad and SASO at Western Air Command. Before taking over as AOC-in-C Western Air Command, the Air Marshal was AOC-in-C of Central Air Command.

## Air Marshal SS Soman takes over as AOC-in-C, WAC

On 1 July 2013, Air Marshal SS Soman took over as Air Officer Commanding-in-Chief Western Air Command and was presented with a ceremonial Guard of Honour in front of HQ WAC. Thereafter, the Air Marshal addressed all the principal staff officers, spelling out his operational priorities and focus areas.

Air Marshal SS Soman has more than 3400 hours of flying on fighters and his senior assignments include Air Defence Commander at HQ WAC and as Senior Air Staff Officer at HQ WAC and HQ SWAC.



Air Marshal SS Soman with his senior staff officers including the SASO, Air Marshal BS Dhanoa, on the right

## RK Mathur takes over as Defence Secretary

RK Mathur, a 1977 Batch Indian Administrative Service officer of the Manipur-Tripura cadre, took over as Defence Secretary on 25 May 2013. Besides being the Chief Secretary of Tripura, he also served as the additional secretary and special secretary in the Ministry of Defence. Prior to his appointment as Defence Secretary, Mathur was Secretary for Defence production. He succeeds Shashikant Sharma, who has been appointed as the Comptroller and Auditor General (CAG) of India.



However, till the time of going to press, no name for the Secretary for Defence Production has been announced, two months after Mr Mathur moved to his new position.

## Air Marshal Paramjit Singh Gill is AOC-in-C Training Command

Air Marshal Paramjit Singh Gill took over as Air Officer Commanding-in-Chief, Training Command on 1 July 2013. Commissioned in 1975 in the fighter stream, the officer spent initial years of his flying career on the Gnat light fighter before moving to the MiG-23BN. The Air Marshal is a highly experienced CatA Flying Instructor with more than 1000 hrs of instructional flying and about 4000 hrs of total flying.



He was an instructor at the Flying Instructors School for about 3 years and commanded No.31 Squadron, was Chief Instructor at Air Force Station Bidar and then went to command the Tactical Air Centre at Ambala. He was AOC Air Force Station, Kalaikunda, which has since become a 'model station' for the conduct of international air exercises.

His next appointment was as Assistant Chief of Integrated Defence Staff (Joint Operations) at HQ IDS, and later took over as Commandant, College of Air Warfare, Secunderabad from where he moved to Udhampur as AOC J&K. He was SASO Central Air Command before taking over as SASO Western Air Command.

## Air Marshal BS Dhanoa is SASO Western Air Command

On 1 July 2013, Air Marshal BS Dhanoa took over as Senior Air Staff Officer, WAC. He has flown over 3000 hours in

various frontline operational squadrons and is an A2 QFI with flying experience on the MiG-21 and Kiran aircraft.

The Air Officer has held various command and staff appointments including Chief Operations Officer of a fighter base, was CO of a MiG-21 squadron and later Station Commander of a fighter base. He also commanded an Indian Military Training Team abroad and has also served as Chief Instructor (Air) at the Defence Services Staff College, Wellington before becoming Assistant Chief of the Air Staff (Intelligence) at Air HQ (VB). Prior to assuming his present appointment, the Air Marshal was Senior Air Staff Officer of Eastern Air Command at Shillong.

## Lt Gen Sanjiv Chachra takes over Northern Command

**L**t Gen Sanjiv Chachra took over as GOC-in-C Northern Command on 1 July 2013. The General Officer has seen active combat service on the Siachen Glacier, high altitude border areas of the North and North East, and commanded the 16th Battalion, Rajput Regiment in counter insurgency operations. He later commanded a brigade on the Western Sector and a frontline Mountain Division deployed along the northern borders. The General commanded a pivot Corps in the Western Sector and was General Officer Commanding-in-Chief, Western Command prior to assuming command of the Northern Army.



## Lieutenant General Philip Campose is GOC-in-C Western Command

**L**ieutenant General Philip Campose took over as General Officer Commanding-in-Chief of Western Command on 1 July 2013. The General Officer was commissioned in the 9th Gorkha Rifles in 1974 and is an alumnus of the St Xavier's School Delhi, the National Defence Academy Khadakwasla (Pune) and Indian Military Academy at Dehra Dun. He later transferred to the Mechanised Infantry Regiment in 1982.

The General's assignments include command of a Mechanised Infantry Battalion, an Independent Armoured Brigade, an Infantry Division on the Line of Control in J&K and a Corps in the Western Sector. He has attended a tactical course in Russia and served in UN Peace Keeping in the former Yugoslavia and Northern Iraq where he was the head of mission. He has also taken over as Colonel Commandant of the Mechanised Infantry Regiment.



## Lt Gen Vijay Kumar Saxena is DG Army Air Defence

**L**ieutenant General Vijay Kumar Saxena has taken over as Director General of Army Air Defence, having had two tenures in the Military Operations Directorate, instructional experience in India and abroad and command experience of his unit and formation in active Counter Insurgency Operations in Northern Command. He was Brigadier General Staff (Information Warfare) at HQ Northern Command besides serving as Deputy Director General Equipment, as well as in the Army Air Defence Directorate and was Additional Director General of Army Air Defence at Army HQ. The General Officer is a prolific writer on military subjects and his articles are regularly published in professional magazines.

## R/Adm Srinivas Kanugo is first ACNS (Air Materiel)

**R**ear Admiral Srinivas Kanugo assumed office as the first Flag Officer in the newly created post of Assistant Chief of Naval Staff (Air Materiel) at the Integrated Headquarters MoD (Navy), on 17 July 2013.



The post has been created as the single point of responsibility for all matters related to aviation technical management of the burgeoning air arm of the Indian Navy. The ACNS (AM) will be responsible for planning and co-ordination of new inducted air equipment and systems, repair and overhaul of all existing aircraft, aero engines and associated equipment and systems as well as provisioning of air stores.

The Indian Naval Air Arm operates over 200 aircraft comprising 20 different types ranging from supersonic fighters to long range MR/ASW aircraft, a variety of helicopters and UAVs. Indian Naval aviation has attendant needs for growth in infrastructure with the addition of new air stations like INS *Parundu* in Ramnathapuram, INS *Baaz* in Campbell Bay and multiple air enclaves across the country.

Rear Admiral Srinivas Kanugo is an air electrical engineer who has held numerous appointments on ships and at air establishments during his near 32 years of commissioned service in the Navy. He was earlier Chief Staff Officer (Technical), Headquarters Naval Aviation and Principal Director, Directorate of Naval Air Materiel at IHQ MoD (Navy).

## S Ravind is Director, LRDE

**'**Outstanding Scientist' S Ravind has been appointed as Director of the Electronics & Radar Development Establishment (LRDE), unit of DRDO, Bangalore assuming charge from Varadarajan on 31 May 2013.

S Ravind was involved in the design and development of Indra I and Indra II phased array radar, the Rajendra radar and the Akash weapon system.



# Hell & Heroism in the Hills



## The Himalayan Tsunami of 2013

**D**uring two terrifying weeks in June 2013, the North Indian states of Uttarakhand and Himachal Pradesh experienced tremendously heavy rainfall that triggered devastating floods and landslides. Uttarakhand bore the brunt of the devastation, with estimates of the death toll from the disaster varying at between 1000 and 10,000. However, with debris still to be cleared across much of the affected areas, it is expected that this disaster was truly of Himalayan proportion.

Damage to bridges and roads left over 70,000 pilgrims and tourists in addition to hundreds of thousands of locals trapped in difficult hill terrain. The scale of the crisis led to the military and paramilitary forces of the nation springing into action, with the Army, Air Force, Navy, Indo-Tibetan Border Police (ITBP), Border Security Force, National Disaster Response Force

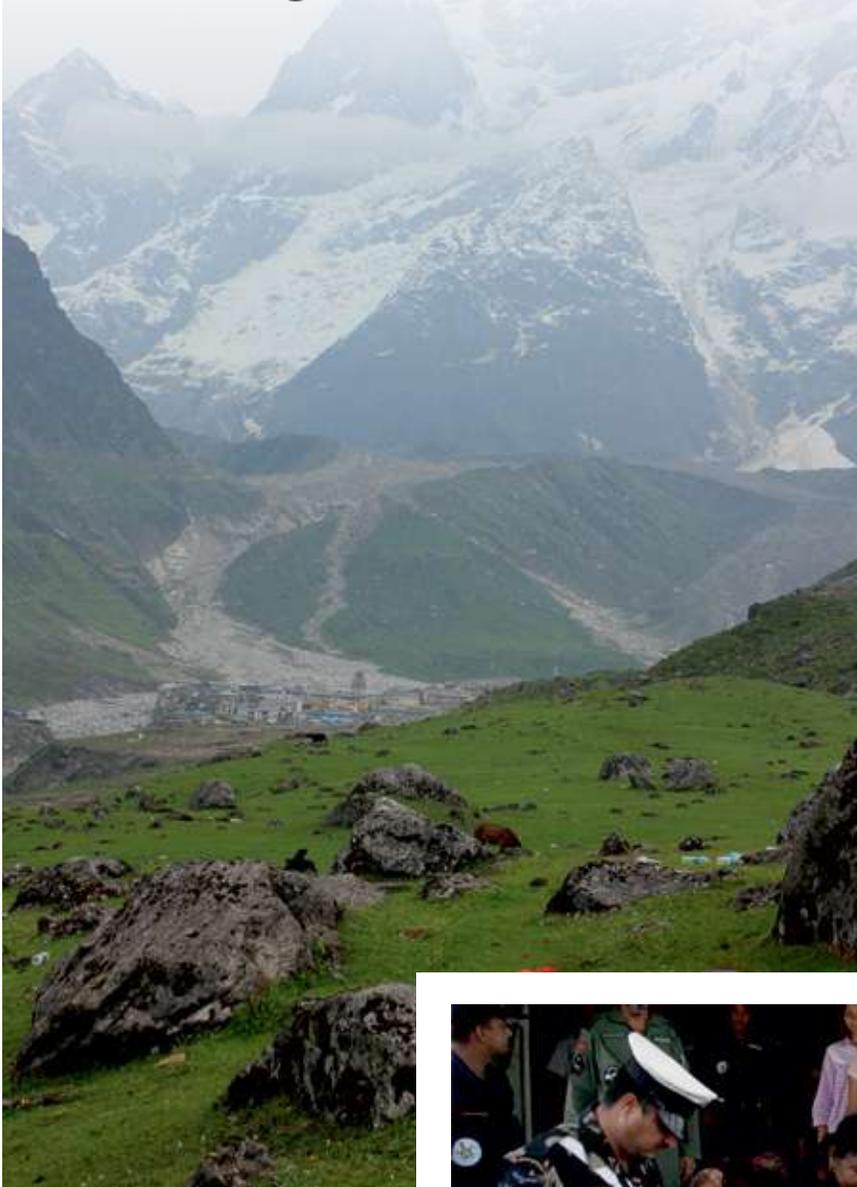
(NDRF), Public Works Departments and local administrations coming together to conduct relief operations. By early July,

some 110,000 people had been evacuated, of which over 20,000 were rescued in air operations conducted by the Indian Air



*Boulders strewn around the Kedarnath temple.*

# Scenes in Uttarakhand, June 2013



Force and the Army Aviation Corps – one of the largest such air rescue operations in recorded history.

Several thousand soldiers of the Army and ITBP were deployed for the rescue missions and because of the nature of terrain, helicopters were used extensively for airlift and supply drops. By 21 June, the Army had deployed 10,000 soldiers and 11 helicopters, the Navy had sent 45 naval divers, and the Air Force had deployed 43 aircraft (including 36 helicopters).



## Operation Rahat

*Operation Rahat* ('Solace') was the code given to the Indian Air Force's rescue operations to assist civilians affected by the disaster unfolding in Northern India. On 16 June, following the flash floods, assistance was sought from the IAF for relief operations. Western Air Command (WAC) promptly responded and undertook simultaneous tasks in the sectors of Yamunanagar, Kedarnath-Badrinath axis, Rudraprayag valley and the Karcham-Puh axis. Air Commodore Rajesh Isser was appointed Task Force Commander of *Operation Rahat*.

The Air Force Station at Sarsawa near Saharanpur was made the hub of operations with helicopters coming in from various bases in the country, including Bhatinda, Hindon and Barrackpore. Units involved included 152 HU from Sarsawa itself, 155 HU from Bhatinda and 157 HU from Barrackpore, all with Mi-17s and 116 HU with Dhruv ALHs.

By 19 June, the IAF had deployed 20 aircraft including 8 Mi-17 medium helicopters, 10 Dhruv light helicopters (including four from the *Sarang* display team), one An-32 transport aircraft and one HS748 transport aircraft to carry out continuous missions. A C-130J flew reconnaissance missions over flood-affected areas in order to identify critical areas to help prioritise relief operations.

As rescue efforts progressed, the IAF activated advanced landing grounds at Gauchar and Dharasu in Uttarakhand to establish a fuel bridge for helicopter



movement. On 22 June, a C-130J from No. 77 Squadron landed at the 3300 ft airstrip at Dharasu and offloaded 8000 litres of fuel into an empty bowser which had been airlifted the previous day from Sarsawa by a Mi-26. On its return trip the C-130J flew out some 40 injured and stranded pilgrims to Air Force Station Hindan. A second C-130J carried another 100 pilgrims back to Hindan where an emergency medical centre had been set up.

On 25 June, however, in a tragic accident, a Mi-17V5 helicopter from 157 HU (Barrackpore) was returning from a rescue mission when it crashed north of Gaurikund in Uttarakhand. All 20 on board including 5 Air Force officers, 9 NDRF personnel and 6 ITBP personnel were killed. Air Chief Marshal NAK Browne, Chief of the Air Staff, signalled “We owe it to the lives our people whom we have lost, that we sustain the mission and complete it successfully.”

The IAF continued to operate in poor weather conditions and complex terrain, maintaining an incredibly high sortie

rate. With activation of the fuel dump at Dharasu, relief operations gathered momentum and more aircraft, both fixed-wing and rotary, were pressed into service. By the end of the operation, some 64 aircraft, had been involved, flying over

2,100 sorties, evacuating some 19,000 people and transporting more than 380 tonnes of material. If not the largest air rescue operation in the world, this was certainly the largest in the history of India South Asia!



## IAF aircraft involved

- 37 Mi-171V/Mi-17V5 medium-lift helicopters
- 14 HAL Dhruv light helicopters
- 3 HAL Cheetah light Helicopters
- 1 Mi-26s heavy-lift helicopter
- 3 C-130J tactical transport aircraft
- 3 An-32 medium transport aircraft
- 1 HS-748 medium transport aircraft
- 1 Il-76 heavy transport aircraft
- 1 Dornier 228 light transport aircraft

## Operation Surya Hope

The Indian Army's rescue efforts were conducted under the codename *Operation Surya Hope*. This operation was the successor to *Operation Ganga Prahar*, the Army's initial response to the disaster. *Operation Surya Hope* commenced on 19 June, and was overseen by Lieutenant General Anil Chait, then GOC-in-C Central Command.

On 19 June, there were 5,600 Army personnel in the affected area. By 27 June, Army personnel in the mission area had risen to above 8,500. The Army's disaster response units included infantry battalions, signals regiments, engineer regiments, advance dressing stations and other medical units, logistic and supply assets, Special Forces, specialised mountain troops, paratroopers, and Army Aviation Corps rotorcraft. The Army Aviation Corps deployed 13 helicopters





including Dhruv ALHs of 205 AA Squadron from Mamun Cantt (Pathankot) over the course of what was to become one of the largest humanitarian missions in Indian Army history.

Heliborne rescue operations conducted by the AAC from 19-30 June encompassed over 660 sorties with more than 3,300 victims rescued and 20 tonnes of relief material carried.

In all, the Army, under *Surya Hope*, delivered over 24 tonnes of relief material and evacuated 33,000 affected persons. By the close, over 10,000 troops had been deployed, and had operated in synergy with the Indian Air Force, Border Roads Organisation (BRO), National Disaster Response Force (NDRF), Indo-Tibetan Border Police (ITBP), and other paramilitary organisations engaged in rescue work in the affected area.



# The Indian Air Force and Army in rescue operations

(Photographs Courtesy MOD)



# Fly Navy !



## Sun, Surf and Supersonic fighters at Goa

*60 years of Indian Naval Aviation were commemorated in May 2013 with commissioning of the Navy's first multirole combat aircraft squadron – INAS 303 'Black Panthers' – equipped with the MiG-29K/KUB shipborne fighter. Vayu spent four days in Goa to bring readers this comprehensive overview of Indian Naval Aviation as well as on commissioning ceremony of the 'Black Panthers'.*

India's first Naval Air Station, INS *Garuda*, was commissioned on 11 May 1953 at Willingdon Island in Cochin. The Naval Air Arm's first aircraft type was the Short Sealand amphibian, the first of which (IN101) landed at Cochin in February 1953. The Sealands were part of the 'Fleet Requirement Unit' (FRU) which later became the Navy's first air squadron, INAS 550, in 1959.

The acquisition of the *Majestic*-class aircraft carrier INS *Vikrant* in 1961 brought Indian Naval Aviation into its own. The induction of *Vikrant* was accompanied by the acquisition of Hawker Sea Hawk fighters, Breguet Alizé ASW aircraft and Aérospatiale Alouette III helicopters. The Naval Air Arm would

HAL Dhruvs of INAS 321 ALH Flt with their distinctive wheeled undercarriage



Sea King formation, led by Sea King Mk.42C followed by a Mk.42B

Top of page : INAS 321 Chetak leading the flypast

go on to prove its worth in a number of actions, notably the Indo-Pakistan War of 1971. *Vikrant* was supplemented and then replaced by the *Centaur*-class carrier INS *Viraat* (formerly HMS *Hermes*) in 1987, with the BAE Sea Harrier VTOL fighter operating off the ski-jump equipped deck of the new carrier. Over the decades, the Navy has commissioned a number of air stations across India and inducted various aircraft, covering all aspects of naval warfare.

Sixty years to the day from when the Navy first 'got its wings,' and a little over fifty years from induction of the first carrier-based aircraft, the first operational MiG-29K/KUB squadron was commissioned on 11 May 2013 at INS *Hansa*, Goa, in the presence of Defence Minister AK Antony and a galaxy of Flag Officers, both current and former. These included Chief of Naval Staff Admiral DK



An INAS 310 Dornier 228



INAS 339 Kamov Ka-31 AEW helicopters showing their contra-rotating rotors to good effect

the newest combat squadron of the Navy. AK Antony said he was confident that the squadron would make a significant contribution in “enhancing peace and stability in the Navy’s area of operations” and would provide “effective safeguards for unhindered economic development of India and other friendly nations” in the Indian Ocean Region (IOR). The Defence Minister also emphasised the importance of India maintaining an edge over its adversaries in defence preparedness through the acquisition of new technology and intensive training.

In the tradition of numbering Naval fighter squadrons in the ‘300s’, the *Black Panthers* have been given the squadron number 303, in reference to the .303 calibre rifle cartridge developed in the late 1800s. The .303 was an accurate and devastating cartridge, setting the standard for firearm design

Joshi and FOC-in-Cs of the Navy’s three commands : Vice Admirals Shekhar Sinha (WNC), Anil Chopra (ENC) and Satish Soni (SNC), along with the C-in-C Strategic Forces Command, V/Adm SPS Cheema, the DCNS V/Adm PK Chatterjee, ACNS (Air) R/Adm DS Sudan, Chief of Staff ANC, R/Adm Sudhir Pillai, FOCWEF R/Adm Abhay Karve and FOMAG R Adm Karambir Singh. Former Flag Officers in attendance included V/Adm Vinod Pasricha, who commanded INAS 300 and was commissioning CO of INS *Viraat*, along with three former Chiefs of Naval Staff, Adm Radhakrishna ‘Ram’ Tahiliani, Adm Arun Prakash and Adm Sureesh Mehta.

Chief of the Naval Staff Admiral DK Joshi, inspected a guard of honour along with Defence Minister AK Antony, congratulating the officers and sailors, reminding them of the honour and responsibility that came with commissioning of



Il-38SD of INAS 315



*The massive Tu-142M flew in over Dabolim from Arakonnam*



*Sea Harrier from INAS 552 in vertical take off*



*MiG-29KUB takes off conventionally*

over the better part of a century. It was therefore fitting that the game-changing capabilities of the MiG-29K be acknowledged with a nod to the venerable rifle cartridge! The squadron's insignia, in keeping with its 'Black Panthers' name, depicts a snarling black panther against blue waves and an azure sky.

The first commanding officer of INAS 303 is Captain Ajay Daniel Theophilus, an experienced Sea Harrier pilot and a Qualified Flying Instructor. He read the commissioning warrant:

*Whereas the Government of India has decided that Indian Naval Air Squadron INAS 303 be commissioned, you are hereby directed to commission the said Air Squadron on the 11th day of May 2013 or as soon as circumstance permit.*

*Indian Naval Air Squadron INAS 303 will be administered by the Flag Officer Commanding-in-Chief Western Naval Command.*

*Given under my hand on this the 22nd day of April 2013.*

*Admiral DK Joshi  
Chief of the Naval Staff*



*Two INAS 551 Kirans took part in the flypast, including one ex-Sagar Pawan aircraft*



*Sea Harriers break away from a MiG-29K as it pitches up to begin the 'vertical charlie'*



*MiG-29KUB lined up at the SBTF ski-jump*

Following the speeches, the commissioning of INAS 303 and landmark 60th anniversary of Naval Aviation in India was celebrated with a flypast comprising each type of aircraft presently operated by the Navy.

Leading the flypast was a trio of HAL Chetaks from INAS 321 'Angels', followed by Sea King Mk.42B and Mk.42Cs of INAS 336 'Flaming Arrows' and INAS 330 'Harpoons'. The Sea Kings were trailed by a pair of naval Dhruv ALHs from the ALH flight of INAS 321. Bringing up the rear of the rotary-wing procession was a pair of Kamov Ka-31 AEW helicopters from INAS 339 'Falcons.'

The fixed-wing aircraft were led by a three-aircraft formation of Dornier 228s from INAS 310 'Cobras,' followed by the two long-range maritime patrol types operated in India : an Il-38SD from INAS 315 'Winged Stallions' and a Tu-142M from INAS 312 'Albatross.' The thunderous drone of turboprops was then replaced by the ear-splitting roar of jet engines as a pair of HAL Kiran Mk.2 aircraft from INAS 551 'Phantoms' streaked past, followed by three Sea Harrier FRS.51s from INAS 300 'White Tigers' and INAS 552 'Braves.' The final formation was symbolic of the change wrought by the commissioning of INAS 303 – a single MiG-29K flanked by a pair of Sea Harriers approached at speed before pitching up sharply as the escorting Sea Harriers peeled off. The MiG-29K then executed a 'vertical charlie' manoeuvre, disappearing into the blue skies above Dabolim.

The flypast was followed by a tour of the MiG-29K-related facilities at Dabolim, including a look at the simulator, a highly accurate full flight simulator equivalent to Level D, which renders an experience so close to actual flight that it theoretically obviates the need for a pilot's first "solo flight"! Another highlight was a brief trip to the Shore-Based Test Facility (SBTF) ski-jump, an exact replica of the ramp on INS *Vikramaditya*. The completed SBTF will also include a land-based arresting gear arrangement to mirror that aboard *Vikramaditya* and is expected to be inaugurated later this year. Once the SBTF is fully operational, it will prove invaluable to development of the Naval LCA currently being developed alongside the LCA Mk.1 and Mk.2.



*The MiG-29K displays its impressive weapons load : R-77 AAMs, Kh-35 AshMs, rocket pods, plus a centreline fuel tank*



*MiG-29KUB thunders down the runway, past parked Il-38SDs of INAS 315*

At a press conference after the commissioning ceremony, the Defence Minister also stated that the first indigenous aircraft carrier (IAC-1) will be launched on 12 August 2013, and that a second operational MiG-29K squadron would be commissioned within the next two years. Other plans for the future were only briefly touched upon, but it was made clear that the Navy's rapid modernisation and expansion remains a priority despite growing budgetary constraints.

*All photos and text by Angad Singh*

Know your MiG-29K : a new generation, all-weather multirole fighter with a maximum speed of over Mach 2 and a ceiling of 65000 feet. Its digital fly-by-wire controls it exceptional agility in the air. In a first for the Indian Navy, the MiG-29K is fully equipped to engage targets in the air, at sea or on land. The type was first received in 2010 and the Navy quickly began to train a cadre of pilots to operationalise the aircraft, flying over 2500 hours and conducting a full range of armament trials in the ensuing period.

# INAS 303 tryst with history : 11 May 2013



*Virtually the real thing : cockpit of the MIG-29K simulator.*



*Adm DK Joshi and Defence Minister AK Antony inspect the guard of honour*



*Officers and personnel of INAS 303 with the Defence Minister.*



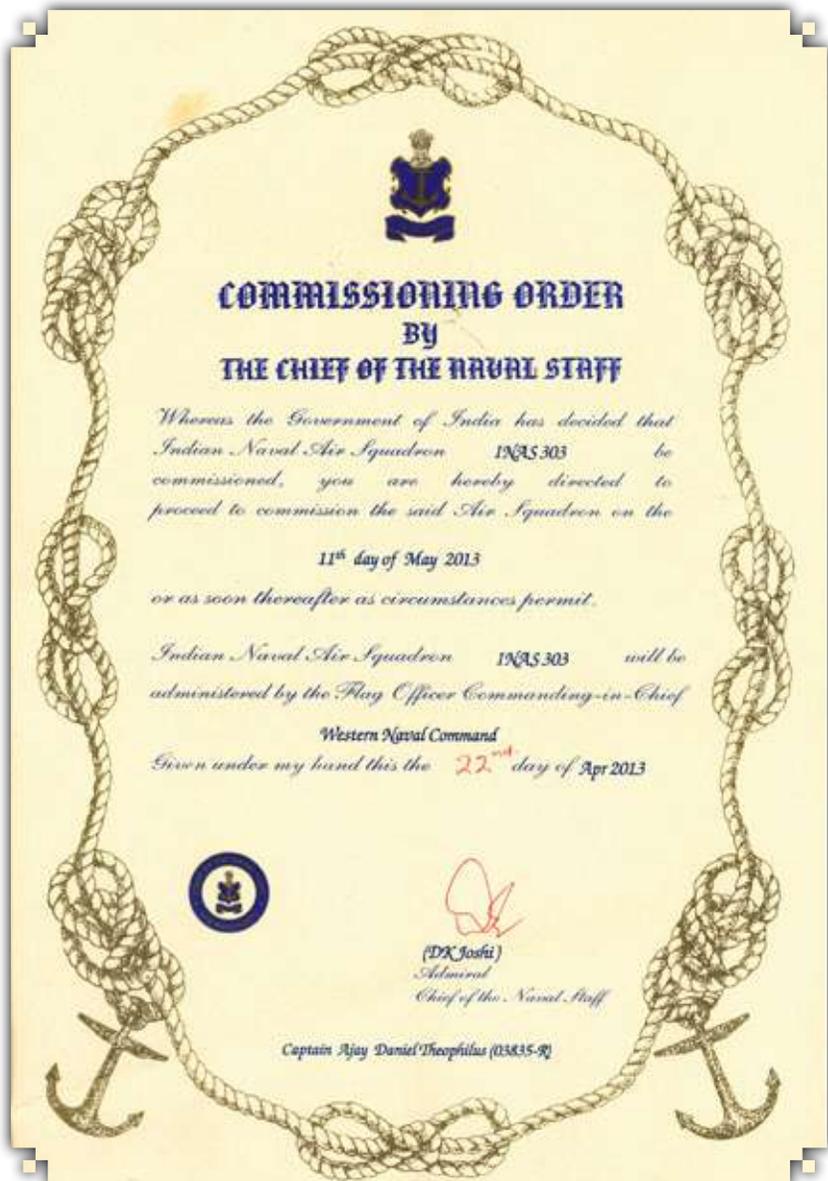
AK Antony with former CNS Adm Arun Prakash



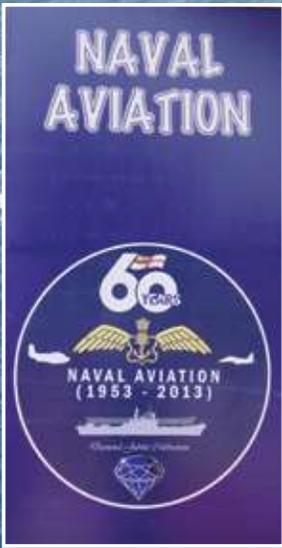
CO INAS 303 Capt AD Theophilus presenting a commemorative squadron commissioning plaque to AK Antony, with V/Adm. Shekhar Sinha at the centre.



In conversation with representatives from RAC-MIG



The Commissioning Order for INAS 303.



*'Admiral Gorshkov' a.k.a. INS Vikramaditya, during sea -trials.*

**Admiral Arun Prakash (retd), former Chief of Naval Staff feels that it is**

# **Time For Introspection, As Naval Aviation Turns Sixty\***

**S**ixty years is a significant period in the life of an organisation especially when viewed in the context of our 63-year old republic and its equally young navy. India's dream of reclaiming its ancient maritime heritage and its aspiration for attaining the status of a major power, call for a modern and robust maritime force, which is, in fact, taking shape before our eyes. It is obvious that in the intense 21<sup>st</sup> century threat-environment such a force will have to rely heavily on a strong air-arm for mission-accomplishment.

