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# Special Supplement

to Aero India 2015



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Narendra Modi, Hon'ble Prime Minister of India



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**Above:** Prime Minister Narendra Modi's 'Make in India' campaign lion roars

**COVER PHOTOGRAPH:** INDIA'S PRIDE TEJAS LIGHT COMBAT AIRCRAFT SET TO FIRE FROM ALL CYLINDERS

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**IN THIS PART OF THE WORLD,** Aero India has held centre-stage for many reasons – the huge market India offers to the world, home-grown technologies, an opportunity for collaboration, a burgeoning base of engineering talent pool among others. Every edition of Aero India, this is the tenth show, has had something to offer to the world. This time round the focus will be on the Prime Minister Narendra Modi's aggressive campaign of 'Make in India'.

To take this forward with the global defence industry, the Prime Minister himself is going to be inaugurating Aero India 2015, a breakaway from tradition of the Defence Minister doing the honours. Prime Minister Modi is going to use this platform to drive home the point of 'Make in India', not just to the domestic industry, but the global exhibitors who are going to be present in large numbers. The United States has the largest contingent of exhibitors and they are all gung-ho about the strengthening of relations between the two countries after the bonhomie between President Barack Obama and Prime Minister Modi. It appears both the sides are enthused about the prospects in the defence sector, wherein the United States has a lot to offer in terms of modern technologies.

Close on the heels of the US contingent is Israel which too has sealed a number of defence deals with India in the recent past. Endorsing the ties will be the Israeli Defence Minister, Moshe Ya'alon, who is going to be present at the show. Then there is Russia with whom India continues to have special ties and the UK with colonial links, all these are going to get a fillip with 'Modi talk'.

In this supplement we have comprehensive coverage of Indo-Russia joint venture development of the fifth-generation fighter aircraft (FGFA) which will have advanced features like stealth, supersonic cruise, satellite link and the network-centric warfare capability. The two countries are soon expected to

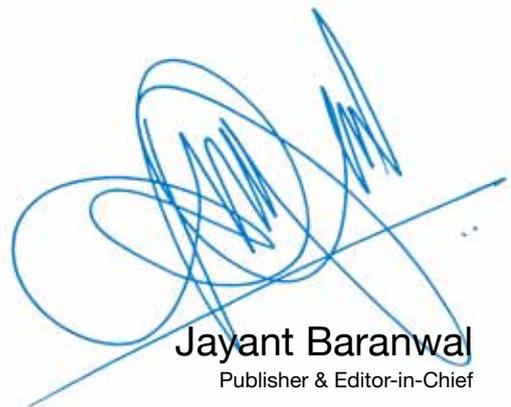
sign a new \$11-billion contract for the crucial final experimental design phase of FGFA programme.

To give one perspective of India's defence requirement, Gurmeet Kanwal, former Director of the Centre for Land Warfare Studies, has stated that like artillery fire, there is now an inescapable need for immediate air support to also be 'on call'. He underscores the need for preplanned air support to a commander in the field at two hours' notice.

The supplement has interesting articles on unmanned aerial vehicles, electronic warfare, light utility helicopters, and anti-submarine warfare. As the show is primarily a defence event, peppered with civil aviation component, we have highlighted the potential of India's civil aviation sector which is waiting to be unlocked.

Aero India is going to be a turning point in many ways. The Indian defence industry is expected to step on the gas and the Bengaluru show is going to facilitate that.

We wish all the participants a fruitful business outing!



**Jayant Baranwal**  
Publisher & Editor-in-Chief

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CHIEF MINISTER OF UTTARAKHAND  
INDIA

It gives me immense pleasure to know that SP Guide Publications is completing 50 years as a publication house regarding aviation and defence sectors.

I hope the published articles will be useful for the readers and will encourage youth to join our defence forces.

I convey my best wishes to the Editor and the staff of the SP Guide Publications for the successful publication of the magazines.

A handwritten signature in blue ink, which appears to be "Harish Rawat".