During the past 60 years the Indian Navy's air arm has seen remarkable growth, in quality and competence as well as in numbers. Having started with WW II vintage piston-engined machines like the Sealand amphibian and the Firefly fighter, it graduated to first-generation jets and turboprops with the arrival of



*An early type, the Fairey Firefly ...*

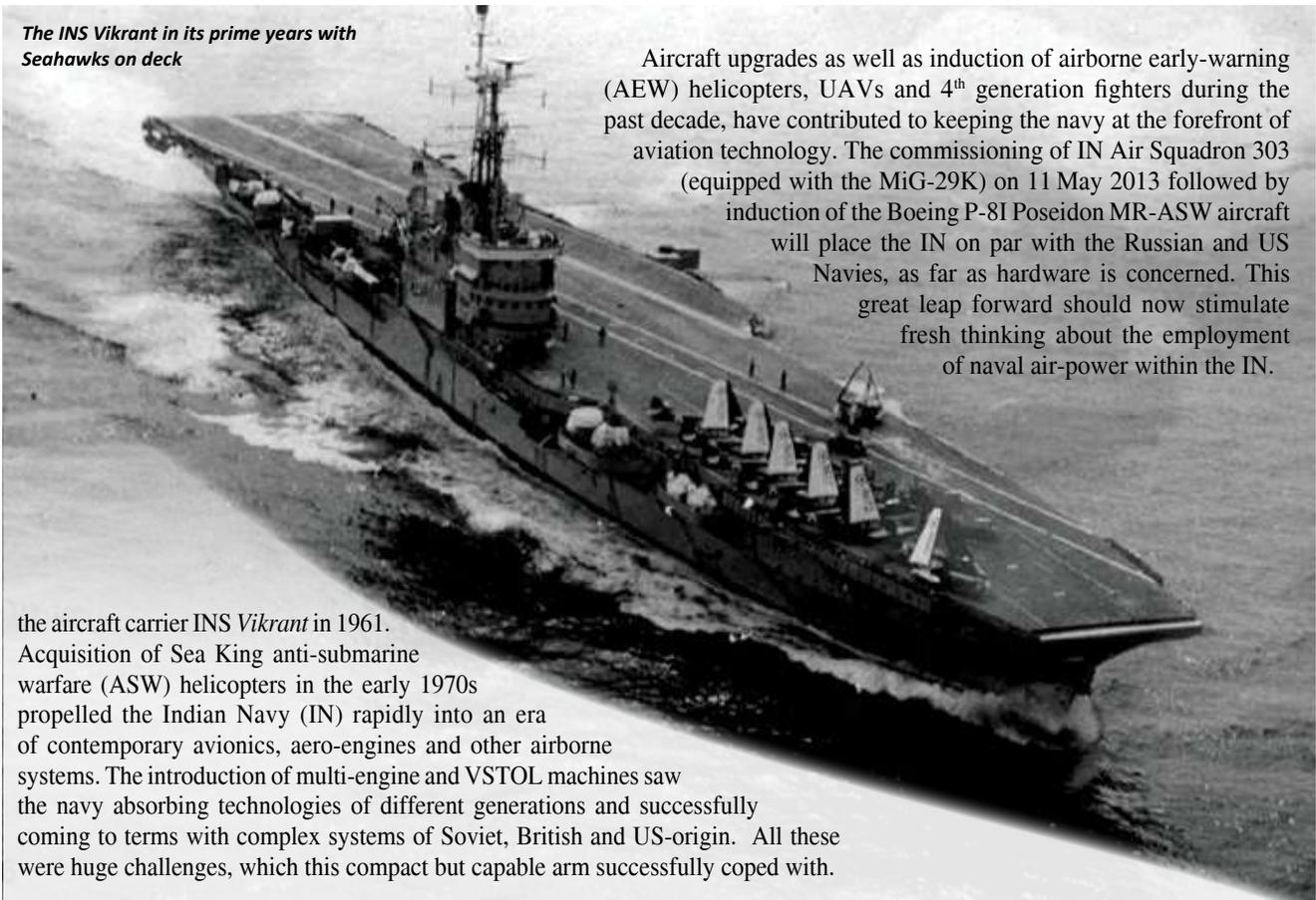


*... and the MiG-29K, the latest type.  
(photo: Angad Singh)*



*Iconic shot of INS Vikrant and mixed formation of IN Sea Harriers, IAF Maritime Jaguars and USN Super Hornets during joint exercises*

*The INS Vikrant in its prime years with Seahawks on deck*



Aircraft upgrades as well as induction of airborne early-warning (AEW) helicopters, UAVs and 4<sup>th</sup> generation fighters during the past decade, have contributed to keeping the navy at the forefront of aviation technology. The commissioning of IN Air Squadron 303 (equipped with the MiG-29K) on 11 May 2013 followed by induction of the Boeing P-8I Poseidon MR-ASW aircraft will place the IN on par with the Russian and US Navies, as far as hardware is concerned. This great leap forward should now stimulate fresh thinking about the employment of naval air-power within the IN.

the aircraft carrier INS Vikrant in 1961. Acquisition of Sea King anti-submarine warfare (ASW) helicopters in the early 1970s propelled the Indian Navy (IN) rapidly into an era of contemporary avionics, aero-engines and other airborne systems. The introduction of multi-engine and VSTOL machines saw the navy absorbing technologies of different generations and successfully coming to terms with complex systems of Soviet, British and US-origin. All these were huge challenges, which this compact but capable arm successfully coped with.

## Air Power at Sea

Recent military interventions by Western powers in Iraq and Afghanistan have given air-power a new aura and profile. Terminology like ‘shock and awe’ and ‘air dominance’ has come to be associated with the aggressive deployment of air power. It has also been said that modern air forces can attain quick military victories after establishment of air-dominance, at little or no cost in lives, thus rendering ground and maritime forces ‘obsolete’. Navies, however, must treat such claims with caution and retain clarity that air power is merely an instrumentality – albeit a powerful one - for gaining operational objectives; whether on land, sea or in the air. Therefore, even as they reflect over the potency and dominant influence of aviation on operations at sea, naval officers need to bear in mind that airpower remains a sub-set of maritime power. At the same time, they also need to re-think the navy’s traditional approach to maritime strategy.

For much of the past 60 years, the IN has lived in a Mahanian world; training and planning for battles on the high seas. The Service tended to ignore British strategist Julian Corbett’s admonition that “...it is almost impossible that a war can be decided by naval action alone. Since men live upon land, great issues between nations have always been decided by what your army can do against your enemy’s territory...”



Sea Harrier FRS MK.51 of INAS 300 climbs out (photo : Angad Singh)





The future : artist's depiction of an Indigenous Aircraft Carrier

The IN's first Boeing P-8I of INAS 312 on first landing at INS Rajali in Arakkonam



The Indian Maritime Doctrine has attempted to make amends by stipulating that “whatever concepts that maritime forces adopt, must eventually – directly or indirectly – impact affairs on land”.

For maritime operations to retain a linkage with the land-battle, IN task forces would need to operate in proximity of the enemy littoral. But before reaching the littoral, these forces would need to establish battle-space dominance, undertake shore air-strikes, and run the gauntlet of enemy air, surface and submarine threats. In such a dense threat-environment the air arm will have a crucial contribution to make to the success of maritime operations.

Against this backdrop, the navy’s leadership needs to introspect by casting a look at the wake - for which I have chosen four legacy issues – before bracing themselves for the great leap forward. The first issue relates to the aircraft carrier, centre-piece of the IN’s doctrine and strategy.



*Ilyushin Il-38SD of INAS 315 takes off from INS Hansa (photo : Angad Singh)*

### The Small Carrier Conundrum

The Indian Navy's commitment to carrier-borne aviation for over half a century, often in the face of determined attacks from many quarters, represents a demonstration of remarkable perseverance on the part of its leadership. It is also significant that carrier-aviation has always received support, not merely from the aviation community but right across the board in the navy. That is the reason why the IN has never been without a carrier for the past 50 years. While laudable in intent, and always fiercely defended, the navy's decision to focus its operational planning around a single aircraft-carrier had its drawbacks, especially when considered in the light of two factors:

Firstly, both INS *Vikrant* and *Viraat*, classed as 'light-fleet carriers', were the smallest in the flat-top family. Restricted in speed, they also had limitations on the size and number of aircraft that they could operate. Due to these constraints, both ships could only be equipped with subsonic aircraft of modest performance, during their operational life. Secondly, since the survival of the carrier in the face of superior shore-based air-forces, remained a question mark, Commanders-in-Chief and Fleet Commanders had to evolve innovative tactics to deploy these ships without exposing them to excessive risk.

The obvious question as to why the IN persisted for half a century with a force structured around a single, small and vulnerable carrier can be answered in two



*Lethality at sea: MiG-29K of INAS 303 with weapons load (photo : Angad Singh)*



*Providing airborne early warning, Kamov Ka-31 AEW helicopter (photo : Angad Singh)*



*A lone HAL ALH Dhruv (photo : Angad Singh)*



*Westland Sea King MK.42C 'Commando' (photo : Angad Singh)*

words: hope and apprehension. The hope was that the government would sanction the acquisition of a second carrier, or that the *Vikrant* would be re-equipped with Sky Hawk, Crusader or Etendard fighters. The apprehension, very deeply embedded, was that if it ever lost its carrier, even temporarily, it would become impossible to revive the precious deck-flying skills and the arcane art of carrier-aviation.

The solution lay in acquiring a bigger carrier which could operate more capable

aircraft and hold its own against all opposition. Since such ships were not on sale, the obvious answer was to build one in an Indian shipyard. Here again, the IN pitched its ambitions too low. The Directorate General of Naval Design started with the design of a 16,000 ton 'Harrier Carrier' in the mid-1980s, which slowly grew to a 25,000 ton 'air-defence ship' and ended as the 37,500 ton Indigenous Aircraft Carrier or IAC-1, due to be launched in Kochi on 12 August

2013. This ship is still smaller than most US Navy amphibious assault vessels. However, it must be borne in mind that that design options were circumscribed by Western sanctions relating to aircraft as well as ship components, such as a steam catapult. Moreover, an obdurate and uncomprehending MoD bureaucracy just could not bring itself to accord sanction to the project till 2004.

Since the *INS Vikramaditya* is a much larger ship, capable of operating state-of-



*HAL-built Dornier 228s of the Navy's INAS 310 Information Warfare Squadron (photo : Angad Singh)*



Admiral Arun Prakash, former CNS, with Admiral DK Joshi, present CNS, and AK Antony, Defence Minister at Goa during commissioning of INAS 303.

the-art fighters, its arrival will enhance the navy's freedom of action. The IN can now contemplate power-projection even in the face of opposition from adversary air forces. However, it is worth remembering that the Soviets were strangers to carrier aviation when they designed the VTOL-cum-helicopter carrying aviation-cruiser, *Admiral Gorshkov* 35 years ago. The range of its *Basalt* surface-to-surface missiles exceeded that of the cumbersome Yakolev-36 VTOL fighters it carried. The halting conversion of this ship to the STOBAR (short take-off but arrested landing) role, by an essentially submarine-building yard unfamiliar with aircraft-carriers, may throw up many challenges when the IN commences high intensity air operations at sea. Indian ingenuity is, however, certain to find a way around them.

It is, therefore, the IAC-2 that should become the focus of IN's planning and attention, because it will enter service at a juncture when the maritime balance of power in the Indo-Pacific region is delicately poised between China and India.

The Naval Staff Qualitative Requirements for the IAC-2 must be defined bearing in mind lessons of the past and the fact that carrier aviation will have a major role to play in the future maritime battle-space. The imperatives that must decide the ship's design should include:

- ⚓ The ability to operate heavy aircraft in light wind conditions that prevail in the Indian Ocean.
- ⚓ The ability to operate a fixed-wing airborne early-warning and control aircraft.

- ⚓ Capability for high sortie-generation rates and
- ⚓ The flexibility to combine roles such as air-defence, strike, ASW, littoral warfare and disaster-relief.

If the IAC-2 displacement is going to exceed 70,000 tons, it may become difficult to identify a steam, diesel or gas-turbine propulsion system powerful enough to impart speeds (of the order of 25-30 knots) necessary to launch fully loaded fighters. In such an eventuality, it would be prudent to seek technological assistance from the USA or France which have extensive experience of surface ship nuclear propulsion-plants.

The next issue relates to human resource management in the air arm.

### Consolidation of Expertise

As of today, over 200 aircraft, helicopters and UAVs, make our fleet air arm as big as many independent air forces world-wide. With two aircraft-carriers and perhaps 60-70 helicopter-carrying ships, the future navy is set to see the numbers exceeding 400 flying machines of all types. The peacetime operation, maintenance and management of these assets will require individuals of outstanding professional ability and depth of experience. Only then will the air-arm be effective in combat.

Historically, the IN has paid more attention to selection of aviation hardware than to the management of human resources. One of the possible reasons is that steady expansion over the past decades, has kept the air-arm in a state of flux, and not permitted time for adequate reflection. The other reason, of course, is a lack of a consensus on personnel management issues within the arm. However, the march of technology and the security environment may not permit the luxury of further procrastination.

In stark contrast to the IAF, which considers flying as the sole *raison d'être* of its General Duties (GD) officers, the IN has traditionally treated aviation as a sub-speciality of the Executive Branch. The direct consequence of these diverse approaches is that (in the first 15 years of service) while an IAF aircrew can devote his complete attention to honing his aviation skills, the IN aviator has to divide his time between gathering flying experience and acquiring ship-related qualifications. The net result is that flying experience is spread very thin in naval aviation. The crux of the problem in the IN can be summed up in the perception that *the demands of being a competent and professional aviator are in conflict with a successful career as a naval officer.*

The answer may, perhaps, lie in creating two cadres: one of hard-core aviation specialists, with a career path leading up to three-star rank, who will man all key aviation billets, while a subsidiary cadre could branch off into sea service after a flying tenure of 8-10 years. Whichever way ahead, this is a good juncture for the IN to undertake a reappraisal and invoke changes that will permit consolidation of aviation expertise amongst its aircrew.

This brings us to a closely related issue that of naval air-warfare doctrine.

### Air warfare doctrines

There was a time when the IN first acquired hardware and then thought about how to employ it gainfully - and there were good reasons for it. Fortunately, the Service is now in a position where it has in place a maritime doctrine, a strategy and a perspective-

plan and can decide what kind of hardware it needs - whether indigenous or imported - to implement the maritime strategy.

Within the ambit of the *Maritime Strategy*, the surface community, the submariners and even the navy's Special Forces have created dedicated centres for evolution of doctrine and tactics. The air-arm has remained dependent - either on these centres or on the Indian Air Force and confined tactical evolution to the squadron level. Given the nature of future maritime threats and the advanced platforms at its disposal, there is an urgent need to establish a dedicated cell or centre for Naval Air Warfare Doctrine.

There is yet another issue related to consolidation of expertise and cadre management.

### The Air Technical Branches

The ability of IN aircrew to fly advanced aircraft attracts frequent notice and praise. What does not find mention, as often, is the extraordinary contribution of the air-technical personnel. This is an appropriate occasion to acknowledge the superb competence with which the navy's air-technical fraternity – officers and sailors - have, consistently, risen to the challenges of the past 60 years. While absorbing advanced aviation-technology, they have simultaneously nursed legacy equipment with scanty resources. The admirable contribution of the Air Engineering and Air Electrical branches of the IN to the air-arm deserves our sincere approbation on this occasion.

Given the strength of the air-technical cadre and its crucial contribution to the air-arm, it has certainly not received its due over the past six decades. With the growing numbers of flying machines and increasing levels of sophistication in aviation technology, the navy needs to pay greater heed to career progression and sound cadre-management of the air technical branches.

Even more than aircrew, there is a need for air-technical personnel to consolidate aviation expertise. But this, too, runs contrary to promotion criteria like sea-time and dockyard-time, which focused on acquiring marine-engineering expertise is quite superfluous in the air-arm. This is another area which calls for radical restructuring of the cadre, in order to provide adequate growth-potential while encouraging consolidation of professional skills.

The final issue relates to self-reliance in naval aviation.

### Self-reliance

Indians should be under no illusions that as long as the armed forces are dependent on foreign hardware they will remain vulnerable to sanctions, disruptions in product-support and blackmail by OEMs, essentially eroding combat-effectiveness in times of crisis. While the indigenous warship-building programmes have given the surface navy a degree of self-reliance, India's aviation industry has lagged far behind in this regard. Consequently, the naval air-arm will remain hostage to the idiosyncrasies of OEMs and countries. In this context, the air-arm needs to follow a two-pronged approach.

In the field, every new induction should trigger a major effort to replicate as many components as possible through the Naval Aircraft Yards and the private sector. While one is aware that the Defence Procurement Procedure has been recently amended for the umpteenth time, the Service still has its own role to play. At the NHQ level, it must continue supporting indigenous projects



*Admiral Ram Tahiliani, former CNS and the Navy's first test pilot, flanked by R/Adm Sudhir Pillai and V/Adm BS Cheema*

like the LCA, ALH and IJT as a matter of policy, and also insist on actual, not sham, ToT. We are all aware that Indian scientists, designers and manufacturers have often produced sub-standard hardware at their first attempt. But there is need to persevere doggedly and make sure they deliver exactly what the navy wants - in the Mark II or Mark III versions of the indigenous product.

### To look back – and reflect !

The proliferation of aviation assets in terms of aircraft carriers, helicopters, MR-ASW and AEW assets as well as UAVs is indicative not only of the growing salience of aviation in maritime operations, but also of the huge burden of responsibility on the air arm and its people. As we celebrate the navy's 60-year old unbroken tradition of aviation at sea, the navy must look back and reflect to ensure that hard-won experience of the past and the invaluable lessons learnt – often at the cost of lives - are incorporated into future planning.

Finally, we must remember that hardware is easily acquired, but even the most sophisticated equipment will not guarantee success in war unless meticulously maintained and skillfully exploited. As the navy's air arm stands poised for a great leap forward, the IN must match the nation's expenditure on hardware, with a matching intellectual investment which will provide the necessary organisational, doctrinal and strategic underpinning for successful air-operations at sea.

It is upon these that ultimate victory will depend.

**\* Adapted from the keynote speech delivered by Adm. Arun Prakash (retd) at a seminar to mark the 60<sup>th</sup> anniversary of naval aviation, in Goa.**

Air Commodore Parvez Khokhar (retd), who was earlier Director of the National Flight Test Centre (NFTC) engaged with the LCA developmental test flights, puts it straight:

# DO WE WANT THE TEJAS -

# - OR NOT?

Painting by Abhishek Kaushal (Mohali)

**A**fter 30 years in the making and cost overruns in multiples of hundred crores, should the IAF now induct the Tejas LCA? A corollary to this question is that, is the Tejas ready to enter service, albeit in a 'Handling Flight' as a precursor to full-fledged induction into squadron service?

The emphatic answer is both YES and NO ! Let us examine and expound on the YES part first.

## Completion Of IOC

The Tejas has flown over 2200 sorties, covering various crucial aspects of the Flight Test Programme. It is pertinent to mention that this quantum of flying has been (touch wood) sans a mishap. Credit must flow to the professional acumen of the IAF test pilots from the National Flight Test Centre (NFTC), who have done the test flying and handled emergencies professionally whenever they have arisen. ADA must also be complimented on designing some robust systems that have seldom

allowed a life threatening situation to arise.

The Initial Operational Clearance (IOC) is a tacit understanding between the user (IAF, in this case) and the Original Equipment Manufacturer (OEM, in this case ADA), that on completion and certification of a pre-determined envelope of flight, the User will induct the aircraft, in limited numbers, until the full envelope has been cleared and certified (FOC). In the case of the Tejas, there are actually two OEMs: ADA who has designed and developed the aircraft and HAL, which manufactures the aircraft. Whilst there

is no universal yardstick for determining how much of the envelope must be cleared and certified in order to obtain the IOC, but a globally acceptable norm is that on completion of the IOC, two mandatory requirements must be fulfilled.

- The aircraft must be completely safe to fly within the cleared envelope, by service pilots.

- It should be capable of imparting operational training and have limited operational usage, within the cleared envelope.

Other conditions may be mutually agreed upon by the User and the OEM,





### Performance: aerodynamic

The Tejas has been certified up to an angle of attack (Alpha) of 24 degrees as against the 28 degrees design requirement. Since the 'Alpha' operationally determines the instantaneous turn rate, low speed handling limits, etc. an in-service clearance of even 22 degrees should be acceptable to commence conversion training. The 15 kms operational altitude, as per the design requirements has been met, as have the 'g' limits. The aircraft has been flown to 1.6 Mach, the max speed accepted by the user. ADA plans to accelerate to 1.8 mach.

### Performance: engine

The take-off and landing performance is satisfactory, except for the engine start up issues in extreme cold temperatures and high altitude runways. The aircraft need not be operated from Leh, at the first instance, and in the interim the problem is being addressed. The extreme hot weather take off performance with external load, has some minor issues, but they pertain to certification. The inadequate thrust being generated to accelerate the aircraft (acceleration factor, often referred to as Nx/Jx)

requires a complete redesign of the air intakes, and must be addressed later.

If this has to be incorporated before the IOC, then this milestone needs to be shifted by half a decade! Hot weather trials have been conducted at Uttarlai and Nagpur and more are planned during the extremely hot weather period this year. The IAF can operate, for the time being with this Nx, though the Navy may encounter some problems with this low acceleration during carrier deck operations.

The GE F404 engine has lived up to its published reliability factor...no problems in flight, so far. The fact that the full rated thrust is not being produced has nothing to do with the engine performance but has everything to do with design of the air intakes that do not permit optimum pressure recovery. A solution to this requires ADA to pull it's head out of the sand and work on a redesign of this area, but suffice it to say that this is a long term solution and cannot be implemented before completion of the IOC or FOC.

A major issue that requires to be addressed before the Tejas LCA can enter service, is the testing and certification of engine restarts in the air. This is a high risk test point, especially in a single



but the two conditions mentioned above cannot be ignored. It must also be borne in mind that in the case of the Tejas, the OEM being actually split into two separate entities and each have their own set of priorities.

The promised completion of the agreed upon IOC was set as end-June 2013. This date will undoubtedly slip to December 2013 and then another promised date and another... ad infinitum.

A brief look at the current status of the Tejas can determine, whether or not, the aircraft is ready to be inducted.

*(Photo by Phil Camp)*



engine aircraft. But it has been done for all aircraft, single or multi engine, and has to be done for the Tejas too. ADA now plans to demonstrate the engine 'hot relight' through the Fully Automatic Digital Engine Control (FADEC) system, whereby the ignition will be activated and fuel and air mixture will be automatically injected into the engine, should the engine sensors detect a fall in RPM below the expected RPM for the corresponding airspeed and altitude. A full spool down of the engine due to a surge/rapid rise in engine temperature beyond specified limits will require a relight to be carried out by the pilot. This too must be certified before the IOC is deemed to have been completed. Whether ADA will do it or not at this stage, is a moot point, since



*The Tejas LCA with typical underwing stores, including R-73 missiles and Litening pod plus drop tank, seen at Jaisalmer during the 'Iron Fist' fire power demonstration. (photos by Simon Watson)*



(Photo courtesy DRDO)

they are reportedly deferring it to the FOC phase. It is up to the IAF to take a call on accepting the aircraft with this status, since it is a safety issue. ADA's decision, in all fairness, is probably based on the empirical data of this engine's reliability.

### Performance & Integration of Systems

**Avionics.** There are no major issues with the avionics on the LCA. Due to the very extensive period spent in the interim years of development, a number of these will be due for upgrades and replacement. But for now, they are not an impediment against induction of the aircraft. A recurring issue

is the inadequate cooling of the avionics bay. Once again it is a design issue and needs to be addressed.

**Radar.** The Israeli Elta 2032 multi-mode radar has been successfully installed and testing is in full swing. Integration with weapons, and advanced features like cueing and selection of modes have been completed. Inputs from the User can only help in expediting the programme, as no safety issues are involved. Since an AESA radar is planned for the future, the performance of this radar as an interim solution should be acceptable.

**Weapons Integration.** The programme is fairly advanced with the

LITENING acquisition and targeting pod having proven itself in many trials and specifically demonstrated in the recent *Iron Fist* fire power demonstration. The DASH Helmet Mounted Display has also proven itself with the R-73 missile being fired with this HMD. Most of the weapons, including laser guided smart bombs have been tested and tried from the Tejas. As the IAF expands its inventory of weapons, integration will not be an issue.

### Auto Pilot

The aircraft already has the autopilot working in the basic modes. This greatly helps in doing head down work on the

radar, Designation pod etc especially during night flying. Advanced modes of autopilot for weapon delivery are being developed to be integrated in the FOC timeframe.

## Control Laws

The Fly-By-Wire control laws have evolved through various software versions since the first flight in 2001 and no major deficiency has been reported so far. This has been a significant achievement since even aircraft like the F-16, Gripen, Eurofighter, F-22, coming from long and well-established design houses, have had major flight control problems during their development years leading to aircraft losses. Throughout its development phase, the Tejas handling qualities have been appreciated by all test pilots who have flown this aircraft. The Tejas demonstrated its versatility and agility doing low level aerobatics and manoeuvres during Aero India 2013. This impressive show was within the cleared envelope and it is not difficult to envisage what the potential of the full envelope would be.

## But NO, Not Yet

So, can the Tejas be inducted into the IAF? There are a few compelling reasons why the Tejas cannot be inducted now, even if the IAF keenly desires to do so. These reasons are explained hereafter.

**Documentation.** No aircraft can be flown by the user unless proper flight and maintenance documentation is provided by the OEM. In the past the IAF has had to suffer due to inadequate or incomprehensible data being provided, especially with the aircraft that had their origins in the erstwhile USSR and now Russia. If that situation continues, whom will we turn to for an Indian aircraft? Documentation is by far the weakest aspect in this programme. HAL is responsible for the Technical and Maintenance documents, as also the Flight manuals. A subsidiary company, BAe-HAL, has been working on the technical manuals for many years, but it is doubtful if they have closely interacted with the User to get approval of the completed sections before proceeding further. The reported excuses include the frequent changes in hardware and software. It is a fact that all the 12 aircraft produced so far have differences

in the Standard of Preparation (SOP). But this is not unusual and a well known and accepted factor in any new aircraft development programme.

To correct aberrations or address issues that arise out of the results of flight testing and software changes are unavoidable. At times even a hardware/air frame modification is necessary. It would not be surprising to presume that as this aircraft evolves, changes will be a part of that evolution. It happens with all new aircraft. It is doubtful that HAL have the domain expertise to deal with this responsibility for this class of aircraft and nor are they willing to employ persons of knowledge, experience and expertise, who are definitely expensive to engage.

The plain truth, regrettably, is that HAL has now made a virtue out of delays! All major aircraft design houses have an exclusive team of domain experts to deal with documentation for various disciplines that feed in to a library that is a repository of knowledge for current use and posterity. Paucity of foresight and not funds is the reason. It must still be done on priority. HAL is reported to maintain that the 'Pilots' Manuals' will be worked upon once the design has been frozen. It is a mystery that they are not using SP-1, the first series production aircraft to be delivered to the IAF, as a bench mark for making these manuals. It is a grueling and challenging task, and without Divine Intervention, could take a year or even more.

## Review of IOC Requirements.

As per the agreed terms, there are still a number of areas that need to be addressed before the IOC is deemed to have been completed. The list of completed areas has been discussed above. This is no secret and the user is well aware of it. ADA continues to delve in its favourite past time of 'postponements and extensions'. A further postponement from June 2013 to the end of the year has already been granted by the Raksha Mantri... but come December, we can expect another p... This must be stopped NOW ! A candid and honest review of the existing capabilities must be undertaken and a irrevocable decision by the IAF to form a Handling Flight should be taken, with the envelope cleared so far.

## Aircraft for the Handling Flight

The Series Production (SP) aircraft are the ones to be inducted into the IAF. Where are these aircraft ? As of date of the publishing of this article NOT ONE LCA is ready for induction! HAL's reported production schedule indicates that the first SP aircraft will be ready by April 2014 (provided that there are no slippages, as is the norm with HAL). The second aircraft will be delivered in 'late' 2014. Three more will be produced in 2015. Thereafter the production rate will be 'ramped up' to eight aircraft per year. By this reckoning, a handling flight would come into existence earliest by 2016 and an additional six aircraft, to form the first squadron, by end 2017. Is that an acceptable time-line?

Of course, if HAL can disprove these time schedules, through performance, not promises, there could be no happier news for this project!

A serious matter of concern is the widely held perception, that for reasons other than professional, HAL does not consider the Tejas as part of their stable, since they did not design it. This has manifested in every single Tejas produced thus far, being well behind schedule, leaving quality control issues unsaid. At a recent discussion with very senior HAL executives, who prefer to remain anonymous, they expressed great anxiety and lamented about lack of work in future at the Bangalore Complex, once the Hawk and HJT-36 programmes are completed and should the Rafale deal get further delayed. There was not an iota of concern or even mention of the Tejas! Is the MoD unaware of HAL's step-motherly treatment of the Tejas? If they are aware, what actions have they taken to ensure that the tax-payers investment is given the respect it deserves?

## So what now?

So, these are the facts of the Tejas programme, as of now. If ADA or HAL wish to refute these facts, with information that is not in the Public Domain, it would be a welcome update. However, mere promises and intentions for the future cannot be credible facts. Performance is the only gauge that can restore their credibility and give the nation an indigenous fighter aircraft that has for so long been awaited by so many.

# Changing dynamics



## of the aerospace industry in India

*The DRDO AEW&C aircraft is based on an Embraer EMB-145SA platform and is powered by Rolls-Royce AE 3007 turbofans (photo: Angad Singh)*

The Indian aerospace industry is today on the verge of catapulting itself into the global arena. With the overwhelming support and involvement of the government in the defence and civil aerospace products, the industry has set itself on the firm path towards a transformational change. The process of change has begun and there are positive signs of the aerospace industry emerging as a major factor in India's increasing self-reliance.

The growth in India's manufacturing sector and the rising stock of its R&D capabilities are bound to have effect not



*Embraer Legacy 600 VIP transports of the IAF also use AE 3007 engines (photo: Angad Singh)*



*BAE Hawk trainers of the Indian Air Force are powered by the Rolls-Royce Adour Mk 871 turbofan, a non-afterburning variant of the engine on the Jaguar strike fighter (photo: Angad Singh)*

only in the Indian but also the international aerospace market in the future.

The commercial and defence industry in India has been active for a long time, however, the sector has seen significant changes with the new government policies and private sector participation.

The defence sector was opened to private sector participation in May 2001 with 100 per cent ownership permissible and foreign direct investment (FDI) limit of up to 26 per cent. The government is examining a proposal by the Department of Industrial Policy and Promotion to raise the FDI limit to 74 per cent.

The private sector has been playing a significant role in the defence industry.

*The Indian Air Force operates six C-130J tactical transport aircraft and will add another six to the fleet in the near future. All C-130Js worldwide are powered by Rolls-Royce AE 2100 turboprop engines (photo: Angad Singh)*



Several hi-tech equipment have also been successfully produced by the industry. In the pursuit of self-reliance in an important sector such as defence, the Government has been continuing its efforts to indigenise defence equipment wherever technologically and economically viable. The involvement of the private sector with its expertise will not only increase the defence production capability but will also give a strong momentum to the economy by creating employment and infrastructure.

Taking the example of public-private partnership, Rolls-Royce's partnership with Hindustan Aeronautics Limited (HAL) goes back to over 55 years. Building on the years of production expertise on the Adour engine for the Indian Air Force's Jaguar aircraft since 1981, HAL is now successfully manufacturing the Adour Mk871 for the new Hawk Advanced Jet Trainers. The company is also an important supplier to Rolls-Royce manufacturing ring forgings for the Trent engines. In

2011, Rolls-Royce and HAL established a 50:50 joint venture company in IAMPL to manufacture compressor shrouds for civil engines.

In order to achieve self-reliance in defence production, the Government of India had introduced the Offset Policy as part of the Defence Procurement Procedure (DPP), which mentions inclusion of an offset clause. The logic behind announcing offsets was that importing defence equipment without offsets was not adding to the economy of the country. The main aim of the Offset Policy should be to get state-of-the-art technologies for both public and private sectors to give major push to self-reliance and enhance defence exports.

Currently, the large purchase orders and contracts to foreign original equipment manufacturers have created large offset obligations, churning out huge business opportunities for small and medium enterprises. Offset obligations worth 30 billion dollars are to be fulfilled in the next five to six years which means that offsets must be strategically and pro-actively used as a catalyst towards bringing investments and technologies into India.

The government and industry must analyse the offset policy to deal with complexities of defence production and partnership with global companies, and suggest measures for it to become more effective.



*Kishore Jayaraman,  
President, Rolls Royce (India) Pvt Limited*

# A Paradigm Change



## Closer security cooperation with Japan

**W**ith attention focussed upon China's burgeoning military and economic strength, India and Japan have in recent months accelerated cooperation on key fronts, principal amongst which is security.

In May 2013, during Indian Prime Minister Dr Manmohan Singh's annual summit with his Japanese counterpart, Shinzo Abe, military cooperation was at the forefront of discussions. Of particular importance was an announcement that the two countries would set up a Joint Working Group (JWG) to establish a framework of cooperation on the supply of ShinMaywa US-2 amphibian aircraft to India (see above picture and *Vayu* VI/2011). This is the first time Japan has offered to work jointly with India on a project of such magnitude and the announcement also marks a significant post-WWII policy

shift in Japan regarding the export of military hardware. Japan has enforced a self-imposed ban on military exports since the Foreign Exchange and Foreign Trade Act of 1949, an effect of the pacifist stance of successive Japanese governments following WWII, and it is unclear whether the US-2 will be delivered as a civilian aircraft or a military one. Although Japan eased the export ban in 2011, a contract for the US-2 would mark the first sale of a complete 'military product' since 1967.

The US-2 is ostensibly a STOL amphibian designed for search-and-rescue (SAR) operations far at sea, with secondary transport capability. Therefore, as it is an unarmed aircraft, the Japanese government has granted ShinMaywa dispensation to market the type overseas, with particular focus on India, although potential users include Brunei and Indonesia.

In January 2012, the Indian MoD issued an RFI for nine amphibious SAR aircraft and ShinMaywa responded with a proposal based around the US-2. The final order could be as high as 15-18 aircraft, which would make India a much larger operator of the type than even Japan, which currently operates five US-2s with the 71<sup>st</sup> Air Wing at Iwakuni.

The US-2 is suited to Indian operations also because it shares Rolls-Royce AE2100J turboprop engines already used by the IAF's C-130J airlifters, while its immense range of over 4,500 km renders it particularly suitable for missions across the vast Indian Ocean Region (IOR). It can operate in rough seas with waves up to 3 metres high, and a unique boundary-layer control (BLC) system powered by an independent LHTEC T800 gas turbine which gives it unparalleled STOL

capability, allowing it to take off fully loaded within 280m as well as to land with a full load within 330m. The BLC system also allows the aircraft to cruise at very low speeds, further aiding search-and-rescue operations that are often limited by speed and visibility.

As a testament to its capabilities, the US-2 and the earlier US-1A from which it is derived have been involved in over 900 at-sea rescues since the 1970s.

The Indo-Japanese US-2 discussions, while widely publicised, were not the only security-related talks on the agenda. Eager to build on the success of last year's *JIMEX 2012*, the first Indo-Japanese naval exercise, the two Prime Ministers pledged to deepen the cooperation with more joint maritime operations. Singh and Abe stated that they were committed to freedom of navigation and unimpeded commerce and agreed to promote cooperation on maritime issues. Dr Manmohan Singh said that "discussions were guided by the fundamental belief that at the time of global uncertainties, change and challenges, India and Japan are natural and indispensable partners. We attach particular importance to intensifying political dialogue and strategic consultation and progressively strengthening defence relations."

Perhaps most crucial, however, were reportedly favourable talks on nuclear cooperation. A civil nuclear pact with Japan would be immeasurably valuable to India, providing it much-needed energy security at a time of tremendous global instability. Since India is not a signatory to the Non-Proliferation Treaty (NPT) or the Comprehensive Test Ban Treaty (CTBT), Japan has no cooperation on nuclear technology with New Delhi, despite the landmark Indo-US Civil Nuclear Agreement that came into force in 2008. While the issue remains contentious in Japan, Prime Minister Abe was firm during the May summit when he stated that negotiations on civil nuclear cooperation "will be accelerated" with a view to signing an agreement "as soon as possible."

In addition, Tokyo pledged support to a slew of infrastructure and technology projects and vowed to encourage the development of further trade between the two nations.

Just a month after the Chinese incursion across the Aksai Chin-Ladakh LAC caused a furore in Delhi, the summit



*The US-2 has an extremely short take off run.*



*Naval exercises underway.*



*The two Prime Ministers at the Summit meet.*

in Japan has resulted in substantial gains for both India and Japan, while simultaneously sending a clear message to Beijing that both nations would remain

committed to "peaceful yet firm action" in the face of Chinese sabre-rattling in their respective neighbourhoods.

*Angad Singh*

# VAYU SURVEY ON

# The Rotor Craft Scene\*



\*With inputs from Forecast International

## SOME COMPLEX TIMES AHEAD

*The Sikorsky CH-148 is a multirole maritime variant of the S-92 utility helicopter*

**T**he global rotorcraft market is facing a complex decade ahead. Slow economic recovery, tightening defence budgets and a host of new technologies have made for the perfect soup of unpredictability. *Vayu* takes a look at what the near and mid-term future holds for helicopters worldwide.

### 'Positive' for next 5 years

North American buying plans have increased for the first time in half a decade, even while Latin America posted the highest regional level of fleet replacement and expansion at 34 per cent.

Delivery rates of new helicopters over the next three years are expected to reach 1,000 new units each year. Purchase plans for new helicopters over this three-year time frame are 35 per cent higher than last year. The latter part of the five-year outlook is also expected to fill in and achieve similar delivery rates if economic recovery trends are sustained, and the cumulative helicopter market worldwide is expected to reach an estimated \$24.7 billion by 2017.

Despite the challenges of unfavourable financing terms, high import taxes for aircraft, plus looming defence budget cuts, the industry is expected to grow in tandem with the eventual economic recovery and global military expansion. Helicopter usage for the corporate, oil and gas, utility, and training missions is increasing, which reinforces the fact that helicopters are value-additions in the modern business environment. Drivers for new purchase expectations include aircraft age and condition, contractual requirements, change in operational requirements, expiring warranties, and regulations which require twin engines.

The five-year forecast of demand from the United States and Canada is

27 per cent, and the Western Hemisphere combined represents 47 per cent of total global demand. Europe's share of the five-year demand closely matches that of North America with 28 per cent. Demand in the Asia-Pacific market area accounts for 19 per cent over the next five years, and the Africa/Middle East share is a little over 6 per cent.

The global five-year rotorcraft fleet replacement and expansion plans decreased last year with a dip of 4 points in expectations versus the 2011 levels. This year's stronger response indicates that the industry may be returning to a more expansionary environment. Overall, five year buying plans in 2013 recovered well and specific purchase plans for 2013-2015 are "very strong."



Relatively lower levels of planned purchases are forecast till 2016, but there are expectations that these plans could strengthen materially over the next few years should political and general economic conditions improve as are hoped.

Purchase plans in major US and European centres of demand have risen by 3 and 7 points, respectively. Other regions also improved moderately compared with 2012, and their purchase plans remain above the world average rate. Specific purchase plans for 2013 remain strong

and have improved over levels reported in the 2012 survey. The expectation for new aircraft orders in 2013 is up over 30 per cent compared with 2012 levels, suggesting the recovery will maintain momentum through this year.

Some rise in military spending and stronger GDP growth in developing economies, including the BRIC nations, are expected to drive industry growth. A combination of factors such as military expenditure, economic growth, oil and gas exploration, and expanding parapublic

services are seen to affect the industry dynamics in these countries significantly.

Global five-year demand for new turbine-powered helicopters is split almost 50-50 between the Americas and rest of the world. Latin America and Asia continue to have the highest fleet replacement and expansion expectations among the regions. In terms of projected regional demand for new helicopters, Latin America and Asia remain in close competition to claim the world's third largest regional market, following North America and Europe.

### AgustaWestland Unveils AW169 AAS

AgustaWestland has unveiled the latest generation AW169 AAS military helicopter during a special ceremony held at the Army Aviation Association of America Annual Professional Forum and Exposition in Fort Worth, Texas in April 2013. The AW169 AAS is a twin-engine helicopter with the capability to meet US Army Armed Aerial Scout (AAS) mission requirements and provides a new-design, new-technology helicopter for the current and future battlefield.



### Exclases Russia orders five AW139s

On 16 May 2013, HeliVert, (a Russian Helicopters and AgustaWestland joint venture) and Exclases Russia announced a contract for the supply of five AW139 helicopters which will be assembled at the HeliVert plant in Tomilino near Moscow. This contract follows an earlier order signed between HeliVert and Exclases Russia for Russian-built AW139 helicopters and expands the presence of the AW139 model in Russia where over 20 have been ordered thus far.



## Ka-226T in demonstration tour of Kazakhstan

Russian Helicopters initiated the first demonstration flights of the light multirole Ka-226T in Kazakhstan in early June 2013. The demonstration tour is aimed at potential Ka-226T customers in Kazakhstan, including the constituents of the Ministry of Emergency Situations, Interior Ministry, Ministry of Health and other law enforcement and environmental authorities, as well as commercial helicopter operators. Flights were conducted over both flat and mountainous terrain around Öskemen (Ust-Kamenogorsk). The new Russian helicopter, with a maximum load capacity of 3,600 kg, showcased the advantages of its coaxial rotors by demonstrating its external cargo mounting system and hoisting capability in flight. Russian Helicopters plan to market the new Ka-226T actively on the domestic and international markets.



## South Korea selects Boeing Apache AH-64E ; Netherlands in support contract

South Korea is to take delivery of 36 Boeing AH-64E Apache helicopters between 2016 and 2018, the order for the heavy attack helicopters worth \$1.6 billion. The current and newest advanced Apache, the AH-64D Apache Block III, features composite main rotor blades, a composite stabilator, 701D engines with an enhanced digital electronic control unit and an improved drive system that enhances the rotorcraft's performance.

Meanwhile, the Royal Netherlands Air Force (RNLAf) has signed an integrated contractor logistics support (ICLS) contract with Boeing for sustainment and supply of spare parts for its CH-47D/F Chinook and AH-64D Apache helicopters fleet. Under the ICLS contract, the company will provide support services both in the Netherlands and at Fort Hood in Texas, US, which hosts joint training exercises for RNLAf's Chinook and Apache air crews and the US Army.

Powered by two GE T700-701D engines, the AH-64 Apache is designed for multiple operations and deep precision strikes against relocatable targets, while CH-47 Chinook is a heavy-lift, high-altitude helicopter used for troop transportation, artillery and cargo supplies, humanitarian, disaster relief, search-and-rescue and fire-fighting missions. Currently, 29 Apache and 17 Chinook helicopters are used by the RNLAf for attack and heavy transport operations.

*A note of interest: both the Apache and Chinook have been selected by the Indian Air Force*



AH-64D Apache Block III



CH-47F Chinook

## The medium/heavy military rotorcraft segment

Beyond these short-term growth predictions for the cumulative rotorcraft market worldwide, *Forecast International* is projecting that 4,796 medium/heavy military rotorcraft will be produced between 2013 and 2022. The Connecticut-based market research firm estimates the value of this production at \$114.4 billion. ‘Medium/heavy’ rotorcraft are defined as

having a gross weight of 6,804 kilograms or greater.

Year on year, medium/heavy military rotorcraft production has grown steadily since 2005. The *Forecast International* study projects that this growth will continue into 2013, when production is expected to reach 615 rotorcraft. Thereafter, the study projects that yearly production will enter into a period of gradual decline, falling to only 380 rotorcraft by the year 2022.

This anticipated decline is attributable to several factors, but essentially the budgetary environment in the United States and many other nations has become severe, with high levels of government debt forcing officials to look for areas, and as military budgets are vulnerable in which to reduce spending.

A number of key military rotorcraft acquisition programmes are well into their production runs and will soon run their course. Other programmes have been stretched out, with smaller annual procurement lots. At the same time, few major new procurement programmes have emerged that would help keep overall build rates growing. Order backlogs at manufacturers are clearly declining. As the market shrinks, the competition among manufacturers for such market share will become even more fierce.

Beyond the forecast timeframe, the study points to the US military’s Future Vertical Lift (FVL) programme as being especially important to the long-term future of the military rotorcraft industry. The FVL project involves the development and manufacture of a new rotorcraft family to meet future US attack, scout and utility rotorcraft needs. Service entry is tentatively planned for around 2030. US military acquisition of FVL-based rotorcraft, combined with possible export sales, suggests that the market potential for such a rotorcraft family is substantial.



The Sikorsky Seahawk family of helicopters has proved adaptable to a variety of maritime roles

## Sikorsky VIP S-92s for the Turkish Prime Ministry

Sikorsky has delivered the first of two VIP S-92 helicopters to the Turkish National Police (TNP) for service with the Turkish Prime Ministry, under a contract signed in 2011. The two S-92 helicopters will join a fleet of more than 140 Sikorsky products operating in Turkey including well over 100 Black Hawk helicopters. Sikorsky’s medium commercial helicopter, the S-76, also is operating in country.

The second S-92 helicopter is also expected to be delivered this year. In addition to Turkey, S-92 helicopters are operated for transportation of the

heads of state in nine other countries. Sikorsky is to formally offer the S-92 platform to the U.S. Government, which is seeking to replace the ‘Marine One’ helicopter fleet that transports the President of the United States. Since entering service in September 2004, the S-92 fleet has grown to 170 aircraft, and this global fleet has logged more than 530,000 flight hours.



An example of the S-92

## IAI LAHAV



*Russian Helicopters Ka-226 which is on offer to meet Indian Armed Forces requirements*

### The light military helicopter market beyond 2017

As a consequence of restricted defence spending worldwide, *Forecast International* is also predicting that 1,805 light (lower than 6,800 kilograms) military rotorcraft will be produced between 2013 and 2022. The Connecticut-based market research firm estimates the value of this production at approximately \$24.3 billion.

Production of light military rotorcraft has steadily grown in recent years, but the market is set to enter a period of much slower growth, perhaps even some retrenchment. A new *Forecast International* study projects that during the next 10 years, the trend in annual

production levels will be quite erratic, with alternating periods of yearly increases and decreases. Overall, though, the general trajectory is still expected to be somewhat upward, with production in 2022 higher than in 2013.

Demand for light military helicopters is weakening in North America and Europe, two regions that have contributed mightily to growth in this market of recent years. The current modernisation cycle in US military rotorcraft procurement is nearing an end. Plus, significant downward pressure is being placed on the US defence budget owing to a combination of factors such as the winding down of the Afghan conflict and efforts to reduce the US budget deficit.

In addition, the possibility still exists of deep reductions in US defence spending being imposed by an automatic budget sequester in 2013. Even if sequestration is avoided, though, US defence spending will continue to decline from previous levels.

Demand for light military helicopters is also weakening elsewhere. Opportunities will continue to exist in such regions as the Middle East and South Asia. However, long-term trends in much of Europe are not promising, either as governments there struggle with severe budgetary problems. According to *Forecast International* senior aerospace analyst Raymond Jaworowski, “The outlook for the light military rotorcraft market in



*Bell Helicopter's weaponised 407*

## RUSSIAN HELICOPTER



*Eurocopter's AS350B3 light single turbine helicopter (its military variant, the AS550C3 Fennec), is on offer for India's Armed Forces but is delayed. (photo: Angad Singh).*

Europe is particularly grim once current programmes such as British acquisition of the AW159 Lynx Wildcat and French/German/Spanish acquisition of the Tiger combat helicopter comes to an end.”

Market projections indicate that Eurocopter and Bell will be the leading manufacturers of light military rotorcraft during the period 2013-2022.

### Civil rotorcraft growth

Global deliveries of new civilian-use helicopters are expected to increase to 4,700 - 5,200 over the five-year period 2012-2016. Slower near term economic growth prospects in key markets have added uncertainty to operator purchase plans this year, however, recent order momentum and strong purchase plans

for the near term future have bolstered the outlook.

Recent order rates have been healthy and near term purchase plans remain strong despite tight credit conditions and significant inventories of used current production models awaiting orders, which continue to overhang the industry. Concerns over slow economic



*The AW139 is used for SAR in the UK*

# Powering The Rotorcraft

## Turbomeca unveils the Arrano

Turbomeca (Safran) has introduced its latest turboshaft engine, the 'Arrano', rated at 1,100 shp engine which is designed to power four-to-six ton helicopters, fitting between the Arriel and Ardiden performance ranges. A major benefit of this new engine is a significant reduction in specific fuel consumption, when compared with other engines in-service today. The Arrano will offer a 10 to 15% lower fuel consumption, contributing to improved performance (range, payload) and reduced environmental footprint. Cost of ownership will be reduced through Turbomeca's optimised maintenance concept designed to significantly decrease the need for on-site servicing.

In July 2012, Eurocopter announced that its X4, new-generation, 5-to-6-tonne helicopter will be the first platform to be powered by the Arrano engine. Its development and certification plans are in line with entry-into-service of the initial configuration of the X4 with first test run of the Arrano scheduled in 2014.



## GE's CT7 surpasses 500,000 hours on Sikorsky S-92

The GE CT7-8A-powered Sikorsky S-92 global helicopter fleet has surpassed 500,000 flight hours, which translates into one million engine flight hours for the CT7-8A on this twin-engine aircraft. More than 90% of all S-92 hours today are flown in the offshore configuration, with 54% being flown in harsh North Sea conditions. Designers have been mandated FAR/JAR safety margins, on-condition maintenance and revenue-producing operating costs for commercial customers.



Sikorsky S-92

## Safran/Rolls-Royce in RTM322 definitive agreement

Safran announced in April 2013 that it has reached an agreement with Rolls-Royce to acquire Rolls-Royce's 50% share in their joint RTM322 helicopter engine programme. Thereafter, Turbomeca (Safran's helicopter engine arm) will assume global responsibility for the design, production, product support and services for the RTM322 engine, a 2,100-2,600 shp engine family equipping the Apache, EH101 and NH90 helicopters. Rolls-Royce will provide full support during a transition phase enabling progressive transfer of all their activities to Turbomeca under this programme. In the next 15 years, Turbomeca aims to supply about 3,500 engines, both on existing military platforms as well as future civilian and military platforms in the 8-13 tons range, with continuous requirements for higher engine power.



NH90

## Turbomeca introduces the Arrius 2B2 Plus

Intended for the future Eurocopter EC135T3, the Arrius 2B2 Plus has been introduced by Turbomeca which variant offers technical improvements compared to its predecessor, the Arrius 2B2. Its new FADEC system increases reliability and availability, and its time between overhaul (TBO) is 4,000 hours. Take-off power is boosted by 5% and the Arrius 2B2 Plus is designed to leverage the global family of 2,700 delivered Arrius engines with more than five million flight hours to meet high-performance requirements worldwide.



*The Eurocopter EC725 Caracal is named after a species of desert lynx and is optimised for troop transport and CSAR roles*

growth in Western economies has increased the level of uncertainty in purchase plans but based on the timing of purchase plans among a wide variety of global civil helicopter operators, the delivery momentum expected (this year and next,) the outlook still calls for overall industry growth for the coming five-year period as compared to the previous five-years. Over the longer term the China market will be a strong contributor to broader demand for rotorcraft as the country opens its airspace to civil helicopter operations and begins production of indigenously designed civil turbine-powered rotorcraft.

The global five-year fleet replacement and expansion plans decreased to 19 per cent in 2012. Relatively lower levels of planned purchases are concentrated in 2013 and beyond, leading to the expectation that these plans could strengthen materially over the next few years should political and general economic conditions improve as projected. Higher purchase plans in Asia helped offset some of the softness in other region's survey expectations. Purchase plans in major US and European centres of demand declined marginally this year. However, while other regions also declined moderately, their purchase plans remain above the world average rate. Expectations for new aircraft ordering is up over 30 per cent compared to 2011 levels, suggesting that the recovery will maintain momentum this year.

The global five-year demand for new turbine-powered helicopters is split almost 50-50 between the Americas and rest of the world. Latin America and Asia have the highest fleet replacement and expansion expectations of all regions. In terms of projected regional demand for new helicopters, Latin America and Asia are 'tied' for the world's third largest regional market, following North America and Europe.



*The maritime NH90 is designated 'NFH' (NATO Frigate Helicopter)*

# WORLD HELICOPTER DEVELOPMENTS

## Bell debuts armed variant 407GT

Bell Helicopter has introduced the new Bell 407GT, an armed version of the Bell 407GX light commercial helicopter. The commercially qualified Bell 407GT incorporates the performance and reliability of the Bell 407 platform with the NVG-compatible Garmin G1000HTM flight deck, providing critical flight information 'at a glance' for greater situational awareness. The 407GX can be equipped with infrared cameras, light munitions and precision weapons systems, including laser-guided rockets and missiles. A variety of optional kits, designed to meet the needs of any tactical mission, will be available for the Bell 407GT with export compliance approval as required. These kits will include AGM-114 Hellfire ATGM, General Dynamics GAU-19/B .50 calibre machine gun, HMP-400 machine gun pod, M260 2.75-inch 7-tube rocket launcher, Advance Precision Kill Weapons System (APKWS), LifePort Armour Protection System and more.

Bell 407GX, basis for the 407GT



## Introducing the Bell 412EPI

In March 2013, Bell Helicopter introduced an upgrade to the ubiquitous Bell 412 utility helicopter - the new Bell 412EPI. The upgrade improves the Bell 412EP platform with the Bell BasiX Pro fully integrated glass flight deck, which provides critical flight information at a glance for greater situational awareness and safety. The Bell 412EPI also incorporates the power of Pratt & Whitney's PT6T-9 Twin Pac engines and the BLR Strake and FastFin System, which improves hot and high performance by as much as 1,410 pounds of payload capacity.

## Bell Helicopter and Turbomeca in unique collaboration

Bell Helicopter and Turbomeca have announced Bell's upcoming five-seat, short light single engine helicopter will be powered by Turbomeca's Arrius 2R engine. The Arrius 2R engine delivers performance and power within the 450-550 shaft horsepower class, while improving safety and lowering pilot workload via a Full Authority Dual-channel Engine Control (FADEC). The twin-module engine configuration will reduce fuel consumption and lower the cost of operation. The Arrius 2R boasts proven reliability and 3,000 hours time between overhaul at service entry. The agreement marks the first time in 75 years of participation in the helicopter industry that Turbomeca has entered a long-term collaboration with Bell Helicopter.

## Bell V-280 Valor selected for Army's JMR-TD Programme

The Bell V-280 Valor's 'clean sheet' design reduces complexity compared to previous generation tiltrotors, and is intended to boost value in procurement, operations and support, and force structure, providing increased maintainability, component reliability and systems designed to reduce operational and support costs. The JMR-TD programme is the science and technology precursor to the Department of Defence's estimated \$100 billion Future Vertical Lift programme expected to replace between 2000-4000 medium class utility and attack helicopters. The US Army and Department of Defence are seeking 'leap-ahead' capabilities and have identified a speed of 230+ knots as a key discriminating capability.



## Cassidian's MiLOWS for NH90s

Having completed its final qualification review, Eurocopter has certified the MiLOWS (Military Obstacle Warning System) for the NH90 military transport helicopter. The system was developed and built by Cassidian and is derived from the Sferion SferiSense range. In completing its qualification flights on the NH90, MiLOWS gave proof of its credentials for use in a military setting. The Bundeswehr will now have the first military helicopters in the world to be fitted with a laser-based, real-time obstacle warning system. These helicopters will thus be able to safely carry out difficult missions in bad visibility.



## Sikorsky and Boeing X2 for US Army

Sikorsky and Boeing are to submit a joint proposal to build the demonstrator aircraft based on Sikorsky's X2 Technology rotorcraft design for the Army's Joint Multi-Role (JMR) Technology Demonstrator (TD) Phase 1 programme. The JMR TD programme supports the U.S. Army's Future Vertical Lift (FVL) initiative to deliver the next generation of vertical lift utility and attack aircraft. The Sikorsky-Boeing proposal will incorporate contra-rotating coaxial main rotors and a pusher propeller, with an advanced fly-by-wire system to deliver efficient 230-knot cruise airspeed, improved hover efficiency, and weight optimisation.



## Eurocopter underscores market leadership



The EC225

New orders and commitments for Eurocopter's helicopter family, along with an unveiling of the latest evolution in its product line, highlighted the company's participation at Heli-Expo 2013, the rotorcraft industry's largest international expo, held in March 2013 in Las Vegas, Nevada. The bookings covered products ranging from Eurocopter's light single-engine AS350 helicopter to the 11-ton-category EC225 helicopter. Eurocopter also utilised Heli-Expo 2013 to debut the newest enhanced member in its product line: the mid-sized, multipurpose twin-engine EC135 T3/P3, which received orders from three launch customers.

## Israel leads in helicopter modernisation

Although cuts in defence spending and high costs of new helicopters have forced countries to plump for modernisation of their current fleets as an alternative to purchasing new helicopters, upgrades of avionics and other subsystems in current and new helicopters remains an attractive option. The modernisation of these 'ageing' helicopters, as a report suggests, will be a \$4.82 billion upwards market this year. Leading this field are Israel Aerospace Industries' Lahav division and Elbit Systems.

IAI's Lahav division has long been involved in maintenance, overhaul, refurbishment, retrofit, upgrade and modernisation programmes. The Mi-17 upgrade programme undertaken by Lahav was hugely successful, with installation of new cockpit panels, avionics subsystems and adaptation of the cockpit to be night vision goggles capable. Of late, they have been involved in the installation of state of the art avionics in HAL's Dhruv ALH.

Elbit Systems, another Israeli player involved in modernisation and upgrade programmes, recently unveiled its new Direct Infra-Red Countermeasure system for small helicopters at the Paris Air Show. They have also been roped in to develop avionics for the Korean Light Attack Helicopter, currently under development, but their primary role in this market is the conversion of utility and assault helicopters into multirole platforms.

## Elbit's mini-MUSIC for rotary protection

Elbit Systems has unveiled its new mini-MUSIC system, the newest member of Elbit Systems' family of Directional Infra-Red Countermeasure (DIRCM) systems. This will provide protection for all types of rotary and fixed-wing aircraft against heat seeking Ground to Air Missiles (MANPADS). The MUSIC family now includes four systems providing protection for all different airborne types: MUSIC - designed for protection of medium to large rotary and fixed-wing aircraft; C-MUSIC - the world's first DIRCM system in production for commercial jet aircraft; J-MUSIC - for distributed installation for aircraft such as military transport, air refueling tankers, business jets, etc. and mini-MUSIC for small and medium sized platforms.

All systems in the MUSIC family employ new technology including a unique fiber-laser based, directional infra-red countermeasure technology and a sealed turret for maximised reliability. The initial detection of incoming threats is provided by a missile warning system. When a threatening missile is detected, the warning is passed

to the DIRCM that then directs a thermal tracker to acquire and track the threat. A powerful laser beam is then fired accurately at the missile causing it to be deflected away from the aircraft.

Mini-MUSIC completes the coverage of the MUSIC family, providing protection for even small rotary and fixed-wing aircraft.



## Sagem's optronic payloads for helicopters

Sagem is a supplier of gyro-stabilised optronic systems for all combat helicopters of the French air arms: army, navy, and air force. The company develops and produces the Strix optronic imaging sight of the Tiger helicopters and its new Euroflir family of gyro-stabilised optronic pods has been designed for surveillance aircraft (fixed or rotary-wing) or UAVs. Integrated in the aircraft's mission system, Euroflir pods call on multiple sensors for reconnaissance, target identification, target location, and laser designation. Euroflir pods are already in production for the NH90 Caïman, Panther Mk II helicopter deployed by the French navy, and for French Caracal helicopters.

The Euroflir turrets offer numerous functions in particular colour video-image acquisition, infrared and near infrared, geographic pointing and designation, automatic scanning for search and rescue, automatic target tracking and laser designation for JVN night-vision imagers. Euroflir can be used on helicopters, UAVs and maritime surveillance and patrol aircraft. Euroflir 350 and 410 were chosen for the modernisation of the French Army's Light Aviation Cougars, Navy's Panther Mk.IIs (seen in the photo) and its special forces' EC725 Caracals, as well as for European NH90s and export markets.



# Helicopters and the



*Two ends of the spectrum: the LCH (on ground) and the Eurocopter AS350B3 – civil variant of the AS550C3 Fenec (photo: Angad Singh)*

**W**ith a sustained push for modernisation across India's armed forces, the military rotorcraft segment is set to see enormous growth over the next decade. However, the glacial pace of decision-making and ever-present spectre of 'underhand dealing' are of much concern to both manufacturers and the customer Services.

Indian Army Aviation is moving ahead following major policy initiatives, with plans to equip each of the strike corps (I Corps at Mathura, II Corps at

Ambala and XXI Corps at Bhopal) with aviation brigades consisting of attack, reconnaissance and utility helicopters. There are also plans to raise dedicated combat helicopter squadrons for close air support and anti-tank roles. At present, most of the Army's support and combat aviation needs are met by the Air Force, with Mi-17s and Mi-35s in the main. The Army is to acquire 114 of HAL's in-development Light Combat Helicopter (LCH) to provide an airborne offensive capability in high-altitude areas where

contemporary attack helicopters have difficulty in operating.

The Army has also projected a further requirement of 60 'tactical battle support' helicopters in the 10-12 tonne class, to be employed for swift and precise transportation of troops in a tactical scenario. Helicopters in this role/weight class include the Boeing CH-47 Chinook, Sikorsky UH-60 Black Hawk and S-92 Superhawk, NHI NH90, Eurocopter EC725, and Mil Mi-17, among others. However, this

# Indian Equation



requirement remains at its earliest stages of decision making.

With the planned changes, the Army Air Corps should see significant growth within the next 5-10 years, although, as always, there is no telling what will happen at South Block which has repeatedly demonstrated its propensity to delay acquisition programmes for years.

Most importunately in this regard, the 'Reconnaissance and Surveillance Helicopter' (RSH) programme to replace the ageing Cheetah (Aérospatiale Lama)

and Chetak (Aérospatiale Alouette III) helicopters of the Army (and Air Force) for high-altitude operations has come to a grinding halt after the conclusion of repeat flight trials. The contract for 197 light helicopters is worth about \$750 million but since June 2012, there has been little movement from the MoD, causing great consternation among the OEMs who have been forced to extend their bids multiple times. Despite a number of crashes, reducing rotorcraft availability and a repeatedly stated need from the

Army and Air Force for new helicopters, it is precisely this type of paralysis that tempers any optimism.