**(Harish Rawat)**

Prime Minister Narendra Modi addressing the inauguration of the 'Make in India' campaign in New Delhi



# Aero India 2015 – Prime Minister's 1st Defence Show

To Pump 'Make In India': Prime Minister Modi's 'Defence Manufacturing Panchsheel'

By SP's Special Correspondent

**PRIME MINISTER NARENDRA MODI** has had multiple trysts with the armed forces since he took office in May 2014, showing an unprecedented interest in matters military and showing a willingness to be physically present with the forces. It began with his day onboard the INS Vikramaditya, followed by his inauguration of the INS Kolkata in August last year. And in his third visit in just five months, he made a surprise visit to spend Diwali 2014 with Indian Army jawans and officers in Siachen. Some would say that inclination itself is half the battle won for the forces; a political leadership that empathises and values the forces enough to take the time out. But the appeal of the military stretches beyond sentimentalism. Prime Minister Modi sees the defence of India as possibly crucial to the reinvention of India's economy on fresh foundations of aggressive manufacturing and industrialisation. And that's where his 'Make in India' philosophy comes in. If Prime Minister Modi is the posterboy, 'Make in India' is without doubt the poster.

In a break from tradition, Prime Minister Modi has decided to inaugurate the Aero India 2015 show, an event traditionally thrown open by the Defence Minister of the day. Sources say it was former Defence Minister Arun Jaitley's suggestion to the Prime Minister that he call proceedings open at Aero India, where advanced systems manufacturers from India and around the world will be present and listening closely. The idea: to underscore and personally push the 'Make in India' idea for defence manufacturing. In fact, the Aero India show this year is officially titled 'the 10th international show on Make in India in aerospace, defence, civil aviation, airport infrastructure and defence engineering', a name that sums up the expansion of the show's scope and what the government is hoping to achieve through it.

SP's has learnt that Prime Minister Modi's message, to also be shared in document form at Aero India 2015, will be summed up in five broad points: First, that India intends to be the port of call for defence manufacturing. Second, that



Prime Minister Narendra Modi releasing the brochure, at the inauguration of the 'Make in India' campaign in New Delhi

it is not only a vast customer for local offtake, but that it intends for manufacturing within the country to be exported to other customers across the world. Third, that procedures and processes for industrial licensing and investment control are being speedily rationalised to make India one of the friendliest countries for industrial investment, including greenfield ventures. Fourth, that the Indian private and public sectors are primed and ready for an aggressive phase of joint development and co-production under the clauses of the Defence Procurement Procedure and other regulations. Finally, the pitch will be that local skillsets, resources, economies of scale and India's own reputation as a robust, reliable and reputable democracy make it a dependable ally in the field of manufacturing partnerships. The message is all set to be a powerful one.

In many ways, the Modi Government has already demonstrated that it means business. As Ministry of Defence (MoD) official said, "In order to give a boost to indigenisation, the Defence Acquisition Council (DAC) recently decided that all the 384 light-utility helicopters needed by the Army and Air Force to replace the existing Cheetah/Chetak fleets will be made in India with foreign collaboration. And in order to give a boost to private sector participation in defence production, the government decided to replace the present fleet of 56 Avro transport of IAF by reserving the project for the private sector only." The message in these decisions hasn't been missed by industry, which sees enormous potential for business from these decisions, even accounting for the damage late decisions have clearly had on India's reputation as a whimsical procurer of armaments.

Prime Minister Modi, who handpicked Manohar Parrikar to be his Defence Minister, took the decision keeping in mind that a technocrat with industrial and business acumen will be crucial to driving the 'Make in India' campaign, and that political leadership and strategic guidance will require aggressive follow-up on the ground, something that Minister Parrikar has been trusted with. Finance Minister Jaitley, who spent only

a few months as Defence Minister in a dual role, will also be closely involved with the initiative. Prime Minister Modi demonstrated the importance of the MoD by allowing a part-time Minister while a suitable candidate for the full-time role presented himself. The trio of Modi-Jaitley-Parrikar will be key to pushing the 'Make in India' concept in defence manufacturing.

The material published by the 'Make in India' campaign office has made an ambitious, but realistic pitch: that India is either already or close to being a potential hub for the manufacture of advanced systems and platforms, including fighter jets, helicopters, warships, battle tanks and submarines. But the more important facet of the campaign will be electronic systems, high-performance sensors and communication equipment, strategic software and code, in addition to critical subsystems and high endurance components. Strides have been made in component or part manufacture, but the government's intention is to make defence component and subsystem manufacture a success story like the automotive ancillary and component story in India starting in the new millennium.

The government has also demonstrated that it is willing to move swiftly on key decisions and has pledged that it won't let political compulsions play truant to strategic objectives or military preparedness imperatives. That remains a tough call in a country where most defence business has been politicised, though the current government through a demonstrated intention to link economic progress and defence preparedness, appears to at least be trying to move things to the next level. The question is whether all elements in an enormously ambitious and complex campaign will come together like the Prime Minister's troika hopes it will. The campaign thrust will draw from the PMO's influence in the areas of not just defence, but external affairs, finance, significantly commerce and other areas. Sources say the economics of defence and the 'Make in India' campaign for defence are areas that all concerned ministers have been specifically briefed in detail by PMO teams. In other words, it's all systems go. ■

Israeli Defense  
Minister Moshe  
Ya'alon



# Israeli Defense Minister to Attend Aero India for the First Time

By SP's Special Correspondent

**GIVEN THE QUANTUM OF DEFENCE BUSINESS** that flies from Israel to India, it's something of a surprise that this will be the first time that an Israeli Defense Minister will grace an Aero India. Moshe Ya'alon will be at the Yelahanka show this year accompanied by a delegation 100-strong from Israeli defence industry, many already well-versed with the Indian market, but many looking for emerging opportunities. Israel's defence exports to India in 2014 amounted to a very healthy \$2.5 billion, making it the third largest supplier of advanced military equipment to India after Russia and the US.

The visit comes three months after India and Israel conducted the first test of the Barak-8/LRSAM surface-to-air missile system, a system expected to see further testing this year. The Israeli Defense Minister's personal presence at the show this year is also being seen as a show of personal importance, given that it comes shortly after Russian Defense Minister

Sergei Shoigu and President Barack Obama both furthered bilateral defence cooperation with India at recent visits. The Israeli Defence Minister and his delegation may conclude deals upwards of \$1 billion during his visit to Bengaluru.

Fifteen Israeli companies, including standard attenders Israel Aerospace Industries (IAI), Rafael and Elbit, will be at the show this year putting on display an array of brand new systems and announcing opportunities for tie-ups with Indian firms. The companies forming the Israeli pavilion are highly specialised in their solutions and products and will be specifically looking for Indian partners. The companies coming this year include Accubeat Ltd, which supplies frequency and time synchronisation products based on rubidium atomic clock (frequency standards) and GPS receivers. Aeromaaz Ltd develops, manufactures and markets ruggedised HMI and control systems for commercial and military applications. Al Cielo

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Iron Dome

and markets servo drives and network motion controllers for customers in Israel. Opgal Optronics Industries Ltd is a manufacturer of advanced infrared thermal imaging solutions for the defence, security, industrial and aviation markets. Orbit Communication Systems Ltd is a provider of superior performance communications equipment and solutions for airborne, maritime and ground applications including maritime satellite communications solutions, earth observation and Remote Sensing ground stations to track LEO and MEO satellites, telemetry systems for tracking missile launches and airborne platforms, and communication management solutions. Orbit FR Engineering Ltd provides antenna, RCS and radome measurement solutions for the defence, aerospace, telecommunication, automotive, academic and research communities. Orion Advanced Systems Ltd, which has been to the show before (formerly the GED Division of Motorola Israel Ltd) is a world leader in the design and manufacture of fuzes for aerial munitions with over 35 years experience. Orion's fuzes have been qualified by the Israeli Air Force for use with their aircraft and weapons systems and meet their rigorous standard safety requirements. Orion's product range covers the full spectrum of fuzes for aerial munition.