On the other hand, acquisitions for the Air Force seem to be progressing more smoothly. *Vayu* has recorded induction of Mi-17V5 medium-lift helicopters (*Vayu* II/2012). These rotorcraft, contracted for in 2008, are augmenting the IAF's existing fleet of around 250 Mi-8/17 family rotorcraft. In December 2012, a follow-on order to the original contract was placed, bringing the cumulative order



*The present and the future? Mi-17V5, the IAF's current medium-lift mainstay with NUH-hopeful Eurocopter AS565MB in the background (photo: Angad Singh)*



*HAL's Rudra has achieved IOC and will soon enter service with the Army and Air Force (photo: Angad Singh)*

to 151 aircraft valued at some \$2.6 billion, with deliveries to be completed in 2015.

The Mi-17V5 is a thoroughly modern evolution of the venerable Mi-8 design dating back to the 1960s. Featuring the same Klimov TV3-117VM engines as the Mi-28NE attack helicopter, the Mi-17V5 is being procured in large numbers to bolster the IAF's medium airlift capability, which has long been centred on the Mi-8 family. The helicopter is capable of carrying 4 tonnes of cargo internally or 5 tonnes slung externally. Alternatively it can accommodate up to 36 troops for transport or 12 stretchers in the MEDEVAC and CASEVAC roles. It also features a powerful searchlight, loudhailer and "bambi-bucket" for firefighting. It features a loading ramp at the rear instead of the clamshell doors featured on older Mi-17 variants, along with a weather radar



through to the decade-long operations in Afghanistan.

As for attack and combat helicopters, close to \$3bn will be spent on acquiring new combat rotorcraft. Boeing has been selected to supply 22 AH-64D Block II Apache Longbow attack helicopters to augment the current Mi-35 gunships in an order worth around \$1.4bn. HAL's in-development Light Combat Helicopter (LCH) will form the bulk of remaining orders, with 65 units to be procured by the IAF at a total cost of \$1.5bn.

On the light helicopter front, HAL will receive a windfall with sales of over 300 domestically manufactured ALH variants projected over the next 5-10 years. The Army and Air Force will adopt large numbers of Dhruvs in the utility role, but with the recent induction of the armed Dhruv ('Rudra') HAL has also been awarded a combined order of 60 Rudras for the Indian Army, the primary customer, along with 16 for the Air Force.

The Indian Navy is looking at major rotorcraft inductions, with three notable acquisitions in the offing: for 16 multirole helicopters (MRH), a 120 naval multi-role helicopter (NMRH) requirement, and thirdly for 56 naval utility helicopters (NUH).

The first of these, for 16 multirole helicopters (MRH) is reportedly to be completed in short order, with Sikorsky (offering the S-70B Seahawk) and NHI (offering the NH90 NFH) said to be in the process of "completing the discussions on

in an all new 'dolphin-shaped' nose. In addition to its utility capabilities, the Mi-17V5 also provides 6 external stations for 1,500kg of munitions, ranging from rockets, to missiles to gun pods.

In addition to medium lift helicopters, the IAF is looking to augment capacity in the heavy-lift role and to replace its aging fleet of Mil Mi-26 helicopters, the Air Force having selected the Boeing CH-47F Chinook tandem-rotor helicopter in a contract worth approximately \$600 million for 15 units. Despite offering a lower payload than the Mi-26, the more modern avionics suite, lower projected maintenance costs and higher operating altitude have tipped scales in the Chinook's favour. It can deliver 50 fully-equipped troops onto a rooftop or cliff's edge and has been extensively battle-tested from the Vietnam War era



IAF Mi-17V5 at Yelahanka, Karnataka. The IAF is in the process of acquiring over 150 of the type which is manufactured by Russian Helicopters (photo: Angad Singh).



*The Westland Sea King has put in over 30 years of service and will be slowly phased in favour of modern types (photo: Angad Singh)*

offsets” with the Indian MoD. Although seemingly small, an option clause for a further 44 aircraft gives the contract crucial importance for either bidder.

### Sikorsky offers S70-B Seahawk

The helicopter manufacturer Sikorsky pitched its S-70B Seahawk helicopters for the NMRH, besides other variants like the MH-60R and MH-60s.

While the specifications on offer would vary as per requirements, the manufacturer said the ability to operate from frigates, destroyers, cruisers and aircraft carrier gave its helicopters multi-role operability. Sikorsky is projecting S-70B’s anti-submarine warfare, anti-surface warfare and search and rescue capabilities, as well as its state of the art avionics and automatic flight control systems.

Air Vice Marshal AJS Walia (retd), Executive Vice President India and South Asia of Sikorsky said “We have suggested four platforms to best suit the Indian Navy’s requirements. All the platforms have been used by a number of forces across the world”.

Sikorsky has evinced interest in supplying helicopters to meet the requirements, as well as ship-borne helicopters for dry lease to the Indian Coast Guard, Air Vice Marshal Walia said.

### Eurocopter Caracal

A 100 per cent subsidiary of EADS (European Aeronautic Defence and Space Company), Eurocopter has identified its long-range tactical transport helicopter, the EC725 Caracal, for the NMRH. The Caracal is a combat-proven platform which has been operational in Afghanistan as part of the French deployment since 2007. Lutz Bertling, Eurocopter president and CEO, said the company will offer this platform with complete systems package, equipped

with all-weather capability, range and heavy-lift capability besides others.

The company will also be contesting for the Navy’s order of 56 NUH with its AS565 MBe Panther. The machine was a major attraction at Aero India 2013 and is capable of anti-submarine and anti-surface warfare.

The large NMRH procurement will supplement the Navy’s obsolescent and aging fleet of Westland Sea King helicopters. In the running for this programme are Sikorsky with either the MH-60S or S-92; Eurocopter with the EC725 Caracal and NH Industries with the NH90 NFH. The NMRH acquisition is expected to take some time, and in the interim it has been suggested that a small number of serving Sea King helicopters be upgraded.

The Naval Utility Helicopter (NUH) programme is intended to replace the 60-odd HAL Chetaks in Navy service, and RFPs have already been issued to eight manufacturers, including HAL, with the selected type expected to enter service in 2016.

With HAL still struggling to engineer a main-rotor blade-folding mechanism, essential for helicopter use aboard naval vessels, the NUH tender has come down to a competition between two foreign vendors : Eurocopter and AgustaWestland. Eurocopter has indicated their participation with the AS565 MBe Panther, a militarised variant of the widely used AS365 Dauphin helicopter and AgustaWestland has entered its AW109 Koala.

Whichever OEM secures any of the Navy orders, there will be significant offset and transfer of technology obligations. The Indian private sector, meantime, has repeatedly made clear that it is ready, able and willing to absorb foreign technology in aid of “self-reliance in defence”.

## Israeli systems on the ALH

The development of HAL’s Advanced Light Helicopter (Dhruv) has involved IAI Lahav in a major manner, having earlier been selected by HAL to install an advanced avionics package to optimise operational performance of the Dhruv. Main features include Glass Cockpit with Multifunction Colour Display (MFCDD), advanced HMOSP (Helicopter Multi Mission Optronic Stabilised Payload) and an advanced Electronic Warfare Suite with Radar Warning Receiver (RWR), Missile Warning System (MWS), Laser Warning Receiver (LWR), chaff and flares. Lahav also partnered with American Aitech Defence Systems for the development of Display and Mission Computers for the ALH. In addition, Lahav were involved in the refurbishment of the Mi-8, which expands the helicopter’s mission envelope, with full capabilities at night and in adverse weather, improved battlefield survivability

Elbit systems have stayed abreast with their Tel-Aviv based counterparts in the country’s growing helicopter modernisation market. At Aero India 2013, they inked a deal with Bharat Electricals Limited for joint development of Compact Multipurpose Advance Stabilisation Systems (CoMPASS), which will be used for naval applications. The CoMPASS has been nominated for integration into the 56 Naval Utility Helicopters that the Indian Navy is to procure. Recently, they have also publicised the new generation ANVIS/HUD24T, a Pilot and Co-Pilot Day/Night Helmet Display System for head-out flight. This combines line of sight (LOS) technology and HUD capabilities, thus enhancing flight safety and crew coordination while facilitating the operation of the helicopters’ systems.

## ELBIT

# VAYU Editorial Team at the 50<sup>th</sup> Paris Air Show, June 2013



## Braving the Economy



## - and Elements

*Airbus' 21st century flagship A380 – which took part in the 2013 Paris Air Show's flying displays – is becoming an increasingly familiar sight at airports around the world. Meanwhile, this British Airways airliner has now been delivered to the airline.*

Although, according to the statistics, there were some 5% more exhibitors during the 2013 Show at Le Bourget compared to 2011, with 340 chalets plus 13 national pavilions hosting nearly 140,000 trade visitors (and over 175,000 visiting the Show during the weekend), it was the rain that was most dominant at the Show, dampening the flagging spirits of many companies. There was marked absence of American combat aircraft, large military transports and helicopters (owing to the 'sequestration' phase – see *Vayu* Issue III/2013) while the overhanging economic gloom across the Continent demonstrably took away some spark from this event. Still, the statistics were not all that bad as in the following review.



*Perfect flight: French and German Tigers perform over Le Bourget*

## Devilish Haul at Paris 2013

Overall there were more than 1,000 new airline purchase commitments announced during this year's Paris Air Show, with 666 (Devil's number) as firm orders, which includes several high-profile orders now formalised but previously announced as tentative deals.

Airbus and Boeing notched an array of orders, with the former reporting a \$14.2 billion order from Singapore Airlines, followed by numerous other smaller deals including 40 A320neos and 20 A321neos for Hong Kong Aviation Capital, 35 A350-1000s for United Airlines and 30 A321neos for Spirit Airlines. All this increased the Airbus sales tally to an excess of \$70 billion, with Boeing following with \$55 billion.

There was intense speculation whether it would arrive, (on time), and it did ! Airbus flew its A350 XWB for the first time in Toulouse on 14 June, eve of the Show (*see report in this Issue*). Airbus has an intensive 2,500-hour flight-test programme aiming for its service entry with Qatar Airways in the second half of 2014.

But Boeing was not found wanting, and launched a new variant of its Dreamliner, the 787-10, obviously encouraged by orders for 102 of the increased-range twinjets from five customers across Europe, Asia and North America: United Airlines, Air Lease, GE Capital Aviation Services, British Airways and Singapore Airlines. With an MTOW of 553,000 pounds and range of 7,000 nm, the stretched -10 will feature a pair of fuselage plugs that extend its length over the -9 by 18 feet for 15 percent more passenger capacity (40 more seats). According to Boeing, the new Dreamliner's extended range will cover more than 90 percent of the world's twin-aisle routes.

The Russians are also really trying: this was the second Show for Superjet International, which had the company handing over the first Sukhoi SSJ100 airliners to a Western operator, which is Mexican carrier Interjet.

Meanwhile, the Canadians are trying to ramp up their CSeries programme and Bombardier's Commercial Aircraft president Mike Arcamone said that the company's pilots and engineers were set to get the new narrowbody airborne within the month. At the other end of

the spectrum, Viking Air sold four Twin Otter Series 400s to Aerostar Leasing and another seven to Russia's Vityaz Avia for operations in Asia. VistaJet placed a \$1 billion order for up to 40 Bombardier Challenger 350s. Later in the show, an "undisclosed customer" ordered 12 Global 8000s in a deal valued at around \$804 million.

## Re-emphasising the competition

Flying displays are normal opportunities at airshows but EADS upstaged all when its new 'avatar', the Airbus A350, dramatically made its maiden voyage out of Toulouse and flew low over the Le Bourget runway just a week after its

debut flight! It is now a clear sign that that the battle for dominance in the next-generation wide-body jet market has risen to the next level : Airbus is positioning the A350 as a head-to-head competitor with Boeing's 787 Dreamliner and the smaller versions of its 777. Not to be left in the shadow and taking advantage of the show's 50th anniversary, Boeing launched its new 787-10, a stretch version of the Dreamliner that can seat 300 to 330 passengers.

The Paris Air Show re-emphasised many things: first, the competition between Boeing and Airbus has now reached a fever pitch and second, while there is a huge global market for single-

*(Continued on page 84)*



*The first of many to come: the A350XWB just days after its maiden flight. As part of its third test flight from Airbus' Toulouse headquarters in southwestern France, the A350 XWB headed north to offer a show-stopping performance in the skies above Le Bourget Airport*



*John Leahy, Airbus's Chief Operating Officer, Customers said: "The dramatic rainfall and thunder storms at Le Bourget this year didn't dampen our order intake!"*

## For ATR: “the best Paris Air Show ever”

The 50th Paris Air Show was “the best in the history of ATR.” Over course of the week, the turboprop aircraft manufacturer announced orders for 173 airliners, including 83 firm orders at the air show. The total value for these contracts exceeds \$ 4.1 billion (including 2 billion in firm orders). The success seen during the air show sets a new record for ATR’s order book, which now comprises over 270 firm aircraft orders for an estimated \$6.5 billion. The current order book also ensures ATR’s production until the end of 2016, Filippo Bagnato, Chief Executive Officer of ATR said he was “very happy with the results seen at this year’s Paris Air Show, which

confirms ATR as the global benchmark for regional aircraft with up to 90 seats, and which portends a bright future for turboprop technology in regional aviation”.



## Bulls eye with MBDA’s Brimstone and Meteor

MBDA’s UK-developed Brimstone missile carried out the world’s first surface to surface salvo engagement of multiple Fast In-shore Attack Craft (FIAC) threats with a single button push. Success of the trial has shown Brimstone’s ability to swiftly strike numerous individual vessels without the need to laboriously designate each target, thereby demonstrating its prowess as a ‘fire and forget’ maritime surface attack weapon. On 29 May 2013, three millimetric wave operational Brimstone missiles were launched in a rapid salvo of less than a second against a simulated attack formation of five representative FIACs. The three missiles independently acquired and engaged their respective targets at a distance between 4km and 5km (constrained by range safety); direct hits resulted in extensive structural damage to the three leading vessels, including one travelling at 20 knots. The missiles were launched from a surface trials platform using a Brimstone triple rail launcher in conditions of sea state 3. On 31 May 2013, MBDA received a production contract to supply Germany with the Meteor Beyond Visual Range (BVR) Air to Air Missile. All six Meteor Partner Nations (PNs) (France, Germany, Italy, Spain, Sweden and the UK) have now placed production orders. Powered by a throttleable ducted rocket with “tomorrow’s technology”, utilising an advanced RF seeker and network enabled through a data link, Meteor’s capabilities provide a step change in combat effectiveness and survivability for modern aircraft. Additionally, on 18 June, Eurofighter Jagdflugzeug GmbH signed a Meteor integration contract with NETMA (NATO Eurofighter and Tornado Management Agency). This means that integration contracts are now in place for Gripen, Rafale and Eurofighter Typhoon. The production and aircraft integration contracts combined with a successful guided firing programme confirm the maturity of the Meteor project.



MBDA Brimstone



MBDA Meteor

## CFM gains \$15 billion worth new orders at Paris Air Show

The momentum for CFM Internationals' advanced LEAP engine family has continued to build as the company logged multiple orders and commitments at the 2013 Paris Air Show. CFM announced orders for 660 new engines (468 LEAP & 192 CFM56), in addition to LEAP and CFM56 services agreements, at a combined value of \$15 billion at list price. 2013 orders to date now stand at 1,654, including installed, military, and spare engines.



### Flash News:

Pegasus Airlines of Turkey has selected CFM International's advanced LEAP-1A engine to power its new fleet of 75 firm, 25 option A320neo/A321neo aircraft. The airline is scheduled to

begin taking delivery of the aircraft in 2016. Total LEAP orders now stand at more than 5,300 engines. The Istanbul-based low cost airline has been a CFM customer since it began operations in 1990. Today, the airline operates a fleet of 43 CFM-powered Boeing 737 aircraft on scheduled routes to 72 domestic and international destinations throughout Europe, Russia, Central Asia, Middle East and Africa.



## Finmeccanica at Le Bourget 2013

Finmeccanica took part in the 50th Paris Airshow with its companies AgustaWestland, Alenia Aermacchi, Selex ES, DRS Technologies and Telespazio. Finmeccanica chose to present itself at Le Bourget 2013 following an expositive concept based on the OODA Loop (*Observe, Orient, Decide and Act*), a philosophy descending from military approach that represents their aim to fit the evolving reality. In the AgustaWestland case, the multirole AW159 (designated the Lynx Wildcat in UK, and more recently also chosen by the Republic of Korea Navy), the AW149, the AW189 (the new 8 tonne class commercial helicopter), the AW139M (militarised version of the best selling AW139) and the AW169 (the new generation 4.5 ton class light intermediate helicopter) were showcased with one of the four prototypes plus full scale VIP and EMS configured cabin mock-ups. 'Star attraction' was the "Project Zero" tiltrotor technology incubator. A completely electric powered tiltrotor, Project Zero is designed to hover like a helicopter and convert to a fixed wing aircraft in forward flight thanks to its two integrated rotors which can be tilted through more than 90 degrees.

On occasion of the 100th anniversary of Alenia Aermacchi, the company showcased the historical SVA9 biplane aircraft, designed in 1916 and built in various versions such as fighter, reconnaissance, attack and training types and the historical trainer MB308, which made its first flight in 1947. Also on display were aircraft ranging from the SF-260 TD, the Eurofighter Typhoon IPA2, the new M-345 HET (High Efficiency Trainer) and the MC-27J, the new 'military' version of well known C27J Spartan.



At the Finmeccanica pavilion- the AgustaWestland "Project Zero" tiltrotor on display

aisle, narrow-body jets like the Boeing 737MAX and the Airbus A320neo, this year's battle is raging in the so-called 'mini-jumbo' space: twin-engine aircraft that can seat around 350 passengers and travel long distances. The A350-1000, which has 350 seats, is expected to enter

## Ellectronica's self-protection suites

Ellectronica chose Paris 2013 to unveil and present its Self-Protection Suite for Combat Search and Rescue Helicopters. A promotional demo was run for key partners and potential customers. Ellectronica's key technological breakthroughs and advanced solutions were showcased: Virgilius, the Integrated EW-Architecture System and ELT/572 DIRCM, the response to MANPADS threats in the E/O spectrum. Other core solutions were the DASS pod of the Eurofighter Typhoon and the ELT/568 system with a specific Escort Support Jammer solution ALQ-703. The company invests considerable amounts in research for the purpose of developing modern assets in the whole frequency spectrum that includes the lower frequency bandwidth for radar and non-radar signals, including communications EW as well as in the higher frequency bandwidth up to E/O, to achieve the utmost in-house capability.



The Ellectronica stand at the show

## Star Spangles for Bell

Bell Helicopter displayed a number of aircraft and shared programme updates on the Bell 525 Relentless. The Bell 525 cockpit simulator highlighted capabilities of the Bell 525 ARC Horizon flight deck allowing pilots to operate in specific mission conditions, including Category A takeoffs and landings, and fly-by-wire augmentation. The Bell 407GT, the new armed version of the Bell 407GX, was also displayed in Bell Helicopter's booth. The commercially qualified helicopter features a fully-integrated Garmin G1000H flight deck and armament options ranging from light munitions to laser guided weapon systems.



Bell 429 in star spangled colour scheme

service in 2017; the first delivery of the 323-seat 787-10 is expected in 2018. United Airlines signed a deal for 10 new A350-1000s at the show and converted 25 existing A350 orders to the 1000 model. Boeing's new, 400-seat successor to the 777, dubbed the 777X, reportedly will enter service around 2019.

All told, Airbus racked up orders for 466 aircraft at a list price of \$69 billion, including 59 orders for the A350 from Singapore Airlines and Air France-KLM. Boeing booked orders for 442 aircraft valued at some \$66 billion, including 102 orders for the 787-10. United will be the North American launch customer for the stretch Dreamliner and other launch customers include British Airways and Singapore Airlines.

ATR had a grand show in its own right with contracts valued at more than \$4.1 billion, including 20 ATR 72-600s for Brazilian carrier Passaredo Linhas Aereas, five ATR 72-600s for Air Lease, but the grand slam was the earlier \$2.1 billion deal with Nordic Aviation Capital, for 91 ATRs.

Bombardier did well too, mainly on the business aircraft side, where it

received \$1.8 billion in new sales and also sold three CRJ1000s and four Q400s to Nigeria's Arik Air, plus three more Q400s to Horizon Air. Embraer has launched its new E-Jets E2 series.

Bombardier launched the CSeries in 2008 as it sought to move up from its signature regional aircraft. Commercial success has yet to arrive. The CSeries, designed to carry as many as 160 people and compete with the smallest Boeing and Airbus offerings, is hoping for more orders even with its first flight scheduled to take place "very soon."

Bombardier has booked 388 CSeries orders and options, according to the company. That compares with 317 orders for Boeing's upgraded 737 MAX this year through May and 391 for the new Airbus A320neo in 2013 up until the beginning of the air show, according to the spokesman.

Russia's Irkut MS-21, due for delivery from 2017, should have its first flight in 2015, according to Mikhail Pogosyan, CEO of United Aircraft Corp. "Airlines with large Airbus and Boeing fleets will buy the Max and Neo. I believe we will get more orders once we are in flight test."

The Chinese Comac has meanwhile secured agreements for the sale of 380 aircraft from 15 customers, according to the Shanghai-based manufacturer's website, mostly Chinese with the exception of General Electric Co.'s aircraft leasing arm, which has signed to take 20 of the C919s.

### Few fighters over Le Bourget

In fact, there were only two fighters flying at Paris 2013. Wowing the home crowds was the Dassault Rafale which impressed both on ground and in the air, and Dassault Aviation CEO Eric Trappier exulted in the type's excellent performance during the operations over Afghanistan and Libya as part of the NATO coalition and also recently in North West Africa. Obviously, most questions were directed to as to when the Indian contract was to be formalised (*see India section*). Watch this space!

And then there was the Sukhoi Su-35S which made its debut outside Russia at Paris 2013. Close on the heels of news that China has signed a deal for 24 of these single-seat 4+ generation multirole fighters (*see Vayu issue II/2013*), the Su-35S certainly made its presence felt at Le Bourget. As at MAKS 2011, the Su-35 displayed almost unbelievable manoeuvres, including instant transition from its famed Cobra 'trick' into low air speed turns and flat spins but under full authority. This was not all circus flying and as professional commentators have opined, "unpredictable flight paths



*Dassault Rafale in home skies*

challenge the guidance algorithms of any missile system, and rapid nose-pointing can permit a short-range missile launch with a greater kill probability." This was repeatedly demonstrated by Su-30MKIs of No.20 Squadron IAF during the 'Red Flag' exercises in Nevada in 2008.

Russia is not doing too badly in other areas either, having sold Mi-28NE helicopters and Pantsir S1 air-defence systems to Iraq. Russia's backlog of export orders for military equipment is estimated at \$40 billion, down from the record of \$50 billion in 2010.

Meanwhile, the Russian military aircraft industry is doing fairly well, what with Su-30 variants and the Yak-130 notching sales successes. Even though the Bangladesh Air Force fields one MiG-29 squadron for the air defence role, and was speculated to order more MiG-29s, it has instead decided to procure 24 Yak-130 advanced combat trainers with enhanced precision strike capability. The Russian Government has reportedly agreed on a \$ 1 billion credit line to Bangladesh for purchases of defence equipment as also to facilitate training of personnel, infrastructural enhancement and spares support.



*Sukhoi Su-35S making dramatic take off*



*Eurofighter Typhoon on static display*

The Yak-130 is also being considered by several other South East Asian nations including the Philippines and Indonesia. The latter has steadily ordered more Sukhoi Su-30s but of different variants including the MK and MK2, which join the existing couple of Su-27SKs and Su-27SKMs in service. Four more Su-30MK2s are expected for delivery by year end and the Indonesian Air Force will finally have a full squadron of 16 Sukhoi Su-27/30s by the end of 2013. More grandly, Indonesian defence authorities project their ultimate requirement is for 180 Su-27/30s to form 10 fighter squadrons over the next decade.

Of course, the Chinese and Indian Air Forces remain the biggest customers for Sukhoi fighters. China and Russia signed an intergovernmental agreement in January 2013, following decisions made during the Russian defence minister's visit to Beijing in November 2012. "There will be direct shipments only, not licence production," according to the Russian spokesman. China last purchased fighters from Russia in 2004, when it ordered 24 Su-30MK2s, bringing the grand total of 'Flanker' series aircraft it has procured from Russia to 283.

India is just 11 aircraft short of that figure, with 272 Sukhoi Su-30MKIs

on order, half of which have already been delivered to the IAF. A Russian spokesman added that, inspite of losing on the M-MRCA programme, Russian military exports to India amount to 30% of the total : President Putin during his India visit in 2012 had witnessed the signing of several new defence deals. Just weeks before the Paris Air Show, the Indian Navy's first MiG-29K squadron was formally commissioned (*see article in this issue*), and there are plans to raise a second MiG-29K squadron even as the aircraft carrier INS *Vikramaditya* is expected to reach Indian waters in December 2013. The MiG-29Ks will also operate from IAC-1 to be commissioned as INS *Vikrant*.

### The Swedish case: more for less

"The time has come ...." a senior Saab executive has recently exclaimed! He was alluding to the potential world market for the Gripen E new generation fighter. Saab were active at the Paris Air Show with their theme 'Breaking the Thought Barrier'. The Swedish industry, including Saab, have an excellent reputation for developing and producing some of the world's finest aircraft and weapon systems most cost-effectively—and with the Gripen E, they have proven it again.

In his media conference, Saab's CEO Hakan Bushke was confident of the future and the Gripen E trials aircraft is flying with its full suite of new systems. Production of the first prototype has begun in Sweden, with maiden flight expected in



*Gripen D with various stores outside the Saab Chalet*



*Mr Hakan Bushke at his media conference*

late 2014, even as the Swiss go through their complex parliamentary processes to gain approval for purchase of 22 Gripen Es for their Air Force. As Bushke put it “Switzerland has selected us and there’s an extremely strong commitment from the Swiss Air Force. They have a political process to go through and I don’t take it for granted – but I’d rather be in this situation than not. The Swiss people will choose and if they’d like to have the best, most affordable fighter then the Gripen is a good choice.”

Meanwhile, the Swedish Government has already approved first phase of the Gripen E development work and formal orders for 60 aircraft are expected by end 2013. As Hakan Bushke explained “we are now delivering a Gripen that will have upto 50% capacity over the previous generation... close to the payload and endurance of the twin-engine fighters but at much lower cost. It will be cheaper to maintain compared to the Gripen C/D, which is already world class. It will be cheaper to build compared to the C/D. We have an extremely good product and that’s how we are trying to win the market.”

Some question the credibility of Saab’s claim that it can build the Gripen E/F for less than the C/D on a planned



RAF instructor with BAE Systems Hawk Mk.127

production run right now that is about a third of the C/D production run. “Today,” countered Bushke “we have lower costs per unit when we are delivering eight to 12 Gripen C/Ds per year than when we were delivering 28. We have been extremely successful utilising tools, integrating design & production in a very close manner and we are taking that even further with the Gripen E.

On display at Le Bourget was a Gripen D and other aircraft were the Saab 340MSA and Skeldar rotary wing tactical UAS.

## Rolls-Royce and EADS unveil new power concept

Rolls-Royce and EADS unveiled a new power concept for advanced future airliners at the Paris Air Show, which could help reduce CO<sub>2</sub> emissions, make less noise and dramatically reduce fuel burn by middle of the 21<sup>st</sup> century. Such an airliner would be powered by a serial hybrid propulsion system, which is similar in concept to the technology found in a growing number of energy efficient motor cars. Propulsion is provided by six electrically-driven fans distributed along the wing span in clusters of three. A single, large advanced gas turbine generates electrical power which is stored in an advanced energy storage system that could be based on Lithium-air energy storage technology. During climb the distributed fans draw power from the energy storage system, but during descent, they act like wind turbines to generate electrical energy which re-charges the batteries. A major benefit of the distributed propulsion system is that it can be integrated into the airframe’s structure to maximise aerodynamic efficiency and optimise the airflow around it. This reduces the aircraft’s weight, drag and the amount of noise it makes.



Hawker Beechcraft T-6 Texan II

## Sagem's cutting-edge solutions for civil and military customers

Sagem (Safran) showcased its globally recognised expertise in drone systems, avionics and navigation equipment, optronics systems and guided weapons. Sagem focused on four main areas in its exhibition space at the Safran stand: safety-critical electronics, flight safety and management services, guidance systems, and aero-surveillance. The company displayed its entire family of

AASM Hammer modular air-to-ground weapons, including the latest laser terminal guidance model, the SBU-54 Hammer, deployed by the French air force since May 2013. All three versions of the AASM were on display at the Safran stand: Inertial-GPS, Inertial/GPS/infrared, Inertial/GPS/laser. They were also shown as weapon systems in the Dassault Aviation stand, and at the French Ministry of Defence pavilion for the Rafale multirole fighter. Also on display was the Patroller drone system which is a medium-altitude, long-endurance (MALE) drone in the one ton class and designed for surveillance, intelligence, security and military support missions, and is based on an EASA-certified Stemme S15 aircraft, while offers endurance exceeding 20 hours. Flight tests in 2012 and 2013 assessed its ability to deploy multi-sensor payloads, controlled from a ground control centre that is interoperable with NATO standard command systems.



The Sagem/ Safran Patroller

### Fighting trainers

The Hawker Beechcraft AT-6C was on show at Le Bourget at a time when the company is going all out to challenge the US Air Force's contract to Sierra Nevada/Embraer for supply of 20-A-29 Super Tucanos for use as a light air support aircraft (LAS) in Afghanistan from 2014 onwards. Beechcraft had appealed to the US Government Accountability Office (GAO) to overturn this decision.

According to the Company "it is now time for Congress to step in and put an end to this flawed acquisition process and limit purchase of the Brazilian aircraft to only that of the Afghanistan requirement covered by the first delivery order of the LAS". Officials from Beechcraft, along with leaders at other general aviation companies in Wichita, also say that "it doesn't make sense for US taxpayers to buy a foreign product to be used on foreign shores, because buying a US product would boost US employment, a critical part of rebuilding the US economy".