In the Aero India 2013 show, Rafael Advanced Defense Systems Ltd displayed its 'Game Changer'; complete air and mis-

**AT AERO INDIA 2015, IAI WILL SHOWCASE ITS WIDE SPECTRUM OF TOTAL SOLUTIONS AND WILL CONCENTRATE ON SOLUTIONS TAILORED FOR INDIA'S SPECIFIC NEEDS AND REQUIREMENTS**

Inertial Solutions Ltd specialises in the research, development, manufacturing and integration of laser technologies and navigation and control inertial sensors. Astronautics C.A. Ltd is a high-tech defence systems supplier, with a record battlefield proven products within the Israeli military, which includes airborne, naval and ground forces systems and solutions.

The companies from Israel this year, as always, will be a healthy mix of Tier-1 and other tier suppliers of both fully integrated battle solutions and platforms, as well as advanced subsystems, sensors and electronics, in addition to turn-key upgrade solutions for existing inventory of equipment in the Indian armed forces. Sources say the Israeli delegations will also be coming armed with a slew of unilateral offers for 'improvement' of certain Indian armament inventories, including artillery, rockets, unguided bombs, avionics, helicopter survivability equipment, etc.

For instance, Controp Precision Technologies Ltd, which has been to Aero India before, specialises in the development and production of electro-optical infrared (EO/IR) observation, scanning, reconnaissance and surveillance systems and solutions for military, paramilitary and homeland security applications. Controp products include day and night camera payload systems, intruder detection systems for border, coastal and perimeter security, night vision/thermal imaging cameras, stabilised gimbals and more. Elmo Motion Control Ltd designs, manufactures

sile defence systems, including the iron dome – active defence system against short-range artillery rockets; David's Sling (STUNNER) – multi-mission, multi-platform interceptor; Spyder SR/MR – family of short- and medium-range air defence systems; Python-5 – Full sphere air-to-air IR missile and air defence missile; DERBY – Beyond visual range air-to-air missile and air defence missile; MIC4AD modular, integrated C4I air and missile defence system The company is back this year with a healthy array on show, including some undisclosed new products that are currently under development. Israel Aerospace Industries Ltd will be putting on display its full inventory of products, including a dummy of the Barak-8 that was tested for the first time in November last year. At Aero India 2015, IAI will showcase its wide spectrum of total solutions and will concentrate on solutions tailored for India's specific needs and requirements. Elbit Systems Ltd, a well-known maker of unmanned air systems and electronic/upgrade solutions for existing military inventory—they will have a large presence at the Aero India show this year. Elbit will focus on helicopter solutions, from platform upgrades and pilot helmet display system to helicopter protection systems such as DIRCM systems, unified self-protection suites, integrated EW suites and more. Elbit, which introduced the Hermes® 900 unmanned aircraft system in a new configuration adapted to maritime missions at the show two years ago, is expected to unveil some solutions targeted specifically at India this year. ■

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# Transiting to Fifth Generation

The FGFA will have advanced features like increased stealth, supersonic cruise, satellite link and network-centric warfare capability

F-35A Lightning II

By SP's Special Correspondent

**INDIA AND RUSSIA WILL SOON SIGN** a new \$11-billion contract for the crucial final experimental design phase of the fifth-generation fighter aircraft (FGFA) programme. This follows a series of contracts since 2007, including a general contract on joint design and production, followed by a contract for engineering development. The crucial phase will involve the actual 'shift' of some of the work to India, including the setting up of facilities, building the Indian prototype and flight testing that is expected to begin by the end of this decade. The Indian prospective multirole fighter (PMF), as the Indian single-seat version is officially called, will take shape during this crucial phase, with deeper clarity on the work share between Sukhoi and the Indian aerospace major the Hindustan Aeronautics Ltd (HAL).

As things stand, the Indian Air Force (IAF) plans to order 144 single-seat aircraft. Indications are that there is limited scope for HAL to tinker with the T-50/PAK FA airframe given the timeframes provided by the IAF for delivery. Secondly, HAL will not be looking to improve upon an airframe that will be largely proven in test flights by the time the Indian PMF prototype takes shape in fabrication facilities. While development work itself may be something of a fait accompli given that the Russians are already testing a full fleet of prototypes,

including two ground test aircraft, HAL has been asked not to surrender work share in the final matrix of cooperation. Currently there are four T-50 fighter aircraft undergoing flight tests in Zhukovsky, the maiden flight of the PAK FA having been undertaken on January 29, 2010, in Komsomolsk-on-Amur. Two more prototypes are dedicated to ground testing, one as a complex ground stand and the other for static tests. The complexity of the negotiations and deliberations means there is a fear that HAL could settle for much less work than initially agreed upon, thereby placing the IAF in precisely the sort of position it is looking to avoid i.e. total dependence on Russia for yet another frontline platform.

The flight test programme had a bit of a scare in June this year when after the regular test flight of T-50 prototype at the airfield of the M.M. Gromov Flight Research Institute in Zhukovsky near Moscow, while the plane was landing, a fire broke out and smoke was observed above the right air intake. The fire was quickly extinguished but not before some damage to the airframe. The aircraft is still under repair, with the Sukhoi Design Bureau's commission yet to complete the investigation into the cause of the accident. Sukhoi had stated at the time that this incident would not affect the schedule of the T-50 test programme.

PHOTOGRAPH: US AIR FORCE

## TECHNICAL SPECIFICATIONS – FIFTH-GEN AIRCRAFT

	F-35A	F-22	T-50
Crew	1	1	1
Length (M)	15.67	18.90	19.8
Wingspan (M)	10.7	13.56	13.95
Height (M)	4.33	5.08	4.74
Wing area	42.7 m <sup>2</sup>	78.04 m <sup>2</sup>	78.8 m <sup>2</sup>
Empty weight	13,199 kg	19,700 kg	18,000 kg
Loaded weight	22,470 kg	29,300 kg	28,300 kg
Max take-off Wt	31,800 kg	38,000 kg	35,000 kg
Engine	P&W135 Afterburning	2xP&W F119-PW-100	2xNPO Saturn AL41F1
	Turbofan	Thrust Vectoring Turbofan	TV Turbofan
	Dry Thrust 125 kN	Dry Thrust 104 kN	Dry Thrust 93.1 kN
	Afterburner 191 kN	Afterburner 156 kN	Afterburner 147 kN
Fuel capacity	8,382 kg	8,200 kg	10,300 kg
Max speed	Mach 1.6	Mach 2.25	Mach 2.3
Range	2,220 km	2,960 km	3,500 km
Combat radius	1,135 km	760 km	N/A
Service ceiling	15,240 m	20,000 m	20,000 m
Max G load	9g	9g	9g

Source: Wikipedia

In February last year, one prototype of the T-50, piloted by the test pilot Sergey Chernyshev, flew to the 929th Chkalov State Flight Test Centre's airfield in Akhtubinsk for joint testing. Here the aircraft was put through evaluation of aerodynamic features, tests for stability and controllability as also of dynamic strength, function check of onboard equipment and aircraft systems. According to Sukhoi, the optical locator radar system as well as the active electronically scanned array radar was tested on the aircraft with “positive results obtained”. Crucial air refuelling mode was also tested. “Super-maneuvrability tests of the aircraft are under way. Aircraft systems are being tested on the test stands, ground experimental works continue,” the design bureau states.