At the higher end of fighter training, for Stage III or LIFT (lead in fighter training) the BAE Systems Hawk is being promoted as the most cost-effective system before pilots go to frontline fighter flying. At Le Bourget, the company displayed a Hawk Mk.127 from No.4 Squadron RAF based at Valley in North Wales, from where, in fact, a large number of IAF pilots graduated before returning to India and being posted to Jaguar, Mirage 2000 and Su-30MKI squadrons. BAE have received orders for the Hawk Mk.127 from Oman and Saudi Arabia while Australia is upgrading its Hawks to the same standard. The Indian Air Force has a requirement for 106 Hawks (the Mk.132 is being produced at HAL's Bangalore Complex), while the Indian Navy has ordered 17 to supplant its current Kiran Mk.IA/II's. BAE are expecting a follow on order for 20 more Hawks for the Indian Air Force which will form a new aerobatic team as successors to the *Surya Kirans* who have stopped flying the Kiran since 2011.

## UAC's presence at Le Bourget

The Paris Air Show 2013 certainly endorsed Russia's return to the world aerospace arena after ten years and was led by United Aircraft Corporation (UAC). The company presented wide range of products, military and civil demonstrating the skill and potential of the Russian aviation industry. At Le Bourget, thousands of visitors people witnessed the world premiere of the Su-35s fighter, which was displayed outside Russia for the first time. The Su-35's airborne agility caused excitement amongst experts and aviation enthusiasts alike. For the first time, the Paris Air Show also hosted the Yak-130 fighter trainer now in service with the Russian Air Force.

UAC's civil aircraft programmes, the Sukhoi Superjet 100 and MC-21 were presented at the Air Show as well – receiving new commitments from a number of different customers. UAC Senior Vice-President and Irkut President Oleg Demchenko said: "During the show, active negotiations on the Yak-130 took place with many countries in Latin America, South-East Asia and the CIS. The MC-21 also attracted attention from a number of potential customers in the international market."

Mexican carrier Interjet took delivery of its first Sukhoi Superjet 100 (SSJ100) on first day of the air show, while the aircraft also received two new orders, from the Ilyushin Finance Corporation and the Bahrain-based lessor AeroLease, with the latter having signed a Letter of Intent for the finance and leasing of a number of SSJ100 aircraft. These agreements reflect continued interest from leasing companies and world finance institutions in the SSJ100. Mikhail Pogosyan, UAC's President, said: "It has been a significant achievement to strengthen our position in the civil aviation market – we have proved we are not only about world-beating military aircraft, but innovative civil aircraft too."!

## Raytheon's AMRAAM and MALD-J

Raytheon has continued to exceed renegotiated delivery schedule requirements of the AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM) to the US Air Force following the renewal of contract payments in December 2012, a successful live-fire test and certification of a second rocket motor source. Nammo Group, the second AMRAAM rocket motor source based in Raufoss, Norway, was officially certified by the Nonnuclear Munitions Safety Board earlier this year. In 2010, Raytheon and Nammo began development and qualification of an alternative rocket motor for the AIM-120 AMRAAM. The live-fire test was performed in January 2013 at Eglin Air Force Base, Fla. All test objectives were "successfully accomplished", according to US Air Force officials.

"The MALD programme continues to surpass expectations in performance and capability," said Harry Schulte, vice president of Raytheon Missile Systems' Air Warfare Systems. "The MALD-J provides significant improvement in strike survivability and tactical electronic attack, giving our warfighters a decisive edge." MALD is a state-of-the-art, low-cost flight vehicle that is modular, air-launched, autonomous and programmable. It weighs less than 300 pounds and has a range of approximately 500 nautical miles. MALD protects aircraft and their crews by duplicating the combat flight profiles and signatures of U.S. and allied aircraft. MALD-J adds radar-jamming capability to the basic MALD platform.



## Israel at Le Bourget

Israel's Rafael showcased an array of cutting edge air and missile defence systems at Paris 2013. On display for the first time was the latest addition to Rafael's SPICE (Smart Precision Impact Cost Effective) family of Precision Guided Kits, the SPICE 250, a modular, integrated C4I air and missile defence system. With its two warhead options, a multi-purpose warhead and another with penetration capabilities, SPICE 250 has been earmarked for a procurement programme by the Israeli Ministry of Defence. Also on exhibit was the combat-proven Iron Dome defence system against short range artillery rockets. The Iron Dome is the "only dual mission system in the world that provides effective solutions for countering rockets, artillery and mortars (C-RAM) as well as aircraft, helicopters, UAVs and PGMs." Apart from these, other weapons presented were the Spike family of electro optic, tactical, precision guided missile systems the Spyder short and medium range and David's Sling missile systems; and the Python-5 and Derby missiles. The Spyder missile system incorporates the advanced Python 5 active imaging infra red (IIR) and the beyond visual range (BVR) Derby missile. In addition to their range of missiles, the company also put on view their range of electro optic and communication systems, led by the Recce U system and Toplite payload for UAVs and helicopters, the Imilite multi source, multi task imagery exploitation system and Global Link system which offers network centric capabilities.



## Props Galore

*Airbus Military A400M destined for the French Air Force*



On the left, A400M with its Europrop International (EPI) TP400 turboprop engines. To the right, the An-70, powered by four Ivchenko Progress D-27 three-shaft propfan engines.

Counter-rotating propellers, installed on twin-and multi-engine propeller-driven aircraft, spin in directions opposite one another. The advantage of such designs is that counter-rotating propellers balance the effects of torque and p-factor, eliminating the problem of the critical engine.



## Irkut's MC-21 "is the future"

The main emphasis in Irkut's diversification strategy is on fast development of the MC-21 Programme. Manufacturing of the first series of big-size components of this airliner had recently been launched at the Irkutsk Aviation Plant. The MC-21's maiden flight is scheduled for 2015, while it is slated to enter service in 2017. At the Paris Air Show 2013, Irkut assembled the international team which have developed the MC-21. The team includes Pratt & Whitney, who will provide the Pratt & Whitney PurePower PW1400G engine for the Irkut's MC-21 family of aircraft, and Zodiac Aerospace Group of France in charge of the plane's interiors and few on-board systems. The main feature of the MC-21, which provides 20% decrease in fuel consumption, is its extended wing made of composites. Tests of the wing's prototypes have been successfully going on for some time at TsAGI Institute.

As stated by Mr. Oleg Demchenko, President of Irkut Corp, "it will be the MC-21 Programme that will provide the bulk of revenues in the next decade."



Cockpit of the Irkut MC-21

## Thales unveils Avionics 2020

Thales unveiled the "cockpit of the future" at Paris 2013. Named Avionics 2020, this cockpit is the natural evolution of the cockpit concept for which Thales has become known, the ODICIS demonstrator. The ODICIS concept illustrated the technologies and innovations that Thales forecasts will be needed on commercial aircraft in the next 20 years. With the Avionics 2020 cockpit, Thales demonstrated the technologies and concepts which are available now and which can be made flight-ready on commercial aircraft in the next 7 years.

Avionics 2020 incarnates a new-generation cockpit founded on the principles of natural and direct hands-on interaction and human-machine interfaces, designed to serve the pilot through the use of the latest head-up and head-down technologies. It is a totally scalable model, can also include bi-chromal head-up displays enabling enhanced collimated piloting data organisation and discrimination, associated with a synthetic representation of the outside environment. The cockpit's concept introduces a modern and effective cockpit layout which integrates a large, secure display area associated with several reconfigurable means of control. This user-friendly organisation of the cockpit incorporates multi-touch screen capabilities, offering pilots an intuitive interaction solution comprising all aircraft systems and functions.



## IAI Launches M-19HD electro-optical payload

Israel Aerospace Industries (IAI) has launched its newest top-of-the-line, long range high definition (HD) stabilised payload, the M-19 HD. This is a true high definition, compactly designed multi-sensor (with up to 7 sensors), multi spectral payload, implemented as a single line-replacement unit (LRU). The M-19 HD enables continuous day/night monitoring in all weather conditions and provides outstanding acquisition ranges due to its powerful sensors, high stabilisation and image processing capabilities. M-19 HD reduces the operator's workload and improves situational awareness thanks to its multimode automatic video tracker (AVT). It also provides accurate geo-location using its embedded IMU/GPS (inertial measurement unit/ global positioning system).

Israel David, General Manager of IAI/Tamam Division said "we are very proud of this new advanced payload which is a real breakthrough in EO/IR (electro-optic and infrared) technology. A remarkable achievement by our engineering and technical staff, M-19 HD will provide our customers with unmatched observation and targeting performance. M-19 HD is ideal for high-altitude, long-endurance, intelligence, surveillance, reconnaissance, targeting and persistent awareness missions."



## Sikorsky forecasts strong international demand

Sikorsky Aircraft predicts bright prospects overall for the global helicopter market, given strong international and commercial demand, as well as the USA's continued commitment to new military rotorcraft programmes, including a new presidential helicopter. "The big theme this year is the international military side," Sikorsky President Mick Maurer stated at the Paris Air Show 2013.

He said international sales of military helicopters would account for more than 50 percent of the company's revenues at some point in the coming four or five years, given strong demand for Sikorsky's helicopters and added that commercial sales were expanding, but Sikorsky expected to remain focused more heavily on military sales, which now account for about 70 percent of the company's revenues. Despite continuing uncertainty about the US

defence budget, he was heartened by the US Defence Department's plan to go ahead with some new helicopter programmes, including a Navy plan to buy a new presidential helicopter. Sikorsky was also closely tracking the US Air Force's bid to buy a new combat rescue helicopter and said the fate of the US Army's "Armed Aerial Scout" competition depended on the depth of the budget cuts, but Sikorsky could benefit from a delay given that it is developing a brand new helicopter for the programme. Sikorsky has also teamed up with Boeing to jointly develop a technology demonstrator for the Army's Joint Multirole helicopter programme.



S-70i Black Hawk

## Russian Helicopters showcase the Ka-52 Alligator

Russian Helicopters, a subsidiary of Oboronprom and part of State Corporation Rostec had an interesting line up of commercial and military helicopters at the 50th Paris Air Show including the latest Ka-62 and Mi-171A2 for the commercial market. In collaboration with Rosoboronexport, the company showcased the Ka-52 Alligator reconnaissance and attack helicopter.

The Ka-62 is a unique example of Russian Helicopters working in collaboration with global partners, which are currently working on components and parts for the new helicopter. The Ka-62 is fitted with two Turbomeca's Ardiden 3G engines, while the gearbox and transmission are supplied by Austria's Zoerkler. Certification of the Ka-62 is planned by the end of 2014, with the helicopter scheduled for commercial launch in 2015. The first orders have been placed by Brazilian company Atlas Táxi Aéreo. The ubiquitous medium Mi-8/17 series



Ka-52 Alligator

is widely operated around the world with a "justified reputation for reliability and ease of use". The new updated Mi-171A2 combines "the best qualities of its predecessors with the latest technologies, introduced based on these helicopters' operational experience across various regions and in different climactic conditions." Completion of work on the Mi-171A2 and certification are expected in 2014, with serial production scheduled in 2015.

The new Ka-52 Alligator was demonstrated for the first time at an international show. In Paris, visitors also had the opportunity to see other Russian-built commercial models available to the international market in the light, medium and heavy classes, including the Ka-226T, Mi-17, Mi-35M and Mi-26T2.

Visitors also had the opportunity to see the Mi-28NE Night Hunter, a day-night, all-weather helicopter that can fly search-and-destroy missions against tanks, armoured and non-armoured targets and also enemy troops on the battlefield and low-speed aerial targets.

# Of Indian Interest at the Paris Air Show 2013



An Air India Boeing 787 Dreamliner in the skies above Le Bourget, June 2013.

Spearheading Indian participation at the Show was the Hindustan Aeronautics Limited double chalet at row A and the Boeing 787 Dreamliner in Air India colours, on static display at the far end but also being flown during the afternoons. The HAL chalet hosted hundreds of visitors for both B2B meetings as also provided a virtual ‘rendezvous’ for Indians, both officials and company representatives who gravitated to the chalet whose informality was a welcome change from the stiff attitudes at most other company chalets at Le Bourget.

The Minister for Civil Aviation Ajit Singh and Minister of State for Defence, Jitendra Singh were at the Paris Air Show



Minister of Civil Aviation Ajit Singh being presented model of the LCH by HAL Chairman Dr RK Tyagi.

2013, accompanied by senior officers and officials from their respective ministries. Senior management from GoAir and Jet Airways were at Le Bourget, but naturally closeted with Boeing and Airbus as they reportedly reviewed present and future requirements. GoAir will be receiving the first of their 72 A320neos from 2016 onwards, supplementing the 21 A320s presently in service or under delivery, while Jet Airways have ordered another 5 Boeing 777-300ERs and await their new Boeing 787-9 Dreamliners, 10 of which are on order along with a reported 50 Boeing 737MAX single aisle airliners.

On subject of the Dreamliner, Gopal Sutar, HAL’s Chief of Media



Virtual reality : images of the HJT-36 and Rudra ALH adorned the HAL Chalet walls.

Communication, who was very active at the Air Show recalled that “notwithstanding the summer rains which were quite heavy on the first day itself Air India made its impact with the display of new Boeing 787 Dreamliner. The giant bird was nicely parked on a large space at the world’s prestigious Air Show. It attracted the attention of large visitors. It was the only Indian aircraft on display.”

In fact, the Dreamliner display at Paris was first of its kind at any air show and was significant considering that the aircraft was grounded in January by carriers worldwide due to faulty batteries. “These batteries have been replaced with the new ones and necessary certifications have been obtained. Other teething problems too have been resolved”, said company sources at the Paris Air Show. Many carriers around the world including Air India have started re-flying the airliners. AI has at present six aircraft and eight more aircraft are expected to be inducted by December this year. The carrier had placed orders for 27 such airliners in January 2006. The showcasing of the flying capabilities was the need of the hour not just for Boeing but as well to clear the doubts over its safe flying.



*Gopal Sutar, CMC of HAL with armed ALH model.*

Touted as the next generation flying machine, Boeing 787 Dreamliner is the latest acquisition of Air India and is expected to shore up the fortunes of the national carrier as the aircraft is fuel efficient and is armed with new technology Providing a comfortable flying experience for most of the flying passengers including this writer.

### 228s under different flags

The HAL chalet was situated next to those of Pilatus and RUAG, both being Swiss companies and both some ongoing issues with HAL. The latter has been engaged in discussions to revive the flagging relationship wherein HAL-built Dornier 228 assemblies were to be imported for final assembly and equipping in Germany and then sold worldwide.

operator console as well as HF, VHF/UHF and VHF FM radios. Additionally, the aircraft are equipped with a search-and-rescue (SAR) radio direction finder, six observer seats and two bubble windows.

Curiously, the Bangladesh 228s (RUAG-assembled) will be patrolling virtually the same area of the Bay of Bengal where Indian Coast Guard and Indian Navy 228s (HAL-built) will be



*RUAG's Dornier 228 with its 5-bladed propeller on static display.*

The contract which was signed with much flourish in 2008 specified 52 shipsets to be imported from HAL but till 2013, only eight had been ordered and a number are reportedly still not sold. The most recent customer for the RUAG 228 is the Bangladesh Navy which has ordered two in the maritime patrol version, these 228NGs fitted with a 360° Telephonics RDR-1700B surveillance radar and

doing the same but wearing different colours. The rationale for Bangladesh Navy to patrol the area is to “protect their maritime territories against big neighbour hegemony (read India !)”.

### Basic training aircraft

The Pilatus PC-21, resplendent in overall red paint, was static displayed behind the Pilatus chalet. This is the third



*Pilatus PC-21 turboprop trainer at the static display.*

generation of basic turboprop trainers which has evolved from the PC-7 which the Indian Air Force ordered in late May 2012 to fulfill its basic training aircraft requirement some four decades after this aircraft's development began.

Meanwhile, HAL are proceeding with the development of its HTT-40 basic turboprop trainer against the requirements issued by the Indian Air Force for 181 aircraft. After the grounding of HPT-32s, the IAF examined various options for fast track acquisition of basic trainers and selected the PC-7 Mk.II, ordering 75 aircraft, the first of which were delivered on eve of Aero India 2013. The IAF is keen to exercise the option for another 38 aircraft and in fact might want the entire 181 imported from Pilatus but HAL are reportedly going ahead with the HTT-40 which is to fly in 2015 (*see news item*).

The PC-7 was based on the earlier piston-powered Pilatus P-3 which was modified from the prototype by replacing its piston-engine with a PT6A-20 turboprop and flew on 12 April 1966, but after a crash the PC-7 programme was shelved. In 1973, the programme was restarted and after modification, this aircraft flew on 12 May 1975. The first production aircraft flew on 12 August 1978. Swiss civil certification followed on 5 December of the same year, with deliveries to Burma and Bolivia starting immediately thereafter.

The PC-7 Mk II is an adaption of the PC-9's airframe and avionics, but fitted with the PC-7's smaller turbine to lower initial and operating costs. The aircraft were assembled in South Africa and also ordered by Brunei and Botswana. The PC-21 is a completely new aircraft design, featuring a tandem-seating arrangement (student in-front/instructor behind) in a bird strike resistant glass canopy with all round vision, glass cockpit with three large colour liquid crystal displays (LCD), head-up displays (HUD), Hands on Throttle and Stick (HOTAS) controls and Zero-zero ejection seats for student and instructor.

### Waiting for the Rafale

Indian eyes were obviously focussed on the Dassault Rafale, selected as the IAF's MMRCAs and a number of examples, both of the French Air Force and Navy were at the static park, while an aircraft carried out thunderous flying displays under the canopy of menacing rain clouds. At his



*Dassault Rafale F.3 outside the massive Dassault Hall at Le Bourget.*



*Sagem AASM Hammer precision guided bombs displayed with the Rafale.*

media conference just before the show, Dassault Aviation Chairman and CEO Eric Trappier was confident that the contract for 126 Rafales for the Indian Air Force would be finalised by end 2013. Even as the Brazilian FX-2 fighter programme has been delayed further owing to the economic situation, Eric Trappier believes there are prospects in other countries including Malaysia and some countries in South East Asia as also the Middle East.

However, Eric Trappier was openly critical about some European countries' obsession with American aircraft: "There seems to be a 'Buy American Act' in force in Europe," he observed. However, Canada has been identified as a significant

prospect, following that country's decision to review its commitment to the F-35. "We are answering their questions. They saw the Rafale in operation first-hand over Afghanistan and Libya, as part of the NATO coalition," Trappier said.

HAL Chairman, Dr RK Tyagi was extremely active and busy with meetings through the Air Show. Amongst his multiple interactions was the one with Dassault Aviation chairman, Eric Trappier when they, with their respective Senior Executives, met to review the progress in ongoing projects. "Both Chairmen expressed satisfaction on the work already achieved by the integrated teams and renewed their commitment towards successful completion of the various projects".

*Eric Trappier (centre) with Dr RK Tyagi and senior executives from Dassault and HAL at Le Bourget.*



In his observations to the media, Dr RK Tyagi referred to challenges that remain including the access to critical technologies and the supply chain, which poses issues : “Supplies from abroad have long lead-times coupled with irritants like unjustified price escalation and obsolescence,” he added. “There is also a need to augment development and production of equipment and spares. This is an area where our sourcing from abroad is the maximum ,with associated difficult supply chains.”



*An Air India Boeing 787 Dreamliner. The airline is now operating the Dreamliner on scheduled services from Delhi to Paris (one seen above at Palam airport before departure).*



*Mr T Suvarna Raju, HAL's Director Design & Development... and model of the Russian T.50 fifth generation fighter aircraft which is to be subject of joint development between HAL and Sukhoi.*



*Tata Steel were amongst a number of Indian industrial companies participating at the Paris Air Show, many in a cluster under the banner of SIATI.*

# State-of-the-A400M

## Second production aircraft makes maiden flight



The second production Airbus Military A400M new generation airlifter has made its maiden flight. Numbered as MSN8, the aircraft made its first flight from Seville, location of the A400M final assembly line on 7 June. It is scheduled for delivery to the French Air Force in the third quarter of 2013.

Meanwhile, Airbus Military has successfully demonstrated the release of decoy flares from the A400M new generation airlifter as part of the development of the aircraft's self-protection systems. The flares are designed to mislead heat-seeking anti-aircraft missiles, particularly shoulder-fired surface-to-air missiles (SAM) and are a crucial part of the self-protection system because of the A400M's ability to operate from short and unpaved



airstrips close to the scene of military action where such SAMs may be fielded by an adversary.



### Key A400M training devices into service

Two of the most advanced aids for use in training crews in operating the A400M new generation airlifter have entered service at the Airbus Military International Training Centre in Seville, Spain. Following an intensive evaluation of the A400M Full Flight Simulator, EASA has recommended the issuance of an Interim Level C Qualification and will enter service immediately. From its very first week of service Airbus Military plans to use the device for up to 22 hours per day, an indication of the Company's confidence in the robustness of this new-generation simulator. At the same time the Cargo Hold Trainer— Enhanced (CHT-E), a full-size replica of the A400M's cargo hold has also entered service at the ITC where it is used for training loadmasters in handling full-size loads such as vehicles.



Airbus Military has delivered the 100th example of its C295 medium transport/surveillance aircraft to the Royal Air Force of Oman and celebrated this milestone at the Paris Airshow in the presence of the Omani Minister Responsible for Defence Affairs, Sayyid Badr bin Saood Al Busaidi and Domingo Urena-Raso, President and CEO of Airbus Military.

The RAFO has ordered a combination of aircraft in transport and maritime patrol configuration, the latter featuring Airbus Military's proprietary Fully Integrated Tactical System (FITS).

A total of 121 C295s has been ordered so far and it is in service in 15 countries with which it has accumulated more than 150,000 flight.

Airbus Military CN235 tactical airlifter. The transformation will configure the CN235 with systems from the HC-144 and the systems will have built-in faults that will allow maintenance personnel the opportunity to learn troubleshooting on actual HC-144 aircraft. The USCG Aviation Technical Training Centre, located in Elizabeth

## Airbus Military C295 Milestone



The aircraft is the first of eight ordered last year by the Royal Air Force of Oman (RAFO) and is configured for tactical transport operations. It will be used for initial training at Seville in Spain, where it was assembled, before transfer to Oman later in the year.

### CN235 a.k.a. HC-144A

The US Coast Guard Aviation Logistics Centre has purchased the prototype CN235 aircraft and plans to transform it into an HC-144A maintenance training unit. The HC-144A is based on the

City, N.C., currently has similar training aids for other fleet aircraft including the EADS Eurocopter MH-65 Dolphin helicopter. The HC-144 maintenance training unit will be the first of its kind for an Airbus Military aircraft when the transformation is complete.

# First A350 XWB in maiden flight ...



A new chapter opened in Airbus' 43 year history as the first A350 XWB with Rolls-Royce Trent XWB turbofans made its maiden flight at Blagnac in Toulouse, France on the eve of the Paris Air Show. This first flight marks the beginning of a test campaign involving around 2,500 flight hours with a fleet of five development aircraft. The rigorous flight testing will lead to certification of the A350-900 variant by the European EASA and US FAA airworthiness authorities, prior to entry into service in the second half of 2014 with first operator, Qatar Airways.

The A350 XWB is Airbus' brand new mid-size long range product line comprising three versions and seating between 270 and 350 passengers in three-class layouts. The new family will bring a "step change in efficiency" compared with existing aircraft in this size category, using 25 per cent less fuel and providing an equivalent reduction in CO<sub>2</sub> emissions.



# ... as orders flow in for the A350XWB

## Singapore Airlines order up to 50 more A350 XWBs

Singapore Airlines (SIA) has increased its orders for the A350 XWB with an additional order for 30 A350-900s, plus options for a further 20 aircraft. Under terms of the agreement, Singapore Airlines will be able to select either the baseline A350-900 or the larger A350-1000 when exercising the options. This is the third order from Singapore Airlines for the A350 XWB. The deal sees the carrier's total firm orders for the all-new aircraft increase to 70, plus 20 options. Singapore Airlines will operate the A350 XWB on long haul and regional services.



## SriLankan Airlines opts for 6 A330s and 4 A350 XWBs

SriLankan Airlines, the national carrier of Sri Lanka, has signed an MoU for six A330-300s and four A350-900s. "We are grateful for this renewed confidence SriLankan Airlines is placing with us," said John Leahy, Airbus Chief Operating Officer, Customers "The winning combination of A330s and A350 XWBs will allow SriLankan Airlines to offer the highest levels of comfort to their passengers while also benefitting from superior efficiency levels at any time."



## United Airlines for 35 A350-1000s

United Airlines and Airbus have announced that the airline will add 35 Airbus A350-1000 aircraft to its future fleet. The agreement between the companies represents a conversion of the US carrier's previous order for 25 A350-900s to the -1000 model, as well as the addition of 10 more orders for A350-1000 aircraft. The A350-1000 is the largest version of the A350 XWB (Xtra Wide-Body) family and typically seats 350 passengers in a three-class layout. The aircraft is capable of flying 8,400 nautical miles non-stop and will be operated by United on higher density routes, including non-stop flights between the United States and the Asia/Pacific region. The aircraft will be powered by two Rolls-Royce Trent XWB engines delivering 97,000lbs of thrust.



# AVI OIL

# **VAYU** visits the Armée de l' Air at Base Arienne BA118 Mont-de-



*Rafales on alert at BA118 : the largest Air Base in France*

## **With fighter squadron EC 2/30 Normandie-Niemen**

**I**n *Vayu* Issue III May/June, we covered the visit to France, courtesy the French Ministry of Defence along with its major aerospace and defence players that included Safran, Dassault, EADS Eurocopter, Thales, Nexter and MBDA.

A week long tour then had *Vayu* visiting Cazaux Flight Test Base (BA120), the BA118 Rafale squadron at Mont-de-Marsan, being briefed on air defence systems, space imagery and defence/intelligence telecommunications, the Military Air Experiment Centre (CEAM)

in Mont-de Marsan and thereafter Eurocopter facilities in Marignane. The focus this article is on airbase BA118 (in particular the Rafale squadron EC 2/30) at Mont-de-Marsan.

BA 118 at Mont-de-Marsan is home to the CEAM, the Air Force military experimentation and trials organisation, air defence radar command reporting centre, instruction centre for air defence control and, of course, fighter squadrons.

CEAM's mission is to "study, experiment and define future uses of the equipment that is tested", and consists

of 'Team brands', small units of experts in the field. This includes the Squadron for experimentation 5/330 *Silver Coast* equipped with several types of fighters used for the development of new weapons for the development of new weapons that equip the Mirage F1, Mirage 2000 and Rafale as also EPIGE 07/330 Squadron Programming and Instruction Electronic Warfare, which is responsible for testing and programming of self-protection systems for aircraft (fighter aircraft, transport aircraft and helicopters).

The Reconnaissance Squadron ER 2/33 *Savoie* with Mirage F.1CRs as well

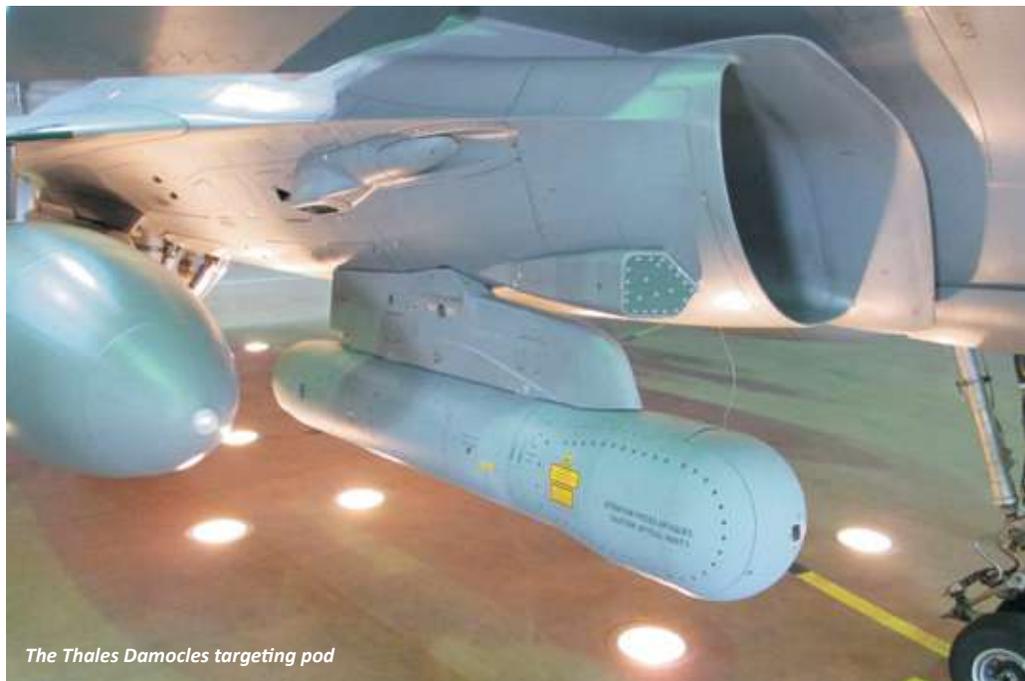
# Marsan



*A fully loaded Rafale takes-off for an air to ground mission with six Sagem AASMs, MBDA MICA AAMs, a Thales Damocles pod and extra fuel tanks.*



*Control tower view as a Rafale taxis for take-off. Vayu was briefed on mission departures as well as essential functioning of the air traffic centre (ATC)*



*The Thales Damocles targeting pod*

as EC 2/30 Normandie-Niemen are based here too.

BA 118 also houses the School of Air Traffic Controllers (CICDA) and the Centre of Detection and Control (CDC), which scans skies of the southwest quarter of France, EDSA (squadron of ground-air defence) which has direct control over surface to air missiles like the Crotale (for protection of the airbase) and, of course, air traffic controllers in the tower managing the airfield. The base is also one of five where the state-of-the-art Aster SAMs are deployed.



A pair of Snecma/Safran M88 engines give the Rafale its power.



Mirage 2000 in its shelter



MBDA's Scalp is well suited for the Rafale, with its effectiveness proven in recent conflicts over Afghanistan and Mali.



Mirage F1 at BA118



For precision strike missions, the Rafale is fitted with six Sagem AASM Hammer INS-GPS-IR guided weapons.



Insignia of Squadrons that have flown the Mirage F1s.



The ER 2/33 'Savoie' headquarters.



Vayu's taxi! An Airbus Military CN-235 configured for paratroops is what the media team travelled in all around France.



## Sagem's AASM Hammer examined at Mont-de-Marsan

The AASM (*Armement Air-Sol Modulaire*) Hammer is a family of weapons developed and produced by Sagem (Safran group) and stands for 'Highly Agile and Maneuverable Munition-Extended Range'. This new family of smart, precision-guided missiles is created by guidance and range augmentation kits adapted to conventional bombs.

The guidance kits are based on a flight control system including computer-controlled movable surfaces, plus inertial guidance unit and sensors. The AASM relies on Sagem's wide range of technological expertise, in particular inertial navigation, electronics, signal management and guidance optronics; inertial navigation unit is based on hemispheric resonator gyros (HRG) ; infrared imager without line-of-sight stabilisation, using associated algorithms; semi-active laser seeker, without line-of-sight stabilisation; hybrid inertial/GPS systems.