Constant comparisons with the F-22 Raptor and F-35 Lightning II don't bother the Russians too much. They believe that a long-term relationship makes them a natural partner in the PMF programme. “Compared to the previous generation fighters, the PAK FA combines strike and air defence roles, thus offering a number of unique capabilities. The use of composite materials and innovative technologies plus the aerodynamic layout of the aircraft, special airframe coating and measures to reduce the radar signature of the power plant, antenna and cockpit, assure unprecedentedly low radar, optical and infra-red observability. This considerably improves the operational effectiveness against air and ground targets at all times and in all types of weather,” says Sukhoi.

HAL says, “The proposed FGFA will have air combat superiority, high tactical capability, group action capability in the regions even with poor communication support. The aircraft will have advanced features like increased stealth, supersonic cruise, satellite link and network-centric warfare capability.” ■

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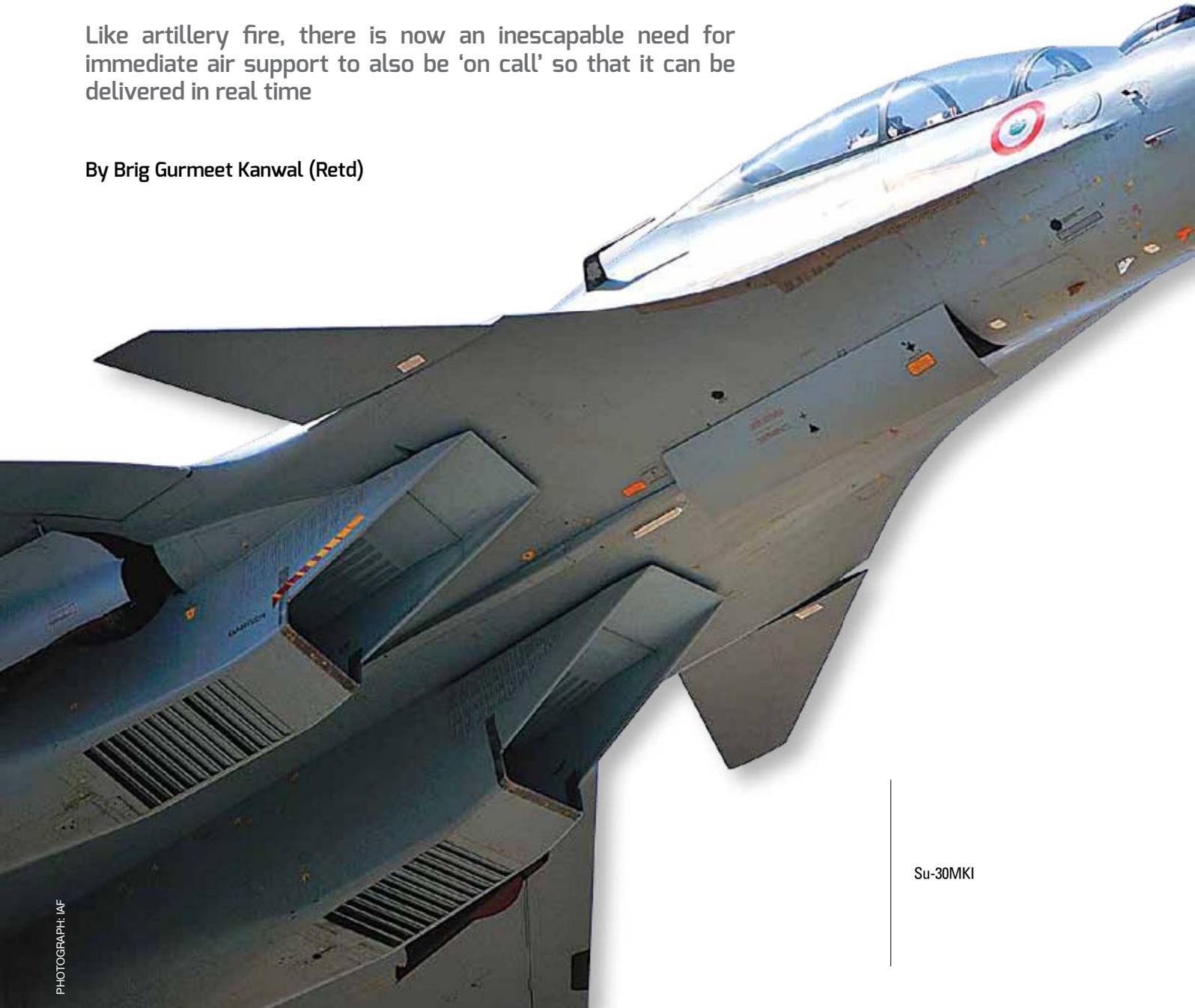
F-22 Raptor

PHOTOGRAPH: LOCKHEED MARTIN

# Role of Air Power in Joint Operations on the Future Battlefield

Like artillery fire, there is now an inescapable need for immediate air support to also be 'on call' so that it can be delivered in real time

By Brig Gurmeet Kanwal (Retd)



Su-30MKI

PHOTOGRAPH: IAF

**DURING THE KARGIL CONFLICT** in the summer of 1999, air-to-ground strikes by fighter ground attack (FGA) aircraft of the IAF played an important role in neutralising Pakistan Army defences. The destruction of a logistics camp at Muntho Dhalo was shown repeatedly on national television. In conflicts in Afghanistan, the Balkans, Chechnya, Iraq, Libya and Syria too FGA aircraft have achieved laudable results, especially while using precision-guided



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(PGMs). However, a key lesson that has emerged quite clearly from the recent conflicts is that air power alone cannot win a modern war.

Employed in a synergistic manner in conjunction with ground forces, air power is a substantive force multiplier that can pave the way for victory. Interdiction of targets in-depth and the provision of sustained battlefield or close air support to the ground forces, that is the neutralisation and, where possible, the destruction of enemy forces in contact with the troops being supported, is now part and parcel of the tactics, techniques and procedures of conventional combat on land. Joint operations are enhanced by the capability of the air force to quickly deliver a wide range of weapons and massed firepower at decisive points. In Gulf War II, the US armed forces had raised close air support to the level of a fine art. Air-to-ground strikes were whistled in more frequently than in any other war and were delivered with alacrity in an unbelievable response time of 15 to 20 minutes, earning for the flyboys the sobriquet "airborne artillery".

In the Indian context, the battlespace of the future will be characterised by high intensity conventional operations, particularly in the plains. Sustained and accurate firepower will be a key requirement in the land battle, with greater emphasis on precision and range to maximise destruction in-depth and minimise civilian casualties and collateral damage. Fast moving mechanised forces will present fleeting, well-dispersed targets. In defensive as well as offensive operations, targets will enjoy greater protection than was the case in wars in the 20th century. The higher tempo of battle will place heavy demands on firepower as the option of choice to cause unacceptable damage to the enemy's military machine. The experience of Coalition forces during the Gulf Wars is a case in point. Robert H. Scales Jr. has written in or book titled *Firepower in Limited War*: "There is no doubt that the American employment of firepower in the Gulf War was a success. Practical application of the precision revolution on the battlefield allowed American air and ground firepower to level Saddam's mountain of first-class war material in a well-conceived campaign of attrition by firepower. Victory came quickly and with few US casualties."

### Battlefield Air Support

The importance of close air support in modern wars must not be underrated. It is well known that just a few missions of FGA aircraft and attack helicopters can deliver more ordnance by way of dumb 1,000 lb. bombs in a few minutes on an objective selected for capture than a medium artillery regiment can deliver in 20 to 30 minutes. What is not so well known is that these 1,000 artillery shells would need more than 20 vehicles and 50 to 60 soldiers to transport from ammunition depots in rear areas to the gun positions and five to six hours to prepare, everything being done manually. In critical situations, particularly in fast-flowing mechanised operations, accurate air strikes can save the day. The battle of Longewala during the 1971 war with Pakistan is a good example. Also, it is a truism that accurate air strikes against the enemy in contact that can be seen by own troops provide a psychological boost to the morale of ground troops. Nothing heartens beleaguered infantrymen more than to see the enemy getting a hammering from one's own air force and artillery. In fact, the US Field Manual (Challenges for the US Army) makes the point that "the air space of a theatre is as important a dimension of ground operations as the terrain itself." The problem of enemy air defence weapons can be overcome by evolving a coordinated suppression of enemy air defence (SEAD) plan employing artillery, attack helicopters and air and ground-based electronic warfare platforms.