Three different guidance kits (inertial/GPS, inertial/GPS/IR and inertial/GPS/laser) are selected according to the



mission and are in service in the French Air Force and Navy :

- The hybrid inertial/GPS (designated SBU-38 Hammer - Smart Bomb Unit) layout is the standard guidance mode for coordinates. Once the coordinates have been entered in the weapon, the inertial guidance system enables it to hit the target without requiring a GPS signal, if that is unavailable.

- The inertial/GPS/IR kit (SBU-64 Hammer) adds an infrared imager for terminal guidance. With a simplified model of the scene around the target first being uploaded to the weapon, this imager allows to recalculate the trajectory during the last seconds prior to impact, using image recognition algorithms. This allows the AASM to hit its target with the highest possible accuracy, even if GPS coordinates are incorrect, or the GPS signal is unavailable.

- The inertial/GPS/laser kit (SBU-54 Hammer) adds terminal laser guidance to

engage agile, moving land or naval targets, illuminated by a ground or airborne laser designator. It has been qualified at the end of 2012.

The Hammer offers a range exceeding 60 kilometers, and is capable of being fired off-axis, by day or night and under all weather conditions, including at low altitude. AASM Hammer kits are fitted to standard 250 kg bombs, and eventually to 125, 500 and 1,000 kg bombs. The AASM 250 is compatible with the Mk.82 (BLU111, CBEMS/BANG, SAMP, etc.), while the AASM 125 uses the Mk.81 type.

The AASM gives the fighter real multi-target capability, all weather, with very high precision and a terminal trajectory suited to all types of targets. The AASM is purpose-designed to control impact conditions, including speed and an impact angle that can be adjusted all the way to vertical. This maximises its impact under any release conditions. Because the AASM is highly maneuverable, it

minimises restrictions on the launch aircraft due to threats, terrain or ground obstacle.

The AASM Hammer is combat proven. During the *Harmattan* operations, French part of NATO's *Unified Protector* operations in Libya as part of the UN's resolution, the French Air Force and Navy carried out 225 launches of AASM missiles from Rafales using the INS/GPS and INS/GPS/Infrared versions. AASM Hammer has also been used in Afghanistan (SBU-38 INS/GPS) and in Mali, as part of *Operation Serval*.

On 12 December 2012, French defence procurement agency DGA successfully carried out the last qualification firing test of the AASM modular air-to-ground missile developed and produced by Sagem (Safran), in its laser terminal guidance version (NATO designation: SBU-54 Hammer). Soon thereafter, on 3 April AASM Laser was officially qualified by the DGA.

## Key elements from Sagem on the Rafale

Sagem has developed many key elements for the Rafale and its weapons system which include the hybrid GPS SIGMA 95 INS gyrolaser navigation system, electrical gyroscopic flight control units, Snecma M88-2 engine's FADEC computer, the Frontal Sector Optronics, IR channel, interface between the Navigation and Attack system and the payloads (BISE) and the SLPRM mission planning and debriefing system. In terms of weapons systems, Sagem has designed and produced the AASM Hammer precision-guided air-to-ground weapons and the infrared seeker for MBDA's MICA mid-range air-to-air infrared missile. The company has also developed the Telemir system for the Naval Rafale, ensuring the aircraft's navigation systems are aligned with those of the *Charles de Gaulle* aircraft carrier.



# Thales : omni presence at BA II8 Mont-de-Marsan

## ThalesRaytheonSystems CybAIR RadBox

ThalesRaytheonSystems has launched CybAIR RadBox, an innovative system to protect air surveillance radars against cyberattack and detect intrusions that could disrupt air operations. Co-located with the radar, CybAIR RadBox is designed for both civil and military airspace surveillance systems. This system monitors operational data, alerts the user if the radar behaves abnormally, performs technical and operational supervision roles and enables operators to visualise the operational consequences of a cyberattack. It can detect any kind of cyberattack, including zero-day incursions that exploit an unknown vulnerability in the system, and insider assault on a protected network. A full range of services and tools are available to update protections, train users and conduct investigations during and after an attack.



CybAIR RadBox is currently undergoing operational evaluation by the French Air Force and the French

defence procurement agency (DGA) at the CDEVS1 testing centre in Mont-de-Marsan. CybAIR RadBox is part of the CybAIR Vision range of solutions designed by ThalesRaytheonSystems to detect any type of abnormal system behavior in radars, networks and air traffic control and air command centers.

## Thales/ SIMMAD

Thales has been awarded the MOREAT1 contract by French Defence Ministry's integrated structure for through-life support of aeronautical equipment (SIMMAD2).



The five-year agreement covers the provision of technical and logistic support as well as through-life support services for the Thales electronic warfare systems and nose-mounted radars on board some twenty types of aircraft in service with the French armed forces, including the Mirage 2000, ATL2, C160/C130 and Puma. Support for equipment on board the Rafale is covered by separate contracts.

## ThalesRaytheonSystems BMD capability

ThalesRaytheonSystems has signed with NATO to produce and deploy a Theatre Ballistic Missile Defense capability to be integrated with the NATO Air Command and Control System (ACCS), a great example of leveraging previous investments from NATO in ACCS and the integration of contributions from NATO Nations across the Alliance. The ACCS TMD1 contract (Theatre Missile Defense 1) will bring new capabilities to the ACCS programme, including

integration of additional radars and satellites, increased data communication capacity and an improved tracking and correlation feature. The award follows on from a previous contract for an Interim Capability also built by ThalesRaytheonSystems and fielded in 2012 in Ramstein.

## Thales to supply NAVAIDS

Thales has been awarded the U.S. Air Force (USAF) Navigational Aids (NAVAIDS) Family of Systems (FOS) programme to modernise the AN/FRN-44 Very High Frequency Omni-Directional Range (VOR), AN/FRN-45 Tactical Air Navigation (TACAN), and AN/FRN-43 Very High Frequency Omni-Directional Range Tactical Air Navigation (VORTAC) infrastructure across the USA as well as at international USAF bases. The NAVAIDS FOS provides navigation signals that allow aircraft to navigate en route and provide approach guidance to aircraft. Thales will replace the existing NAVAIDS with its more advanced and modern products that provide lower maintenance costs and remote maintenance monitoring capability.

## Thales Alenia Space

Thales Alenia Space, serving as prime contractor, has signed a study contract with French Defence Procurement Agency (DGA) to enhance communications between ground and military mission aircraft through a telecommunication satellite without interruption during extreme flying conditions (attitude, tight turns, landing). The aim of KALB study (KALB standing for Kit Aero Large Band, that is Wide Band Airborne Kit) is to develop a high throughput airborne SATCOM terminal compatible with a wide range of aircraft including A400, MRTT, ATL2. Typically a tanker equipped with KALB will be able to disseminate in quasi real time Intelligence Surveillance and Reconnaissance information collected by fighters.

A flight demonstration is scheduled in 2015.



The MBDA MICA on Rafale wingtip

The modern combat pilot has adapted to the very many changes over recent years. Today's need to possess multi-role capability has seen a paradigm shift in the modern air force's role as shown by recent experiences in Afghanistan and Libya which have highlighted strong demand for low collateral, precision effects ground attack weapons whilst still maintaining the ability to control the air. Two former combat pilots, one who flew with the UK's RAF and the other who flew Rafale F3s while in the French *Armée de l'Air*, discuss these new challenges.

Russ Martin, who only recently left the Royal Air Force to join Europe's leading guided weapons company MBDA, experienced these changes himself having served for 20 years as a fighter pilot as well as having completed a three year exchange tour with the United States Navy. "I've seen many changes in the mission profile since the days when I first joined the RAF. Clearly the need to have leading edge air-to-air weapons remains if we are to survive in air combat. However, the growing need is to have true multi-role capability with the right weapons mix to meet the demands of emerging combat missions. Air-launched weapons must be able to cover a broader target set than ever before; from static to

time-critical targets in fact anything from a fast-moving pickup truck to a tank or armoured car, a fast in-shore attack craft (FIAC) or a frigate, landing craft to an integrated air defence system – be that land or ship-based. MBDA weapons such as Dual Mode Brimstone and Exocet have been designed with just these requirements in mind".  
 "Yes I agree" adds former French Rafale pilot François Moussez now also with MBDA, "the multi-role requirement has certainly changed what is expected of the modern pilot (earlier, there were two distinct roles, air-to-air and air-to-ground) With the new generation of multi-role aircraft the pilot needs to master the full range of skills which calls

for more advanced training and user-friendly equipment. Today's role has become increasingly difficult with fewer participants carrying out the same range of roles in an increasingly compressed timeframe while adhering to ever more demanding rules of engagement – it's all become very fast and of course, there is no room for error".  
 Today's pilot will almost certainly be operating in a fully networked environment with constant data interaction between participants. So interoperability is crucial, both in terms of working procedures as well as technical material. Weapons are only part of the equation. It is clear that for success in the modern mission, increasing demands are being placed on

sensor performance to provide the all-important and highly critical situational awareness. The latter is key to mission success as it is essential that the pilot knows where he is with regard to friendly aircraft (on the same mission), enemy aircraft (AWACS, fighters, tankers and so on) and of course intended or opportune targets. To build this situational picture, data flow is required from a mix of radar, EW (electronic warfare) systems, electro optical sensors (the aircraft's targeting pods), third party data from other aircraft (provided by MIDS /Link 16 for example) all merged together by the aircraft (known as sensor fusion) to provide the pilot with a clear tactical image through optimised MMI (man machine interface). With this awareness, the pilot is equipped to exploit firing opportunities for his weapons, it also provides the confidence that they can be fired safely given prevailing conditions on the ground or in the air.

With the Indian Air Force looking towards operating the Rafale, François Moussez describes how this aircraft's performance during the 2011 Libyan operation typified the new air force role. "The Rafale had a crucial role to carry out in the early days of *Operation Harmattan* in Libya, a role it carried out very well. With Libyan columns advancing towards Benghazi, the key requirement was the ability to 'enter first' carrying out SEAD (suppression of enemy air defences), establishing immediate air superiority and then striking the target. Thanks to their MICA multi-mission missile suite, the RBE2 radar and the SPECTRA EW suite, the Rafales were able to penetrate safely inside enemy territory without fearing air threats. In the same time frame, the aircraft were able to detect the enemy's radars, localise and designate the targets with their targeting pods and front sector optronic sensors and then carry out multi-target strikes with their AASM guided munitions at ranges much greater than those of the Libyan anti-aircraft missiles. Of course, some years ago, a similar operation would have had an SEAD element and then an air superiority element before ground strikes could have been carried out. The mission in March 2011 called for a much more rapid response, a rapid response that was duly provided by the Rafale pilots".

"Combat operations are what pilots train for but when the moment comes,



*The Scalp has proved its mettle in recent conflicts.*

you find yourself in a high-pressure environment," continues Russ Martin. "Because of this you need to have the utmost confidence in your aircraft, its systems and of course its weapons. To have an effect, and you've got to deliver effects, at the end of the day that's what combat is all about. In this respect, my contacts in the RAF were extremely enthusiastic about the capability that the Brimstone weapon gave them during operations in Libya. They were able to pinpoint difficult, fast moving targets with unflinching success then return to base knowing that the job had been done".

Today's talk about current, fourth and fifth generation aircraft is inseparable from discussions about weapon capability. With this in mind, Russ Martin pointed out "In looking at air combat and the need to face up to the threats posed by new generations of combat aircraft, weapons can be a significant 'gap filler'. Current

generation platform capability can be greatly enhanced through technology insertion. Supported by new sensors, weapons such as MBDA's Meteor BVR missile can provide a step change in an air force's mission success and survivability without the need to replace current aircraft types. Similarly, the integration of other weapons such as ASRAAM can be a total game changer. We are seeing emerging threats with ever increasing capabilities in both air-to-air and air-to-ground weapons technology. The latest advances in weapon's technology are able to offer air forces a real fighting edge while also ensuring that their aircraft remain both relevant and potent well into the future. Air forces need to start thinking now how they will deliver winning capability for the future, with the flexibility to meet the demands of 21st Century war fighting".

**Russ Martin and François Moussez,  
MBDA Military Advisors**



*A range of air-to-air weapons from MBDA: ASRAAM, Meteor and the MICA-RF*

## **SELF AD 38 Years**

# Aviation Aficionado's Paradise

## VAYU visits Eurocopter at Marignane, France



*Lineup of light helicopters straight out of the final assembly lines!*

**A**s a location it does not get better! Imagine having your office and production facilities on the Riviera with beautiful scenery, beaches and scores of aircraft? Well, Eurocopter have done just that and it was well worth the visit!

Established in 1992, the Franco-German-Spanish Eurocopter Group is a division of EADS. Last year, the company had a turnover of 6.3 billion Euros, with orders placed for 469 new helicopters and a 44 percent market share in the civil and parapublic sectors. Eurocopter's strong international presence is ensured by its subsidiaries and participation in 21 countries along with a worldwide network of service



*The NH90 with a Puma at the back.*



*An EC725 Caracal taxis past our briefing room.*

centres, training facilities, distributors and certified agents supporting some 2,900 customers.

With more than 11,800 helicopters currently in service in 148 countries, Eurocopter products account for 33 percent of the total world helicopter fleet in the civil and parapublic market. Their success is based on its comprehensive range of civil and military helicopters, that benefit from "continuously improving on state-of-the-art technology".

The EC120 is the lightest helicopter



*The Tiger demonstration for Vayu felt like a cross between an airshow and actual operations !*

in the Eurocopter range, and this extremely silent aircraft is also the most modern single-engine helicopter in its category. The Ecureuil family including the AS350, AS355 and EC130 has been known for its multi-mission capabilities, operating in even the harshest of operating conditions.

The EC135 and EC145 light twin-engine aircraft have been widely successful in the law enforcement and emergency medical sectors, “proving once again that Eurocopter’s range of helicopters can perform a fully comprehensive range of missions”. The EC155 and the AS365 from the Dauphin family offer high speed, low vibration levels and are “perfect” platforms for long range transport and public service missions.

The new EC175 will complement Eurocopter's civil range in the 7-ton class. This aircraft is particularly well-adapted for offshore, search and rescue (SAR), VIP and corporate transportation missions.

The EC225 and the AS332, from the Super Puma family, are popular for oil and gas missions and remain a “must-have” for operations in this industry. Both types of aircraft are fitted with contemporary autopilots.

In the military sphere, Eurocopter offers aircraft for all operations of armed forces, from light single engine to heavy twin engine aircraft. The Fennec for observation and armed Scout missions (which is still on offer to India despite extended delays and confusion from the Indian side); the EC635 for armed reconnaissance and advanced military training; the twin-engine EC645, including the UH-72 Lakota version of the US Forces, which is primarily in use for light utility, surveillance/security, medical evacuation and command and control missions; the

## Chinese order more EC225 and AS350 B3es

China’s largest helicopter operator in the power and electricity sectors, the State Grid General Aviation Company (SGGAC), has ordered one EC225 and two AS350 B3e rotorcraft to support the country’s electrical grid development and build the Chinese company’s business into other airlift duties. The latest agreement expands a multi-year relationship during which Eurocopter has become one of SGGAC’s most important aircraft and services provider. Eurocopter supplied an AS350 B3 that assisted in completing the Qinghai-Tibet AC-DC Interconnection Project plateau line, with the rotorcraft setting a 5,350-meter altitude record for helicopter-based power line support operations.



*NH90 final assembly line*

Panther, specialising in naval missions as well as the heavy-lift Cougar, mainly for troop transport. In its combat SAR version the EC725, from the Cougar family, has been successfully deployed in difficult operations such as in Afghanistan and Libya.

The Tiger combat helicopter has proven its capabilities in demanding environments such as Afghanistan and Mali. Deliveries of the NH90 in its Tactical Transport (TTH) and Nato Frigate (NFH) versions continue and the first multi-role helicopters have entered service to support armies in their operations. With 206 Tigers sold and more than 500 NH90s ordered by the armed forces of 14 countries, these programmes are already a huge success on the export market.

Every year since 2008, a new helicopter, a new helicopter version or a new technology demonstrator has performed its maiden flight. Spearhead of Eurocopter's innovation policy is the X3 high-speed demonstrator combining vertical takeoff and landing capabilities of a helicopter with high cruise speeds. The X3 performed its first flight in September 2010 and exceeded its original speed target of 220 knots (407km/h) in May 2011. At a speed of 232 knots (430 km/h) the X3 demonstrated the compound aircraft's performance, capabilities and maturity. The concept is tailored to situations where operational costs and mission success depend directly on the maximum cruising speed.



*EC225 being fitted out and readied for testing*



## Japan acquires more helicopters for various prefectures

**E**urocopter Japan recently signed contracts with Japan's National Police Agency for a total of four helicopters. Comprising two medium-class and two twin-engine light helicopters, the new acquisitions will be deployed with the Hyogo Prefectural Police (EC155 B1), Hiroshima Prefectural Police (AS365 N3+), Osaka Prefectural Police (EC135 P2e) and Fukuoka Prefectural Police (EC135 P2e), as replacement for ageing aircraft in the respective fleets.





*The Tiger displays its lethality*

Eurocopter’s ability to integrate unmanned flight capabilities into its helicopter family has been validated by an optionally piloted vehicle (OPV) demonstration programme, which used an EC145 to fly routes that included deployment of an external sling load and a representative observation mission.

Furthermore, Eurocopter has successfully tested a hybrid helicopter that combines a turboshaft internal combustion engine with an electric motor. This world premiere marks a new milestone in Eurocopter’s innovation roadmap and opens the way for further enhancements in rotary-wing aircraft safety. The supplemental electric system, installed on a single-engine demonstrator helicopter, automatically serves as engine backup system in case of a main engine failure and increases maneuverability during the autorotation landing. The application of the electric system aims at increasing safety of a single-engine helicopter. In the future, hybrid propulsion could pave the way for reduced fuel consumption and emissions.

The successor of the Dauphin family will evolve from the X4 programme, launched in 2011. With deliveries to start in 2017, this helicopter will

incorporate “break-through technologies” developed by Eurocopter and its partners. Axes of innovation include in particular performance levels, operating costs, environmental impact and the overall way of one flies and controls a helicopter.

The *Helicopter of the Future Project* includes, in addition, a comprehensive set of research efforts for the next generation of helicopters. New technologies aim at the long-term evolution of the whole helicopter range involving cockpit design, communication systems, navigation support and airframe as well as associated maintenance and repair techniques.

## Sagem STRIX on the Tigre/ Tiger HAD/HAP

Having day/night surveillance and long-distance firing capabilities thanks to its stabilisation qualities, STRIX was developed and produced by Sagem for attack helicopters, enabling the use of a vast array of weapons. STRIX is mounted on the roof of Eurocopter’s Tigre helicopter – the HAP version in France and the HAD version in Australia and Spain – and the NightOwl version of the Rooivalk helicopter. The HAP (Air support and Protection) STRIX version has a direct optical channel, a day TV channel, an 8-12m infrared channel and a telemeter laser. The HAD (Air support & Destruction) version has in addition a laser designator and an illuminated target laser detector. It is capable of firing cannon, rockets, Mistral air-to-air missiles and laser-guided missiles. In its export version, it is compatible with firing the Hot and/or Trigat anti-tank missiles. STRIX is coupled with image processing and automatic tracking.

The STRIX has been ordered for 40 French Tigre HAPs and 40 Tigre HADs, and 24 Spanish Tigre HADs and 22 Australian Tigre HADs. Sagem also developed and produced the German Army’s Tigre UHT OSIRIS observation and firing system.



## HYDERABAD AIRSHOW

# Helisim at Marignane



Helisim training includes courses for helicopter type ratings, instrument ratings, maintenance flight checks, glass cockpit familiarisation, line-oriented flight training, multi-crew coordination and cockpit resource management, along with the qualification of simulator training operators.

Mission-oriented training offered by Helisim covers offshore procedures, flight with night vision goggles, tactical flight, government and VIP operations, as well as combat SAR (search and rescue). Recurrent courses include all possible emergency procedures, within flight profiles covering instrument flight rules (IFR) and mountainous terrain flying to operations at helipads, in confined areas and to offshore platforms.

Situated close to Eurocopter's headquarters and production facility location in Marignane, France, Helisim trains an average of 3,000 pilots annually – performing approximately 14,000 hours of simulation per year. Helisim is co-owned by Eurocopter and Thales, with 45 percent shareholdings each, and Défense Conseil International, which holds the remaining 10 percent.

**H**elisim has celebrated the 100,000th hour milestone for flight simulator sessions with international customers, marking a key milestone in its training of pilots on Eurocopter helicopters that directly contributes to the safety of operators worldwide.

The value of Helisim's services is the highly realistic flight experience provided in its ground-based simulators, enabling pilots to encounter even the most extreme operating conditions across a full range of civil, parapublic, governmental and military missions.

Helisim operates two full-flight simulators with motion systems that accommodate roll-on/roll-off Level D cockpits for various rotorcraft including the EC225, EC155, AS332 L1 and AS332 Super Puma/Cougar, along with the AS365 N2 Dauphin/Panther. It also has a full-flight simulator for the NH-90 TTH tactical transport helicopter, along with one multi-cockpit Level 3 flight training device.

“Our training places pilots in real-life scenarios that cover everything from routine flight to the most demanding of situations – all within the safe environment of our ground-based simulators,” said Helisim Chief Executive Officer Patrick Bourreau. “The commitment of our team is fully aligned with the goals of Eurocopter to ensure the safe operations of its customers – whatever type of missions they perform.”



## 250th UH-72A Lakota delivered to US Army

The U.S. Army has accepted the 250th UH-72A Lakota helicopter delivered to it and National Guard units by EADS North America since 2006. Every Lakota – including an additional five produced for the U.S. Naval Test Pilot School – has been delivered on time and “on budget”, by an American workforce that comprises more than 50 percent US military veterans. The combined Lakota fleet’s operations have now exceeded 150,000 flight hours, while maintaining greater than 90 percent availability.

## Nepal’s Shree Airlines order eight Ecureuil light helicopters

Nepal’s Shree Airlines has placed an order for eight helicopters from Eurocopter’s Ecureuil family – comprising five AS350 B3e and three EC130 T2 – for use in search and rescue, aerial work, disaster relief missions and heli-tourism. With the additional orders, Shree Airlines becomes the biggest operator of the Ecureuil fleet in the South Asia region with a total of nine aircraft, comprising six AS350 B3e and three EC130 T2.

First deliveries of the Ecureuil family aircraft for Shree Airlines will begin from early 2014.



## Upgrade for 24 RAF Puma Mk2s

Eurocopter UK’s role in maintaining the United Kingdom’s military helicopter capabilities has been further expanded with the award of a three-year support contract for the fleet of 24 Royal Air Force Puma Mk2 helicopters being upgraded by the company “to extend their life, enhance performance, mission capability and operational safety.”

The 24 Puma Mk2 rotorcraft covered by this support contract are being upgraded under the Puma Life Extension Programme contract awarded to Eurocopter UK in 2009 by the UK Ministry of Defence. All 24 helicopters have been inducted into the programme, with the first aircraft deliveries from Eurocopter UK made in 2012. To date, eight have completed the process. Improvements for the Puma Mk2 include the use of new Makila 1A1 turboshaft engines; the integration of a full glass cockpit incorporating modern avionics and a flight management system; the implementation of a digital automatic flight control system, as well as the incorporation of a secure communications suite, defensive aids and ballistic protection for crew and passengers.



## The Aviation Aficionados at Marignane



### French Army Aviation's first Tiger HAD

Delivery of the first production Eurocopter Tiger helicopter in the HAD (*Hélicoptère d'Appui Destruction*) attack configuration took place on 19 April, to be operated by the French Army Aviation Corps (*Aviation Légère de l'Armée de Terre*). France has ordered 40 Tiger combat helicopters in HAD configuration while 24 have been ordered for the Spanish Army Aviation (*Fuerzas Aeromóviles del Ejército de Tierra*).



Improvements over the earlier Tiger HAP variant include two enhanced MTR390 turboshaft engines, improved ballistic protection, a new optronic sighting system, the capability to target and launch Hellfire air-to-surface missiles, an evolved electronic warfare suite and an IFF interrogation system.

### Sikorsky UM-60Ms for Sweden

Delivery of all 15 Sikorsky UH-60M Black Hawks on order by the Swedish Armed Forces was completed on 24 April when the final pair arrived at Linköping, on board a Boeing C-17A Globemaster III of the NATO Heavy Airlift Wing. The Swedish-designated HKp16s will be handed over to the Helicopter Wing based at Malmslätt and operated by 2 Helicopter Skvadron. Four HKp16s began operations immediately in Afghanistan, two having been air freighted there from Linköping on 12 March.



### Korean Marines order 40 Surions

Korea Aerospace Industries (KAI) has been selected to supply 40 Surion helicopters to the Republic of Korea (ROK) Marine Corps. KAI plans to start the development programme worth 800 billion SK (\$713 million), awarded in July, complete development by 2015, following which production will commence.

The ROK Marines' version will incorporate an integrated flotation system, specialised communications equipment, an auxiliary fuel tank to increase range and various other modifications. The helicopters are expected to operate from the ROK Navy's *Dodko*-class amphibious assault ships, each of which can carry upto 15 helicopters.



### Canada's 1st CH-147F Chinook

On 21 June 2013, Boeing delivered the first of 15 new CH-147F Chinook helicopters to the Royal Canadian Air Force. The aircraft boasts of a modernised airframe with a long-range fuel system, upgraded electrical system, fully integrated Common Avionics Architecture System cockpit and Digital Automatic Flight Control System along with improved survivability features including a Directional Infrared Countermeasures system.

The first CH-147F was accepted by the Royal Canadian Air Force's 450 Tactical Helicopter Squadron and will be followed by six additional aircraft over the remainder of 2013. The Canadian government awarded Boeing a contract for 15 Medium-to-Heavy-Lift Helicopters (MHLH) and in-service support in June 2009; all deliveries are scheduled to be completed by June 2014.



## TAMIR AD

### Malaysian EC725 Operations begin

The first two EC725s for the Royal Malaysian Air Force (RMAF) were displayed at LIMA 2013. Twelve EC725s were ordered in late 2010 with these first two handed over at Eurocopter's Subang facility in December 2010 and are now based at Kuantan with No.10 Squadron. A second helicopter unit, No.7 Squadron at Kuching is expected to be operational in mid-2014. Initially configured for search and rescue, the EC725s will eventually be upgraded to combat, search and rescue (CSAR) standard.

### Ka-52 potential market

Rosobronexport is reportedly in discussions with several CIS nations over potential orders for the Kamov Ka-52 reconnaissance and combat helicopter. "We believe the immediate and most relevant customers are CIS countries and we are already in discussions," according to Alexander Dolin. "These countries traditionally operate Russian weapon systems," he said, adding that the Ka-52 is also expected to be ordered by other "traditional partners."



The VK-2500-engined type's high power-to-weight ratio will be useful for operations in high altitude and high temperature regions in Asia and Latin America. "We are ready to enter into dialogue with customers to use their own systems, or to tailor the aircraft for their national needs," Dolin said.

Developed as an intended successor to the Mil Mi-24 using Russia's combat experience in Afghanistan and the Caucasus with the Ka-50 Black Shark, the coaxial-rotor Ka-52 uses a side-by-side crew configuration, with armoured protection and ejection seats. Already in service with three Russian regiments, it has completed all qualification tests.

### Increased V-22 sales

The US Marine Corps are reportedly pushing for the Bell Boeing V-22 to operate from ships of other nations, as part of an effort to secure additional sales. Col Gregory Masiello, the US Naval Air Systems Command's programme manager for the joint programme has revealed that an MV-22 landed on two different types of Japanese helicopter-carrying destroyers.



Meanwhile, an agreement has been reached between the US government and France to qualify the tiltrotor to operate from the French Navy's *Mistral*-class amphibious assault ships and similar agreements have been discussed with Italy and other allied nations. The USMC has options for 22 additional V-22s.

### Rafale offered to Canada

Even as the first Dassault Rafale equipped with an active electronically scanned array (AESA) radar (RBE 2) is being delivered to the French Air Force, Dassault is working towards a potential sales opening in Canada. "The first aircraft equipped with the new antenna will be delivered to the forces in early July 2013," stated Bruno Carrara, Rafale programme director for RBE 2 radar supplier Thales. Eleven radars are being provided per year.

Dassault is mounting a sales campaign for the Rafale in Canada, which chief executive Eric Trappier feels is a "significant" prospect. On the competition he stated that, "There are some problems with the F-35 programme in delivering the technology and the budget, the F-35 will be operationally expensive and so I am happy. Some countries are reviewing their plans."

Dassault has responded to Canada's request for technical information and on 5 July, submitted pricing data. It is also preparing a package of industrial benefits for the nation, which it will submit on 2 August based on the French Air Force's AESA-equipped configuration. Eric Trappier has also stated that "progress is also being made with a fighter bid for Malaysia," and that he is "confident".



## Norway approves F-35 purchase

The Norwegian parliament has approved purchase of the first six operational F-35 Joint Strike Fighters. While it has yet to sign a contract, Norway's acquisition will cover conventional take-off and landing aircraft to be built during the F-35 programme's ninth lot of low-rate initial production, with deliveries to start in 2019.



Earlier in 2013, Oslo confirmed plans to buy up to 48 operational F-35s, following four aircraft to be used for training purposes. Meanwhile, Lockheed Martin have urged that the UK Ministry of Defence should make a so-called 'Main Gate 4' decision, covering its first operational-standard F-35Bs. The UK has taken delivery of three short take-off and vertical landing aircraft, which will be used to support initial operational evaluation and training activities in the USA.

## Sukhoi forecasts 200 Su-35 sales

According to Mikhail Pogosyan, head of United Aircraft (UAC), the Su-35 will attract orders for at least 200 aircraft, both from Russian and export countries. There are 48 examples currently on order for the Russian Air Force and sale of another 100 aircraft should come from existing operators of Sukhoi or MiG-series combat aircraft. China has expressed interest in the Su-35 (see *Vayu II/2013*).



The Su-35 was the first Russian-built fighter to appear in an air display at the Paris Air Show since 1999. Powered by multi-axis thrust-vectoring Saturn 117S afterburning engines, the fighter can carry up to 8,000kg (17,600lb) of air-to-air and air-to-ground weapons on 12 hardpoints. The type has a range of 1,940 nm (3,600km), which can be extended by external tanks and inflight refueling.

## Typhoon sales prospects

The Eurofighter consortium is targeting a potential opportunity to export 250 more Typhoons during the next decade according to new chief executive Alberto Gutierrez. "The size of the global market is close to 1,000 aircraft in the next decade and our aim is to capture not less than 25% of that."



The Typhoon is presently being offered to Malaysia, South Korea and the United Arab Emirates, while Saudi Arabia could be adding to its current commitment for 72 numbers. Opportunities also exist in Bulgaria, Kuwait and Qatar.

BAE Systems are reportedly leading the Eurofighter campaign in South Korea in competition with the Boeing F-15 Silent Eagle and Lockheed Martin F-35. South Korea is expected to take a decision on its 60 aircraft F-X III requirement by end of July.

## Unmanned Gripen ahead?

The Saab Company has cut metal on its first of three dedicated test examples of the Gripen E fighter even as flights have taken place with the production standard active electronically scanned array (AESA) radar for the first time in the two-seat demonstrator. Saab's head of aeronautics Lennart Sindahl said the metal-cutting milestone was achieved recently at the company's Linköping site in Sweden and involved the radar bulkhead for an aircraft designated as JAS 39-8, due to fly in 2015, and will be followed by two more E-model test aircraft.

Demonstration-phase work using a modified D-model trainer has advanced with the aircraft now flying with a digital head-up display, new infrared search and track sensor and Selex ES-05 Raven AESA radar. In a new development, Saab's chief



executive Håkan Bushke has said that the company's investment in technologies linked to Europe's Neuron unmanned combat air system demonstration programme could enable adapting the type for optionally piloted operations.

"Maybe an air force could fly with a mixed formation of Gripens – one or two manned and the others without pilots. We are working with the Neuron programme and will have flight tests at the Vidsel test range next year," according to Håkan Bushke.

### Romania buying ex-Portuguese F-16s

Romania has made a bid to buy 12 F-16A/B MLU fighters from the Portuguese Air Force to replace the Romanian Air Force's ageing MiG-21 Lancers, with deliveries to start in 2017. Romania would pay around € 670 million over a period of five years for the complete package, including aircraft, pilot training, maintenance, upgrades and logistics support.



Various options for replacement of the FAR Lancers have been under consideration for the last decade but plans to acquire new aircraft were dropped owing to lack of finance.

### French 'La Cocotte' squadron marks centenary

12 April 2013 was marked at Base Aérienne 118 Mont-de-Marsan as the centenary of the French Air Force's Escadrille BR11 'Cocotte' and also 30 years of the Mirage F1 in service.

BR11 was formed on 10 June 1913 as Escadrille C-11 at Brayelle, near Douai, flying Caudron G-3s, its current BR11



designation adopted in November 1917. The Escadrille has been involved in every major conflict from the First World War to the present day. For the last 20 years it has been an Escadrille of ER 2/33 and has seen involvement in Operation *Harmattan* in Libya and Operation *Serval* in Mali over the past two years.

### MPAs for Yemen

According to reports from the USA, Yemen is seeking US assistance for procuring light maritime patrol aircraft plus associated ground support equipment. These include 12 Seabird SB7L-360 Seeker Maritime Patrol Aircraft (MPA) with forward-looking infrared cameras and video data downlink, together with 120 tactical patrol vehicles and 54 data and video downlinks for the Yemen Air Force and Coast Guard. This is to protect (and monitor) Yemen's maritime borders by providing integrated air-to-ground/maritime operations.

Of Australian origin, Seabird Aviation America (SAAM) was recently set up to manufacture the Seabird SB7L Seeker in New Mexico.

### Yemen seeks new fighters, helicopters

Modernisation of Yemen's Air Force and counter-terrorism strategies were reportedly discussed with Russian President Putin by Yemen's President Abdrabbuh Mansour Hadi, who has asked Russia to sell Yemen new aircraft and helicopters. Yemen is hoping for a \$1 billion deal in order to buy new MiG-29s and attack helicopters.

### More F-16 Block 52s for Egypt

Four more Lockheed Martin F-16C/D Block 52s have been delivered to the Egyptian Air Force, these being the second batch of the 20 on order. These were flown from Texas to Egypt on 11 April with support provided by a US Air Force KC-10A. All 20 F-16s are scheduled to be delivered by the end of this year.

## Tunisian C-130J-30 delivered

Lockheed Martin has delivered the first C-130J-30 Super Hercules to the Republic of Tunisia marking initial delivery of the type to an African country. The aircraft is one of two for the Tunisian Republic Air Force and made its maiden flight on 12 February. The second aircraft is due for delivery in 2014. The TRAF currently operates a fleet of nine C-130Hs and C-130Bs, first purchased in mid-1980s.

## Exercising in Morocco

USAF F-16s were deployed to Ben Guerir Air Base in Morocco, from the USAF's 31<sup>st</sup> Fighter Wing's 510<sup>th</sup> Fighter Squadron at Aviano Air Base, Italy, for bilateral training exercise *Majestic Eagle* 2013 in mid-April. The exercise brought airmen from both countries to train together in air interdiction, air superiority, air refueling and reconnaissance in order to improve interoperability. In addition to the F-16s, KC-135R Stratotankers from the 100<sup>th</sup> Air Refueling Wing at RAF Mildenhall, Suffolk were also deployed to support the exercise.



## French detachment at Dushanbe

The French Operational Transport Group (*Groupement de Transport Opérationnel – GTO*) detachment at Dushanbe, Tajikistan has ceased operations after supporting the operations of French soldiers and coalition forces in Afghanistan since December 2001. The detachment comprised 30 personnel and two French Air Force Transall C160s supplemented when required by a C-130H Hercules. These were maintained at an operational readiness level that enabled deployment on medical evacuation missions.

Since 2001, the GTO has undertaken almost 11,000 airlift missions and accumulated around 21,500 flight hours, 60% of them supporting French soldiers in Afghanistan. The remainder supported other members of the International Security Assistance Force. Between 2001 and 2008, GTO operations were solely based at Dushanbe, after which aircraft were regularly detached to Bagram, Kabul and Kandahar for airlift within the theatre.

According to sources, under a bilateral cooperation agreement between France and Tajikistan, the GTO also trained the Tajik Army airborne forces, sharing expertise in airdrop and transported foreign military and civilian authorities' personnel, including Tajiks, between Dushanbe and Kabul.

## Bangladesh Navy to get Do 228NGs

The Swiss company RUAG is to shortly deliver two Dornier 228NGs to the Bangladesh Navy. Bangladesh aircrew have already been trained by the Company in Germany.

The aircraft will be equipped with a Telephonics RDR 1700B 360° radar integrated with a moving map display. The 228s will have two air-deployable life rafts on board for search and rescue duties. The Bangladesh 228s will be based at Chittagong and primarily deployed for protection of Bangladesh territorial waters and offshore islands against other claimants (read India).

Meanwhile, a HAL-built Do228 was delivered to the Seychelles Air Force on 27 April, to be based at Seychelles-Mahé International Airport-Pointe Larue. The new aircraft, built by Hindustan Aeronautics (HAL) at Kanpur, had been officially handed over on 31 January but remained in India for training purposes. It will replace an Indian Coast Guard Dornier 228 that had been temporarily deployed to the islands.

## First JMSDF P-1 delivered

The Japan Maritime Self-Defence Force (JMSDF) took delivery of the first two pre-production Kawasaki P-1 maritime patrol aircraft at Gifu Air Base on 26 March. A few days later, they were flown to Atsugi Air Base to join the two prototypes operated by 51 Kokutai (Air Squadron) for two years of operational flight testing.



Development of the XP-1 began in 2001 alongside the XC-2 (replacement for the C-1 of the Japan Air SDF), the first development and design programme covering two large aircraft in a single concept. Kawasaki Heavy Industries was selected in late 2001 as the main contractor for the programme. Four P-1s have been delivered and six are on order, including two in the 2013 budget at a price of ¥40.9 billion (\$411 million). Some 70 P-1s are to be purchased to replace the present 80 P-3 Orions and the first operational unit will be 5 Kokutai at Naha Air Base, Okinawa.

## Five ex-RAAF C-130Hs for Indonesia

Five Royal Australian Air Force (RAAF) C-130Hs have been offered to the Indonesian Air Force (TNI-AU), following delivery of the first four ex-RAAF C-130Hs. The RAAF had

retired its eight remaining airworthy C-130Hs in November 2012 following Australian defence budget cuts. They currently remain in storage at their former base at RAAF Base Richmond, New South Wales.

## Dassault chief critical of European "attitudes"

Dassault Aviation chairman and chief executive Eric Trappier is openly critical of "the attitude of European governments towards defence procurement." Referring to what he describes as "a buy-American policy at any cost" among some European nations, Trappier was also critical of both French and British governments for their lack of commitment to joint UAS development.

"We worked with BAE Systems and had MoUs for development and were confident we could be ready for 2020. But then the government support for the start of the development phase never happened. This is a problem for Europe," he said at Dassault's headquarters in St Cloud on eve of the Paris Air Show.

## Launch customer for AT-6 "near"

According to Beechcraft, there is now a launch customer for its AT-6 light attack aircraft to be announced by the end of 2013. The company has held "serious discussions" for a 24-aircraft deal, stated Bill Boisture, CEO and said there is "interest from countries in Asia, Latin America and Middle East."

Boisture however expressed Beechcraft's displeasure at the US Government Accountability Office's rejection of its protest against the outcome of the US Air Force's Light Air Support (LAS) contest, which will see Embraer and Sierra Nevada supply Afghanistan with 20 A-29 Super Tucanos.

The Super Tucano is "less capable and more expensive than the AT-6" and US Congress should examine the procedures and process leading to its selection for the LAS deal.

## T-50 sales to Indonesia and Philippines

The Indonesian Air Force is to receive all of 16 Korea Aerospace Industries (KAI) T-50 advanced jet trainers between September 2013 and February 2014. The first export



order for the T-50 was signed in May 2011 and Indonesian pilots and maintenance crew are familiarising themselves with the T-50 in South Korea. Meanwhile, KAI is near closing a deal with the Philippines for 12 armed FA-50 trainer and light fighter aircraft.

## Irkut confirms Yak-130 buyers

The Russian United Aircraft (UAC) has confirmed an order with Belarus for the Irkut-built Yak-130 advanced jet trainer. According to UAC officials, Belarus signed a production deal for the Yak-130 in December 2012 and next international contract is expected to be signed with Bangladesh later in 2013. Further sales opportunities are being followed up in Southeast and Central Asia.



Meanwhile, Irkut is set to deliver 18 Yak-130s to the Russian Air Force during 2013, the service receiving its first examples last year under an initial order for 55 units. Irkut has previously supplied 16 of the type to the Algerian Air Force. The Company is considering the addition of several new features to the Yak-130, which will allow it to also serve as a light-attack aircraft, including a radar, targeting pod, inflight refueling capability and an expanded weapons fit.

## 100<sup>th</sup> C295 to new user Oman

The 100<sup>th</sup> C295 is slated for delivery to the Royal Air Force of Oman. Sporting camouflage markings and the service number 901, the C295 was to be transferred to Omani ownership in Seville, Spain. "We look forward to working with the company as we train our initial pilots and loadmasters," said Royal Air Force of Oman commander Air Vice Marshal Matar Ali Al-Obaidani. "By the end of this year, the aircraft will be in service as a tactical transport. It will significantly increase our ability to support our sister services and the civilian population in Oman."

Oman had signed an eight-aircraft deal for the C295 in May 2012. Its aircraft will be split between the tactical transport and maritime patrol configurations.

## Saab's weapon locating system 'Arthur'

Saab has received an order for the Arthur weapon locating system with deliveries to take place in 2014. Arthur is a C-band medium-range weapon-locating system that detects and locates enemy artillery fire. The system is used by several armies, including those of Sweden, Norway, Denmark, UK, Greece, Czech Republic, Spain and Italy. Applications in the system include counter battery operations, fire control, peace enforcement missions and force protection by suppressing enemy Rockets, Artillery and Mortars (RAM). It utilises a passive phased-array antenna technology for optimised performance, the technology providing the perfect balance between mobility, range, accuracy, ECCM (Electronic counter-countermeasures), operational availability and operational cost.

## US Army order 215 Chinooks

The US Army and Boeing have signed a \$4 billion multi-year contract for 177 CH-47F Chinook helicopters, with the Army holding options that could increase its total acquisition to 215 aircraft. Deliveries from the agreement, which is a cost-effective alternative to annually contracting for the aircraft, begin in 2015. The tandem-rotor Chinook is the backbone of combat, logistics and humanitarian operations for the US Army and 18 other operators around the world. This order would eventually bring the Army's CH-47F total procurement close to its target of 464 aircraft, including 24 to replace peacetime attrition aircraft. The US Army's current inventory stands at 241 F-model aircraft.



## 99 V-22 Osprey Tiltrotor aircraft for NAVAIR

The Bell Boeing V-22 Programme, a strategic alliance between Bell Helicopter and Boeing has been awarded a five-year US Naval Air Systems Command (NAVAIR) contract for the production and delivery of 99 V-22 Osprey tiltrotor aircraft, including 92 MV-22 models for the US Marine Corps and seven CV-22 models for the US Air Force Special Operations Command. The contract also includes a provision permitting NAVAIR to order up to 23 additional aircraft.

The V-22 Osprey is a joint service, multirole combat aircraft that deploys tiltrotor technology to combine the speed and range of a fixed-wing airplane with the vertical performance of a helicopter. With its nacelles and rotors in vertical position, it can



take off, land and hover like a helicopter, and once airborne, its nacelles can be rotated to transform the aircraft into a turboprop airplane capable of high-speed, high-altitude flight.

More than 200 V-22 Ospreys are currently in operation and the worldwide fleet has amassed more than 185,000 flight hours, with half of those hours logged in the past three years.

## Raytheon's Enhanced Paveway II

Raytheon is leveraging innovative technology resulting in superior accuracy and reliability with the latest variant of Enhanced Paveway II "L-5" guidance kits. The advanced system is designed to engage manoeuvring targets traveling at high speeds, while simultaneously improving accuracy and minimising aircrew workload. At the heart of the system is the innovative digital Semi-Active Laser seeker, which improves performance and increases overall capability and reliability of the Enhanced Paveway. The company was awarded a direct commercial sale in 2012 from an international customer for more than 600 of its next generation of Enhanced Paveway II "L-5" guidance kits.

## CAE's military contracts

CAE has won approximately C\$100 million worth of military contracts from customers that include a contract to design and manufacture a CAE 3000 Series AW139 full-flight simulator for Coptersafety, a foreign military sale contract from the United States Navy to provide KC-130R aircrew and maintenance training services to the Japan Maritime Self Defence Force, and a contract from Havelsan to provide the CAE Medallion-6000 image generator for T-129 attack helicopter full-mission simulators.

However, CAE has introduced the latest generation of its market-leading visual image generator (IG) for civil aviation training: CAE Tropos-6000XR. The software provides a



more immersive environment and an enhanced pilot training experience with new features leveraging the power of the latest NVIDIA commercial graphics processors. The first simulator to be equipped with the new CAE Tropos-6000XR visual system is an Embraer 190 full-flight simulator (FFS) delivered to Swiss Aviation Training (SAT).

## First C-130J Super Hercules for Israel

On 26 June 2013, Lockheed Martin delivered Israel's first C-130J Super Hercules airlifter during a ceremony at its production facility. This is the first of three C-130Js currently on order for the Israeli Air Force which has operated 'legacy' C-130s since 1971.

Israel ordered its C-130Js through a Foreign Military Sale (FMS) contract with the US Government. Upon delivery, this aircraft will move into a modification programme and receive Israeli-unique systems. An in-country delivery for this C-130J "it is scheduled for spring 2014. Fifteen countries have chosen the C-130J Super Hercules to meet their air mobility needs and is the standard by which all other airlift is measured in terms of availability, flexibility and reliability. C-130Js currently are deployed in two combat theatres where they operate at a very high tempo efficiently and reliably".



## RAN's MH-60R Seahawk Romeo first flight

The first of 24 MH-60R Seahawk Romeo helicopters has completed its maiden test flight. The initial test flight occurred at Sikorsky's Production Facility in Connecticut, USA on 26 June 2013, passing a range of tests including controllability, engine



performance, vibration analysis and navigation as well as the 'Contractor Flight Acceptance' phase. The acquisition of 24 Seahawk Romeos will give the Royal Australian Navy (RAN) ability to provide at least eight helicopters embarked at any one time with Australia's *Anzac-class* frigates and the new *Hobart-class* air warfare destroyers, with the remainder based at HMAS *Albatross* in Nowra. The first helicopter is now being prepared for transit to Lockheed Martin's facility in Owego, New York, where it will be fitted with its highly capable mission systems and sensors. A further three Australian helicopters are currently in various stages of assembly with the first two planned to be handed over to the RAN in December 2013.

## First pre-production Gripen E

Saab has started assembly of the next generation Gripen E, first pre-production test aircraft being 39-8. Following a short and intense period of design using the latest tools and methods through the 'Model Based Design', construction of the Gripen E begins with the manufacturing and assembly of all parts of the fuselage. Based on the design of previous versions of the Gripen system, the Gripen E offers a next generation sensor suite, new communication links, revolutionary avionics architecture, more thrust, increased flight time, more weapon stations and load capability, a fully digital cockpit including HUD (Head-Up Display) and a brand new electronic warfare system. The test aircraft 39-8 will be the first complete pre-production version of the Gripen E and will be used to demonstrate new features and capabilities. The technological leaps in the Gripen E have been proven in the Gripen demonstrator programme with the Gripen E/F demo aircraft that has flown over 250 hours in countries such as Sweden, the UK, India and Switzerland (in Emmen in October 2012, January and April 2013) since 2008.

## FMV order for Gripen support

Meanwhile, Saab has received an order from the Swedish Defence Materiel Administration (FMV) for reserve material regarding Gripen for the years 2014-2016, the order's total value being some SEK 184m. This order for the three-year period provides options for placing suborders and



The Gripen at Aero India 2011.

has been configured within the framework of the previously signed agreement with FMV, Gripen PBL (Performance Based Logistics), which encompasses performance-based support and maintenance for Gripen. The order applies to expanded supply of reserve material for maintenance conducted by units of the Swedish Armed Forces. The original contract with FMV includes options for additional suborders up to a maximum value of SEK 2 billion for the period ending in December 2016. With this order, a total of SEK 514m of the available options have been exercised.

## A larger turboprop for Alenia ATR

Alenia Aermacchi has been in discussion with its ATR joint-venture partner EADS to decide by the end of 2013 on a 90-seat turboprop programme. “Alternatively, Alenia will team with another manufacturer for the development,” according to a spokesman.

Alenia chief executive Giuseppe Giordi has said that although he believes EADS shares with it a “common understanding” of the need and potential market for a higher-capacity regional turboprop, it cannot wait “forever” for a launch decision. “We are ready to develop the 90-seat turboprop. We have all the capabilities in place and we will find an alternative partner in case EADS decides not to participate,” and added that, “we would like to launch the new turboprop by end of the year.”

According to ATR chief executive Filippo Bagnato, “I think there are some technology-maturation activities launched by Alenia, while Airbus is studying our business plan. I think they will soon arrive at a decision.”

ATR sees strong demand for a 90-seater and “customers are really pushing”. One potential client could be lessor Nordic Aviation Capital, which signed an agreement for upto 90 ATRs at Le Bourget, of which 35 are firm orders. “We’re certainly encouraging ATR to come out with the 90-seat sooner than later,” said NAC chairman Martin Møller. As well as netting over 100 orders and commitments at Paris, ATR handed over the first ATR 72-600 to Latin America airline Avianca.

## Comac’s C919 enters new phase

The Chinese Comac C919 narrowbody programme has entered into the engineering development phase, even as detailed design work continues. Focus of its work has transferred from engineering design into development, including component and system integration, flight test and certification. Critical design reviews of the aircraft’s systems are also ongoing. “Advanced tooling, like digital assembly carried out for the purpose of manufacturing, first flight and delivery have entered into design and manufacturing phases.”

To date Comac has 380 commitments for the C919, which is scheduled to make its first flight in 2014, with deliveries to begin in 2016. Meanwhile, Comac has signed a definitive agreement with Bombardier at the Paris Air show detailing the second phase of their collaboration on their respective C919 and CSeries programmes. Comac will be involved in “non-



flying tasks” related to CSeries flight-test activities. Comac will be sending a team to Bombardier’s facility in Quebec, a move that is expected to help the Chinese airframer in its certification process for the C919.

## Nordic Aviation Capital orders 90 ATR -600s

The European turboprop manufacturer ATR and the Danish leasing company Nordic Aviation Capital (NAC) signed a historic agreement at the Paris Air Show 2013, for the sale of 90 ATR -600s, including 35 firm orders (30 ATR 72-600s and 5 ATR 42-600s). The contract, including options, amounts to over \$ 2.1 billion. NAC, which has signed several orders for new ATRs over the past three years, already has the largest fleet of ATRs in the world with over hundred aircraft. With the progressive arrival of the 30 additional ATR 72-600s and 5 ATR 42-600s into its fleet, NAC’s ATR portfolio will exceed 150 aircraft by 2016.



## Air Arabia and CFM celebrate one million flight hour milestone

During a special ceremony held at Sharjah in the United Arab Emirates on 29 May 2013, Air Arabia and CFM International celebrated completion of one million engine flight hours with the airline’s fleet of CFM56-5B engines. Air Arabia has been a CFM customer since it began scheduled service in 2003. At present, the airline operates a fleet of 32 CFM56-5B-powered Airbus A320 family aircraft. All of these engines are covered by long-term

service agreements with CFM, with part of the fleet covered by a time and material agreement; the aircraft delivered since 2010 are covered by a Rate per Flight Hour agreement, wherein CFM will guarantee engine maintenance costs on a dollar per engine flight hour basis.

## First Aeroflot Sukhoi Superjet 100

On 31 May 2013, the first Sukhoi Superjet 100 was delivered to Aeroflot with full specifications. In 2005, JSC 'Aeroflot' and JSC 'Sukhoi Civil Aircraft' (SCAC) had signed a contract for delivery of 30 Sukhoi Superjet 100 aircraft in standard specification, single class arrangement for 98 passengers. The airline later decided to improve the aircraft specifications including the arrangement, passenger cabin equipment, and avionics.

Delivery of the first ten SJ100 aircraft is financed by VEB-leasing JSC as part of the financial lease agreement concluded with Aeroflot in 2009. The first Sukhoi Superjet 100 was delivered to Aeroflot by the Ulyanovsk branch of VEB-leasing JSC and there are several foreign and Russian airlines interested in buying Sukhoi Superjet 100 aircraft in the light specification.

## CFM Engines for AirAsia A320s

AirAsia have announced an order for additional CFM LEAP-1A engines and CFM56-5B engines to power the 100 Airbus A320 aircraft ordered in a deal announced in December 2012 and signed a comprehensive long-term service agreement to support its fleet. The order, which comprises LEAP-1A engines to power 64 A320neos and CFM56-5B engines to power 36 A320ceo aircraft along with 5 CFM-56B spare engines and 9 LEAP-1A spare engines, is valued at \$8.6 billion at list price, including a 20-year RPFH (Rate per Flight Hour) agreement, under the terms of which CFM will guarantee maintenance costs on a dollar per engine flight hour basis.

## CFM56-7B powered 737-800s for Ryanair

Ryanair has placed a firm order for 175 Boeing Next-Generation 737-800 airplanes powered by CFM56-7B engines on 19 June 2013. Ryanair had first become a CFM customer in 1998 with an order for 28 CFM56-7-powered 737s and today operates the largest CFM56-7B-powered Boeing Next-Generation 737 fleet in Europe on more than 1,600 flights per day from 57 bases on 1,600 routes across 29 countries, connecting more than 180 destinations.

## Bombardier CSeries aircraft for Odyssey Airlines

Bombardier Aerospace has confirmed an order for 10 CS100 aircraft placed by Odyssey Airlines, a new airline that intends to operate from London City Airport. Based on the list price



for the CS100 aircraft at the time of the order, the firm order is valued at \$628 million.

## Sikorsky, Boeing offer Saudi rotorcraft 'logistics and training'

Sikorsky and Boeing have formed a joint venture to compete for sustainment services in support of the Kingdom of Saudi Arabia's rotorcraft fleet. Contracts that the joint venture will pursue are administered by the US Government as part of its Foreign Military Sales process. The joint venture will help advance Saudi Arabian efforts to diversify its economy, expand the technological expertise of its aerospace and commercial sectors, and create jobs. An equal-share joint venture, BSIS offers comprehensive in-country logistics, fleet and supply-chain management, maintenance support and aircraft modifications, as well as training for aircrews and maintainers.

## Air France-KLM MoU with RR for Trent XWBs

Air France-KLM Group has signed a MoU with Rolls-Royce for Trent XWB engines to power 25 Airbus A350s and also have options covering 25 more A350 XWB aircraft. Alexandre



de Juniac, Chairman and Chief Executive Officer of Air France said, "We're very pleased to have reached agreement with Rolls-Royce for Trent XWB engines to power our fleet of Airbus A350 XWBs. Eric Schulz, President, Civil Large Engines, Rolls-Royce, said, "We look forward to forging a strong relationship with Air France-KLM group and we're delighted that for the first time their fleet will soon include aircraft powered by a member of our Trent family of engines."

## Rolls-Royce engines for Philippine Airlines' A330s

Rolls-Royce has been selected by Philippine Airlines to deliver Trent 700 engines to power 20 of its Airbus A330 aircraft. This is the first selection of Trent engines by Philippine Airlines and also includes long-term TotalCare service support. The Trent 700 is the market leading engine for the Airbus A330 and has won 70 per cent of new orders over the last four years. The engines will power aircraft that were announced by Airbus in 2012. The Trent 700 is the only engine specifically designed for the Airbus A330. Rolls-Royce has more than 1,400 Trent 700 engines either in service or on order.

## 10 Bombardier Q400 NextGens ordered by Alaska Air Group

Horizon Air has signed a firm contract to acquire three 76-seat Bombardier Q400 NextGen turboprop airliners, the transaction represented the conversion of three previously booked options on the aircraft. The airline also reconfirmed its options on another seven Q400 NextGen aircraft. The three new aircraft will increase Horizon Air's orders for Q400 and Q400



NextGen airliners to 51 aircraft making this the world's largest fleet. Including this order, Horizon Air has ordered a total of 100 Bombardier Dash 8/Q-Series.

## Boeing launches 787-10 Dreamliner

Boeing has launched its 787-10 Dreamliner, the third member of the 787 family. Commitments for 102 airliners from five customers across Europe, Asia and North America provide a strong foundation to support development and production of the newest Dreamliner. Customer launch commitments for the 787-10 include Air Lease Corporation, with 30 aircraft; GE Capital Aviation Services, with 10; International Airlines Group/British Airways, with 12 subject to shareholder approval; Singapore Airlines with 30 and United Airlines with 20 aircraft.

The new 787-10 will fly up to 7,000 nautical miles (12,964 km), covering more than 90 percent of the world's twin-aisle routes, with seating for 300-330 passengers, depending on an airline's configuration choices. The second member of the family, the 787-9, is in final assembly in Everett, Wash., and is set to make its first flight later in 2013.

## GENx Engines for Boeing 787 Dreamliners

GE Capital Aviation Services (GECAS) have announced an order for 10 Boeing 787-10 Dreamliners powered with GENx-1B engines. The engine has accumulated more than 58,000 flight hours and more than 13,000 cycles since entering service in 2012. Some 850 GENx-1B engines have been sold to more than 30 customers. The GENx engine family is the fastest-selling engine in GE Aviation history with more than 1,300 engines on order. Compared to GE's CF6 engine, the GENx engine offers up to 15 percent better fuel efficiency, which translates to 15 percent less CO<sub>2</sub>. The GENx's innovative twin-annular pre-swirl (TAPS) combustor dramatically reduces NOx gases as much as 55 percent below today's regulatory limits and other regulated gases as much as 90 percent. Based on the ratio of decibels to pounds of thrust, the GENx is the quietest engine GE produces due to the large, more efficient fan blades that operate at slower tip speed, resulting in about 30 percent lower noise levels.

## Trent 1000 engines power Boeing 787-9

Rolls-Royce has delivered Trent 1000 engines to power the first test flight of the new Boeing 787 Dreamliner family, the 787-9. The engines will provide 74,000lb thrust for the 787-9 Dreamliner aircraft, which will fly for the first time later this year and will also power the aircraft's entry into service with Air New Zealand in 2014. The engines are one per cent more fuel efficient than Trent 1000s currently in service and a further upgrade, the Trent 1000-TEN, will enter service in 2016 and will be up to



three per cent more fuel efficient than Trent 1000s currently in service. The Trent 1000-TEN will be able to power all variants of the 787, including the 787-10.

## Southwest launches CFM LEAP-1B-powered 737 MAX 7

Southwest Airlines has formally launched the Boeing 737 MAX 7 powered by the advanced LEAP-1B engine, converting an existing order for 30 Next-Generation 737s to the MAX 7 variant. Southwest originally launched the LEAP-1B engine on the 737 MAX in 2011 with an order for 150 firm aircraft. This new order takes the airline's total firm fleet to 360 engines and deliveries are scheduled to begin in 2019. Southwest also has options for 150 additional LEAP-1B-powered 737 MAX aircraft. The LEAP-1B engine incorporates revolutionary technologies combining advanced aerodynamic design techniques, lighter, more durable materials, and leading-edge environmental technologies, making it a major breakthrough in engine technology.

The engine achieved a major milestone in April when CFM concluded design freeze, which is effectively the point at which the engine configuration is set, or frozen. CFM will finalise and release detailed engine design drawings over the next six months. Parts manufacturing for the LEAP-1B engine will then accelerate through year end, leading to build-up of the first engine in early 2014. The LEAP-1B is on schedule for CFM flight testing in 2015 and engine certification in 2016, the 737 MAX being scheduled to enter service in 2017.

## Gripen fires first Meteor

In collaboration with the Swedish Defence Materiel Administration (FMV), Saab has successfully conducted

first test firing of the Meteor radar-controlled air-to-air missile, developed for mass production. Gripen is thus the first combat fighter system in the world with the capability to fire this version of the Meteor, which has been developed for the Gripen, Typhoon and Rafale fighters.

At the end of June, the first two Meteor missiles in mass production configuration were fired for the first time from Gripen at a remote-controlled target. The test firing demonstrated separation from the aircraft and the link function between the aircraft and missile, as well as the missile's ability to lock in on the target; the test firing was also used to verify the command support that has been developed for the pilot.



The Meteor is a BVRAAM (Beyond Visual Range Air-to-Air Missile) developed to enable engagement of airborne targets at long distances. The missile is the result of a European collaborative project involving Sweden, France, Italy, Spain, Germany and Great Britain. "Once again it's clear that Gripen is the leading combat fighter system with great opportunities for fast and cost-efficient continuous integration of new capabilities, such as weapons and sensors, thanks to our efficient way of working and Gripen's innovative design. Gripen with the Saab PS05 radar and the Meteor missile represent the absolute best in the world when it comes to air defence," stated Lennart Sindahl, Head of Saab's business area Aeronautics. During this autumn, additional tests will be conducted so that delivery of the new capabilities can be made during 2014.

## LEAP-1B engine "on schedule"

Development of CFM International's advanced LEAP-1B is progressing on schedule as the LEAP-1B / Boeing 737 MAX combination sees a major growth in orders. CFM has received orders for a total of 2,762 engines (powering 1,381 aircraft) at a value of approximately \$35 billion at list price. "When we launched this programme with Boeing in 2011, we knew it would be very successful," said Jean-Paul Ebanga, president and CEO of CFM international. "But even we could not have believed we would sell nearly 3,000 engines in less than two years. Our

focus now is on execution. We have to deliver what we have promised. But everything we are seeing from this engine so far validates that we will meet our commitments to Boeing and our airline customers.”

Highlights of 2013 orders include TUI, which finalised an order for 60 aircraft in June 2013; Turkish Airlines (THY), which ordered 50 737 MAX aircraft in late May and Icelandair, which finalised an order for 16 aircraft in February. Japan’s Skymark announced its intent to purchase an undisclosed number of 737 MAX aircraft as part of its fleet renewal programme.

The LEAP-1B development programme is progressing on schedule and in May, CFM announced design freeze for the engine, paving way for the first full engine to test in mid-2014. This milestone is effectively the point at which the engine configuration is set or frozen and will allow CFM to finalise and release detailed engine design drawings, which it will do over the next six months. Parts manufacturing for the LEAP-1B engine will then accelerate through year end, leading to build-up of the first engine in early 2014. The LEAP-1B is on schedule for CFM flight testing in 2015 and engine certification in 2016. The 737 MAX is scheduled to enter service in 2017.

## Saab Skeldar V-200 completes flight test

Saab has verified a number of key capabilities of its Skeldar V-200 vertical lift UAS through flight campaigns at different sites in the US and Sweden demonstrating the system’s performance for both land and sea based operations. A number of successful customer demonstration flights have also been conducted. High complexity flight envelopes such as fully autonomous flights were conducted in both day and night conditions demonstrating convoy shadowing capability, EO/IR sensor utilisation, precision landing as well as long range missions using Tactical Hand-Over between Ground Control Stations using Saab’s flexible stationary and mobile ground control station.



## Raytheon Standard Missile-6 full-rate production approved

Defence Acquisition Board has approved full-rate production of the Raytheon Company’s Standard Missile-6 and once operational in 2013, the SM-6 will provide US Navy vessels



extended range protection against fixed- and rotary-wing aircraft, unmanned aerial vehicles and cruise missiles. In February 2013, Raytheon delivered the first SM-6 from its new \$75 million, 70,000 square-foot SM-6 and Standard Missile-3 all-up-round production facility at Redstone Arsenal in Huntsville, Ala, which features advanced tools and the latest processes for missile production, enabling Raytheon to streamline processes, reduce costs and add value for the warfighter.

## Trent XWBs power flight of A350XWB

Rolls-Royce Trent XWB engines for the first time powered the Airbus A350 XWB when it took to the skies on 14 June 2013. Tony Wood, President, Aerospace, Rolls-Royce, said, “We congratulate Airbus on today’s huge achievement and look forward to supporting the A350 XWB to a successful entry into service and beyond. Our own employees are very proud to have delivered a global engine programme that has achieved new levels of efficiency.”

The Trent XWB is the fastest-selling of six Rolls-Royce Trent types of engine, with more than 1,300 already sold. Rolls-Royce started the Trent XWB programme in 2006 and four years later ran the engine for the first time on a test bed. Since then, it has been tested all over the world including climate extremes from +42°C in Al Ain in the United Arab Emirates to -23°C in Iqaluit, Canada. Twelve engines have been tested on the ground and, since February 2012, in the air on an A380 flying test bed, proving performance, endurance and safety. The Trent XWB version that will power the A350-800 and A350-900 variants was awarded its “ticket to fly” in February with European Aviation Safety Agency (EASA) certification. A higher thrust version of the Trent XWB is under development for the A350-1000.

## Raytheon delivers 5,000th AIM-9X Sidewinder

Raytheon’s AIM-9X Sidewinder air-to-air missile programme achieved a major milestone in delivering 5,000 missiles to the US government and nine international partners. The AIM-9X



Sidewinder is an infrared-guided, air-to-air missile employing a focal plane array sensor for unparalleled target acquisition and tracking, augmented by jet vane control technology for extreme maneuverability against a variety of high performance threats. The missile also has proven capability in air-to-surface and demonstrated capability in surface-to-air missions.

The AIM-9X Block II adds a redesigned fuze and a digital Ignition Safety Device that enhances ground handling and in-flight safety. The Block II variant also features updated electronics that enable significant enhancements, including lock-on-after-launch (LOAL) capability using a new weapon datalink to support Beyond Visual Range (BVR) engagements. Block II is currently on track to complete Operational Testing and is expected to be cleared for employment in the U.S. Navy and U.S. Air Force in early 2014. Block II missile deliveries to international partners are scheduled to begin in 2014, initial recipients being two current AIM-9X international partners.

## 500 Raytheon tactical AESA radars

Raytheon has delivered more than 500 tactical active electronically scanned array (AESA) radars for multiple platforms worldwide, “a historic achievement for the industry”. The company’s AESA portfolio, including the APG-79, APG-63(V)3 and APG-82(V)1 radars has also achieved more than 400,000 cumulative operational flight hours on F-15, F/A-18E/F and EA-18G aircraft. Raytheon designed, developed and fielded the world’s first operational AESA radar for fighter aircraft in 2000. Since being introduced, Raytheon’s AESA systems have demonstrated significant reductions in customers’ operational lifecycle costs, providing significant improvement in system reliability compared with mechanically scanned array radars.

The US Air Force has recently completed development testing of Raytheon’s next generation APG-82(V)1 AESA radar for the F-15E Strike Eagle, and began operational testing and evaluation in March 2013. Initial operational test and evaluation is an integral part of the US Air Force’s Radar Modernisation Programme to “ensure F-15E mission superiority in an increasingly sophisticated threat environment.”

## LM launches Lockheed Martin International

Lockheed Martin Corporation has launched *Lockheed Martin International (LMI)*, a new organisation responsible for strengthening international customer relationships and industrial partnerships, and growing the company’s global business. Patrick M. Dewar, has been named Executive Vice President of LMI and will continue as a corporate officer. The LMI team will work with global Lockheed Martin customers to deliver the company’s products, technologies and services to meet their national security and citizen services needs. The LMI organisation is headquartered in London, UK and the Washington, D.C., metropolitan area, with corporate offices in Ottawa, Riyadh, Abu Dhabi, Singapore and Canberra; and regional offices in Tel Aviv, New Delhi, Tokyo and Seoul.

## Sequester-hit USAF squadrons fly again

Combat units from multiple USAF commands began flying again on 16 July 2013, after many stopped flying in April of this year due to sequestration (see ‘Sign of the Times’ *Vayu* III/2013). The restored flying hour programme comes as a result of US Congressional authorisation for the Department of Defence to shift some \$7.5 billion from lower priority accounts to more pressing operations. The money has restored critical training and test operations for the combat fleet across the USAF for the remainder of the 2013 fiscal year (until 1 October 2013). This impacts not just Air Combat Command units, but also combat units assigned to United States Air Forces Europe (USAFE) and Pacific Air Forces.

For Air Combat Command, the flying hours will be allocated to combat aircraft and crews across the command’s operational and test units, including the Air Warfare Centre Weapons School, Aggressor squadrons and the *Thunderbirds* aerial demonstration team. However, an Air Combat Command spokesman confirmed that the *Thunderbirds* are only to resume training flights, and all air show participation remains cancelled for the remainder of the 2013 fiscal year. While the return to flight is crucial for training and development of pilots, navigators, flight crews, mission crews and maintainers, General Gilmory Hestage, commander, Air Combat Command cautioned that this is the beginning of “measured climb to recovery” and not the end. He noted that the restoration of flight hours comes at a cost to future capability, including reduced investment in the recapitalisation and modernisation of the combat fleet.



Indian and US Army soldiers disembark from a CH-47 Chinook during training (US Army photo by Sgt. Michael J. MacLeod).

The ninth annual *Yudh Abhyas* (Hindi for ‘war preparation’) exercise between the Indian and United States Armies was conducted from 3 to 17 May 2013 at Fort Bragg, North Carolina. Fort Bragg is home to the storied 1<sup>st</sup> Special Forces Operational Detachment – Delta (1<sup>st</sup> SFOD-D, commonly called ‘Delta Force’) along with the 82<sup>nd</sup> Airborne Division. The latter, along with the 3<sup>rd</sup> Squadron, 73<sup>rd</sup> Cavalry Regiment was involved in the exercise this year, with the Indian Army sending companies from the famed 2<sup>nd</sup> Battalion, 5<sup>th</sup> Gurkha Rifles (Frontier Force), along with detachments from the Parachute Regiment, and the 54<sup>th</sup> Engineers Regiment.

The two countries alternate hosting duties for the exercise, and this year was the first time a *Yudh Abhyas* exercise was held at Fort Bragg. Previous locations have included Rajasthan, Alaska, Uttar Pradesh and the Punjab, among others. It has also grown impressively in size and scope: from a company-level engagement in 2004, *Yudh Abhyas* 2013 executed battalion-level field exercises and brigade-level command-post exercises.

Capt. David Von Bargen, a military intelligence officer with the 82<sup>nd</sup> Airborne’s 1<sup>st</sup> Brigade Combat Team, highlighted an interesting advantage gained from conducting exercises on the scale of *Yudh Abhyas* “scheduling flights, getting embassy-to-embassy and higher-level commands talking

is a big portion [of logistics for an international exercise], so if we need to do this again, whether it is for additional training or some sort of real-life aid scenario, we have those systems in place.”

Current exercise planner for the United States Army Pacific (USARPAC), Blaire Harms, who has also planned the exercise for the past five years, was similarly glowing in her assessment of the utility of engaging with the Indian Army on a large scale. “The camaraderie I saw here has been outstanding,” said Harms. “Everything has been developing proportionally each year.”



US and Indian flags flutter together at the opening ceremony of *Yudh Abhyas* 2013.



*An Indian Army paratrooper exits a 34-foot training tower at the 82nd Airborne Division's Advanced Airborne School.*



*An Indian Army infantryman familiarises himself with the M249 light machine gun used by US forces.*



*5 out of 5! Five Javelin missiles fired from the command launch unit achieved five direct-hits. The Javelins were fired by two US Army gunners from the 82nd Airborne Division and three Indian Army paratroopers.*



*Indian Army soldiers from 2/5 Gorkha Rifles (FF), take cover against a wall while conducting urban combat training.*



An Indian Army paratrooper prepares to exit a CH-47 helicopter during an airborne training exercise with US Army paratroopers from the 82nd Airborne Division.

Brigadier Ashok Dhingra, the Indian military attaché and also a seasoned paratrooper, explained the bonds that formed so naturally between the soldiers of the two Armies. “Our cultures may be different, but our attitude and approach to work, what we yearn and fight for and honour – those qualities are the same.”

During this year’s exercise, there were very few troops in either force who had not experienced actual combat. That, along with the professional execution of training, including live-fire range exercises, situational training exercises, and combined air assaults and airborne operations, made soldiers of each army receptive to learning from each other. While the Indian troops were impressed by the equipment and mechanised assets available at the individual level, the US Army commanders held the combat experience of Indian soldiers in high regard, especially given their longer service terms (15 years) which enable them to retain and disseminate knowledge more widely.

The superbly fit ‘Piffer’Gurkhas also impressed their American counterparts, and many US soldiers commented favourably throughout the exercise on the Gurkhas’ ability to manoeuvre silently and swiftly through difficult terrain.

Brigadier Jagdish Chaudhari, commanding 99 Mountain Brigade (of which the 2/5 (FF) Gorkhas are part) commented on the conclusion of the exercise that “this partnership is one of the very good things that has happened between the United States and India. We have interacted with at least 500 Army personnel here, if not more, and I think those interpersonal relationships will carry on for a long time.” His remark underscored the lasting and far-reaching effects of large-scale bilateral exercises between allied armies.

With India hosting the exercise in 2014, it is probably safe to say that the two armies look forward to their next engagement with renewed vigour, “eager to cooperate more closely and continue to learn from one another.”

*Angad Singh*

(All photos by US Army Sgt. Michael J. MacLeod)



Camaraderie! American and Indian paratroopers pose for a photograph highlighting the mutual respect and admiration between the two forces.



US Army Lt. Col. Phillip Sounia describes a scale model of a training area to Indian Army Brig. Jagdish Chaudhari, Col. Prashant Kandpal and Maj. Arun Varughese prior to company-level training.

## ‘Operation Surya Hope’

Within weeks of their return to India from North Carolina, some troops of the 2/5 Gorkha Rifles (FF) were deployed to evacuate stranded persons from the Sundardhunga and Pindari Glacier region of Uttarakhand following unprecedented rain and landslides. Shabash!

# “Mediterranean Caïmans”



During the author's visit to CEPA/10S in May 2013 the unit was involved in testing of the Step B variant of the NH-90 (aircraft number #9). The clear distinction with the Step A variant is the Electronic Countermeasures (ECM) kit. The first Step B will be introduced before the summer with 31F.

The genesis of Naval Air Station Hyères-Palyvestre dates back to the year 1919. Much has changed ever since. The introduction of the NH-90NFH (NATO Frigate Helicopter) by the French Navy ‘Caïman’ (Cayman) with 31F (Flotille/ Squadron) is adding a new chapter to the long history of French Naval Aviation in southern France. On 4 October 2012, 31F was re-activated operating the ‘Caïman’ after a stand down of many years when the unit’s Lynx fleet was transferred to 34F based at Lanveoc-Poulmic. In May 2013, 31F was operating three ‘Caïmans’ in a so-called Step A version; a fourth was tested by CEPA/10S (*Centre d’Expérimentations Pratiques de l’Aéronautique Navale/ French Naval Aviation test and evaluation centre*) during the author’s visit. This fourth ‘Caiman’ will be the first in a Step B version. Further ‘Caiman’ deliveries are planned in July (1), October (1) and December 2013 (2).

Flotille 31F was founded in Algeria, North Africa on 1 August 1956. The unit then operated the H-21C ‘Banana’ helicopter and in March 1960 was replaced by the Sikorsky HSS-1 and the unit relocated to Saint-Mandrier. By 16 November 1978 after flying 70,000 hours with the H-21C and HSS-1, the Westland Lynx (WG-13) was introduced in the French Navy. In 2003, 31F moved to BAN Hyères Le-Palyvestre and had been operating the type till June 2010.

## Transition to the ‘Caïman’

The first ‘Caïman’ delivery to the French Navy took place on 5 May 2010; CEPA/10S received the new type for initial experimental testing on behalf of the Aeronavale (French Naval Aviation). Each NH-90NFH to be delivered to the French Navy will follow this route before being delivered to either 31F or 33F based at Lanveoc-Poulmic. The latter was the first unit to be declared operational

on the new type in December 2011. “Members of our unit were involved heavily ever since mid-2010 in the preparations of the NH-90 introduction” 31F Commander (*Capitaine de Frégate*) Frédéric Barbe explained. “It has been a huge task to prepare for the introduction of the ‘Caïman’; we have been developing training syllabuses for future NH-90 pilots and evaluate existing documentation as being delivered by Eurocopter. Basically we have been writing the instructions how to operate and fly the new type together with CEPA/10S”, the Commander continues “We have handpicked sixteen officers, including seven pilots to support this introduction and form the core team of 31F; these pilots are a mixture of ex-32F (SA.312G Super Frelon), 35F (SA.365F/N Dauphin), 36F (AS.565SAPanther) and 31F pilots previously operating the Lynx. All pilots are very experienced with thousands of flying hours. We will have to invest in younger people and sharing

knowledge is now the most important thing to do. Currently the knowledge is with the older officers in the squadron”, said 31F Executive Officer Le Boursicot.

Currently five crews (seven pilots, six taccos) are operational with 31F while sister squadron 33F has five crews operational. In September 2013 the first student crews will arrive at Hyères for their operational conversion training; these will all be trained to become tacco on the NH-90. The ‘Caïman’ has a reduced crew of three as thanks to the 4-axis autopilot, only one pilot is required, seated on the right hand side of the cockpit. The tacco (the tactical coordinator responsible for mission management) is seated on the left side, plus a senso (sensor systems operator) in the cabin who doubles as the loadmaster and winch operator.

The senso community within 31F is a mixture of experienced helicopter senso, but also former Atlantique NG senso operators have joined 31F, with much experience.

The French Navy NH-90NFHs are being supplied directly from the Agusta production plant in two different configurations: 13 for SAR and sea assault, with a rear loading ramp and 14 for pure anti-submarine warfare (ASW) operations, without a ramp. However the cabin of all 27 NFHs is able to be fitted with specific pallet-mounted ASW kit comprising an avionics bay, a sensor operator station and tactical coordinator station, plus dipping sonar and sonobuoy launcher. A magnetic anomaly detector (MAD), in the helicopter’s tail boom, completes the ASW suite for the detection and identification of underwater targets. Besides a complete IFF system, the ‘Caïman’ has a comprehensive communications suite for tactical communications and a navigation suite including GPS, INS, Doppler, air data and a digital map generator.

The NH90-NFH extended avionics system, built around five large liquid crystal digital screens, is supplied by Thales Avionics and is based on a dual MIL-STD-1553B digital databus. The French NH-90NFH is fitted with two radar sets: a Thales ENR 360° surveillance and surface detection radar mounted under the forward part of the fuselage and Honeywell Primus 701A weather radar installed in the nose just over the forward-looking IR ball.



*Currently CEPA/10S is preparing for trials with the MU-90 torpedo which is expected to be introduced with the NH-90 in the autumn of 2013.*

The ENR or ‘European Navy Radar’ is derived from the Thales Ocean Master and has been developed in conjunction with EADS and Galileo Avionica. The ENR is a lightweight (85kg) system used to monitor surface ships, detect submarine periscopes, track their movements and accurately classify all the detected vessels. This digital radar has been designed to operate in dense electromagnetic environments, under all weather conditions and high sea states. For all-weather and night operations, all 27 French naval machines are equipped with the 45kg Sagem Euroflir 410 tactical forward-looking infrared (FLIR) system mounted in the nose below the weather radar.

Other main sensors, directly related to the NH-90NFH principal ASW mission, which will only be included with the Step B variant, will be the Flash Sonics sonar system from Thales Underwater Systems, which combines the Flash active dipping sonar with the TMS 2000 sonobuoy processing system. All Step B NFHs will be able to carry a pair of MU90 torpedoes or two 250kg drop tanks providing an extra hour of flight.

The NH90 NFH is equipped with a powerful pair of engines with dual channel FADEC (Full Authority Digital Electronic Control) system in the form of two Rolls Royce Turbomeca RTM 322-01/9 turbines delivering a maximum power output of



*The NH90-NFH extended avionics system, built around five large liquid crystal digital screens, is supplied by Thales Avionics and is based on a dual MIL-STD-1553B digital databus.*



*Every NH-90NFH is flight-test evaluated before delivery to either 31F or 33F. For these tasks CEPA/10S have two experimental flight test pilots, crew member, and ten technical staff on strength.*

2,270 shp (shaft horse power). These modern 4-stage turbines, identical to those of the EC665 Tiger or the Westland AH-64D Apache, provide enough thrust to meet the needs of naval users.

The FREMM multipurpose frigate (*Frégate Multi-Mission*), designed by DCNS/Armaris and Fincantieri, operates for anti-air, anti-submarine and anti-ship warfare and is capable of carrying out strikes against land targets. The French Navy plans to operate nine FREMM frigates and 31F's aircraft will be on detachments to *Forbin*-class air defence ships, while 33F, the other NH-90 unit, will deploy its aircraft on the FREMM-class vessels. Typically, primary missions of the NH-90 NFH helicopter are in the autonomous anti-submarine warfare (ASW) and anti-surface ship warfare (AsuW) role. Secondary roles include anti-air warfare (AAW), vertical replenishment (VERTREP), search and rescue (SAR), troop transport and mine laying. NH-90s conducted flight deck trials on a FREMM Aquitaine frigate for the first time during March 2012.

A vital role in introduction of the 'Caïman' is for CEPA/10S. The unit has been involved from the start of the NH-90 introduction to prepare for integration of the NH-90 in the French Navy. Each NH-90 is extensively tested before it is handed

over to either 31F or 33F. Currently the unit is involved in experimenting with implementation of the MU-90 torpedo which is foreseen to be finalised before the autumn of 2013. The first NH-90 Step B was delivered by CEPA/10S during January 2013 and now includes an ECM (Electronic Counter Measures) kit. Based on feedback from 31F crews and technicians CEPA/10S is able to deliver solutions on short notice.

On 21 December 2012 the Directorate General of Armaments (DGA) took delivery of the first standard B 'Caïman'. After a short period of evaluation conducted by CEPA/10S, the total number of NH-90s in service will be delivered by end May 2013 to 31F. In total eight 'Caïmans' will be in service by then. The seven earlier delivered 'Caïmans' from 2011 (Step A) will be gradually upgraded to the Step B between 2014 and 2017.

During October 2012 the NATO Helicopter Management Agency (NAHEMA) awarded Thales a two-year contract, with a three-year extension clause, to support 14 FLASH dipping sonars on the French Navy's 27 NH-90 NFH helicopters. The contract will contribute to the operational readiness of the French Navy NH-90NFH helicopters equipped with the FLASH sonar system and will enable them to fulfill their

anti-submarine warfare missions in conjunction with the Navy's FREMM frigates equipped with the Captas-4 variable depth sonar from Thales.



*The French NH-90NFH is fitted with two radar sets: a Thales ENR 360° surveillance and surface detection radar mounted under the forward fuselage and Honeywell Primus 701A weather radar installed in the nose just over the forward-looking IR ball. The ENR or 'European navy radar' is derived from the Thales Ocean Master and has been developed in conjunction with EADS and Galileo Avionica.*

*Carlo Kuit & Paul Kievit/ Bronco Aviation*

# 25 Years Back

## More heavy-lift helicopters for IAF ...

The IAF's fleet of heavy lift, Soviet-built Mi-26 and Mi-17 helicopters is being augmented by further numbers in order to support the ground forces deployed in the Siachen glacier area. The IAF's helicopter fleet, including HAL-built Cheetahs and Chetaks as well as the Soviet Mi-26s and Mi-17s have been strenuously engaged in providing the lifeline to the Indian Army deployed in this arctic zone. The Mi-17 has virtually replaced the Mi-8 in the high mountains while the Mi-26 can be termed as a true "force multiplier".

## ..... and AEW helicopters for IN

The Defence Minister has stated that the Indian Navy was likely to get airborne early warning (AEW) helicopters "to increase the missile-platform detection capability of the surface fleet". The Minister said that the threat to the country from the sea was far greater now than in the past and expressed concern at militarisation of the Indian Ocean.

The Minister's reference was to the possible acquisition of Westland Sea King AEW helicopters, similar to the type operated by the Royal Navy. The Indian Navy has contracted for 20 Sea King Mk. 42B ASW helicopters, 6 Sea King Mk. 42C Commando helicopters and the new requirement is for three Mk. 42D AEW helicopters.

## Test Pilots take Command

Two of the Indian Air Force's most important Air Commands now have former test pilots as their AOC-in-Cs. Air Marshal Prithi Singh assumed command of Western Air Command at Delhi while Air Marshal PK Dey took over South-Western Air Command at Jodhpur.

## Privatisation of AI and IA ?

"Neither Air-India nor Indian Airlines have much chance of acquiring adequate aircraft fleets to meet the growing demand". This conclusion is derived from the report of the National Committee on Tourism which was appointed by the Planning Commission in July 1986. Some of the highlights of the major recommendations in the report-described as a "comprehensive document on current trends in tourism development and civil aviation".

The recommendations on "tourism and transport linkage" are that "Making tourism the primary justification for investment in aviation appears to be premature, if not untenable. More desirable will be to assess the economic costs and benefits from leisure travel for tourist destinations for a balanced investment plan."

## LCA configuration "frozen"

The configuration of India's light combat aircraft (LCA) has been "frozen", marking a milestone in the country's prestigious

## From Vayu Aerospace Review Issue IV/1988

defence project. "The entire specification of the indigenous, advanced multi-role aircraft has been laid" according to the Aeronautics Development Agency, the apex body executing the LCA project. An Indian team visited France in April 1988 to finalise the aircraft's geometry with the French firm Dassault-Breguet (AMD-BA) who are design consultants for the project.

The government informed Parliament in April that production of the LCA would begin from 1993-94 in the facilities of HAL. Six prototypes will be flight tested, as also to prove the weapon systems. "The aircraft is specially suited to India's needs. This will replace our MiG-21s and Ajeets; the LCA is agile at subsonic speeds and possesses supersonic manoeuvrability."

## Northrop TF-5 offer

The Minister of Defence replied in the affirmative that Northrop Corporation had offered to transfer the assembly line for TF-5 advanced jet trainers to India. Northrop have offered the two-seat aircraft to meet the IAF's advanced jet trainer (AJT) requirement and the entire transfer of production facilities to HAL at Bangalore. Based on the F-5E tandem-seating trainer which complements the single-seat F-5E Tiger II fighter, the TF-5 would not only meet the IAF's requirement but be a useful point-defence interceptor, a role in which it is operated by over a dozen countries in the world.

## INSAT-1C launched

The INSAT-1C satellite, designed by ISRO to complement the earlier INSAT-1B, was launched into geostationary orbit above the Indian Ocean on 21 July. Hoisted by an Ariane-3 rocket from Kourou in French Guiana in the north-east of South America, the launch itself was the 24th flight of the Ariane.

## P-3C Orions for Pakistan

The US Defence Department has notified Congress of its approval for the sale of three P-3C Orion maritime surveillance aircraft to Pakistan. The three aircraft, plus spares, ground support facilities and training services will cost some \$ 240 million. According to a Pentagon spokesman, "this purchase will permit Pakistan to enhance its maritime surveillance, anti-submarine and anti-surface warfare capabilities.

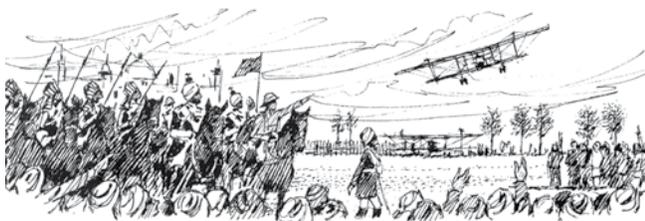
## Ex-RAAF Mirages for the PAF ?

The Royal Australian Air Force is to sell about 50 of its remaining Mirage IIIOs, plus a considerable quantity of spares and ground support equipment on a government-to-government basis. This follows re-equipment of RAAF fighter squadrons with the F/A-18 Hornet and consequent phasing out of the Mirage IIIO. Tender documents are reportedly under preparation and the sale is expected to be finalised by early 1989.

The Pakistan Air Force is the likely purchaser of these aircraft as it already flies a variety of Mirage III and 5s and the Aeronautical Complex at Kamra has overhaul and re-build facilities for the type. The ex-RAAF Mirage IIIOs would provide a most valuable reserve back up for the frontline Mirages of the PAF. The Mirage IIIOs would reportedly be available at \$ 1.3 million each and are said to be well-maintained.

## Patiala pegs of a different kind

The erstwhile Maharaja of Patiala Bhupendra Singh had commissioned a 1400-piece silver dinner service which was used just once to entertain the visiting Prince Edward, later King Edward VIII, in 1922. This dinner set was sold some 90 years later, in early July 2013, at Christie's auction for the royal sum of £1.9 million (Rs 17 crore), to a private collector who wished to remain anonymous.



Drawing taken from Himalayan Eagles Volume I

However, forgotten by the world, particularly India, is that the same Maharaja of Patiala was the first Indian to procure aeroplanes. This was in December 1910, just seven years after man's first heavier-than-air flight. Maharaja Bhupendra Singh, who was keenly following aviation developments, had sent his Chief Engineer to Europe for an on-the-spot study and immediately ordered three aeroplanes including a Bleriot monoplane and Farman biplanes.

These were probably taken over by the Indian Flying Corps which accompanied the Indian Expeditionary Force to Egypt in August 1914, at start of the Great War. Real history anyone ?

## Enshrining History

The British left behind many legacies in India, including a great railway network, professional armed forces, the game of cricket (and of course the English language) but unfortunately not a grand sense of history. An example : on 70th anniversary of the Royal Air Force No.617 Squadron's historic Dambusters mission, a special gold-plated coin was issued which has become another collector's item. As the RAF's spokesman stated "Our nation can rest assured that today's generation of Dambusters go about their work with the pride, steely determination and esprit de corps of those who have gone before".

In sharp contrast, even as the Indian Air Force's No.28 Squadron ('First Supersonics') celebrated their 50th anniversary



in March 2013, there was no national recollection of their incredible performance during the December 1971 war. Only a 'family affair' where the squadron history (published by the *Society for Aerospace Studies*) was released. Some aviation enthusiasts have embraced that historical treasure recorded in the book - which has still to receive any official recognition !

## 'Culture of Deference'

Some analysts believe that the Asiana Airlines 777 crash landing at San Francisco airport was owed to the strong hierarchical structure of most personal and professional relationships among Koreans which can lead to communication failures, especially affecting a junior's ability to point out a senior's mistake or question their judgement.

But why Koreans alone ? Several incidents have taken place in India where similar situations resulted in mishaps, once when a Japanese DC-8 landed at the Juhu Flying Club airfield even though frantic calls were being made by the ATC at Santa Cruz next door (happily there were no injuries, just loss of face). Another when an Indian Airlines 737 landed at Patna 'wheels up' as the co-pilot did not read out the landing check list to his Commander with whom he was not on talking terms ! Happily, we now have the DGCA allowing pilots to take a nap in the cockpit during flights, "provided the nap is less than 40 minutes on a flight duration of at least three hours".

Sleep well - but please wake up before landing!

## Welcome Globemaster III !

The heaviest aircraft in Indian Air Force colours is its latest acquisition, the Boeing C-17 Globemaster III with MTOW of 265 tonnes, but having a gentle footprint as it lands back on terra firma. The next in weight is the IAF's Ilyushin Il-78MKI mid-air refueller at 210 tonnes while the Navy's Tupolev Tu-142M *Bear Foxtrot* is a 'mere' 185 tonnes but still needs most of the 13,460 feet of concrete runway at Arakonam to take off with full load from this, its main base.



A Parisian artist's tribute to the C-17 strategic airlifter, with its friendly attributes

**Afterburner**

# Vayu Self AD Awards

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