Careful cost-benefit analysis would often reveal that with the aerial delivery platforms and air-to-ground weapons available at present, the effort necessary is simply not commensurate with the result that might be achieved. To some extent this challenge could be overcome by employing attack helicopters. However, as the Afghan resistance proved against the Soviets and as was witnessed during the Kargil conflict, these lumbering fighting machines are extremely vulnerable to shoulder-fired SAMs. Since India is more likely to fight future border wars in the mountains than in the plains, as in the past, this shortcoming needs to be addressed early.

It is the synergy between the army and the air force that needs improvement on the Indian subcontinent where the response time between an immediate air strike being initiated and delivered is still almost the same as it was during World War II. The procedures for demanding air support, vetting the demands at various levels of command, the coordination between the airbase launching the strike and the forward air controller with the ground forces and, finally, the air-to-ground communications available to the strike pilot, all need to improve substantially. Only then will the provision of close air support to a leading spearhead or a beleaguered defender be upgraded by an order of magnitude. A mechanised combat team commander in the plains and a company commander in the mountains must be able to bank on close air support being available in a here-and-now manner when the shrapnel is flying thick and fast around them like artillery fire is today.

### Need for Dedicated Strike Platforms

In view of the lessons learnt during the Kargil conflict and the capabilities necessary for future wars, the IAF should reassess

the suitability of its weapons platforms and ammunition and launch a concerted drive to acquire the required means. Ideally, the IAF should be equipped with a specialised, dedicated ground strike aircraft of the A-10 Thunderbolt or SU-25/39 variety which are relatively slower moving, enable greater precision to be achieved in aiming, can carry several tonnes of payload per sortie, including air-to-ground precision strike missiles and bombs, and can absorb a lot of damage from the enemy's air defence weapons. Writing about the role played by the US air power during the Gulf War, Robert H. Scales Jr. states that "The A-10 was devastating once the ground war began and once the aircraft dropped low enough to provide effective 30mm cannon support."

Such aircraft would also cost only a fraction of the cost of multi-role aircraft such as Mirage 2000 and the future MMRCA. The risking of costly multi-role aircraft for tactical bombing runs has obviously to be very carefully considered. It is certain that in the coming decades, the IAF will continue to be called upon to launch ground strikes with precision munitions in support of the army. The IAF quite obviously cannot afford to acquire new,

**TIGER HILL AND MANY OTHER OBJECTIVES WERE FINALLY RECAPTURED WITH VERY FEW CASUALTIES. AIR STRIKES BY THE IAF ALSO ACHIEVED SIGNIFICANT RESULTS AND HELPED TO WEAKEN THE ENEMY'S RESOLVE. THE BATTLE WINNING UTILITY OF GROUND AND AIR FIREPOWER IN LIMITED WARS WAS ESTABLISHED BEYOND DOUBT.**

dedicated ground strike aircraft with its present budget. Once the need for such aircraft has been adequately debated and is established beyond dispute, additional funds will have to be provided to the IAF for their induction.

IAF aircraft that are earmarked for ground strikes also need to be armed with PGMs in large numbers to achieve a telling effect. Free flight 1,000 lb. and 500 lb. bombs cannot be dropped with the precision necessary to destroy individual bunkers, pillboxes and armoured fighting vehicles (AFVs). Just like artillery batteries firing standard high explosive ammunition are designed to 'neutralise' large areas of ground with their inherent dispersion of fire, modern jet aircraft flying at supersonic speeds and constrained by the threat posed by air defence weapons in the TBA, such as hand-held, shoulder-fired SAMs like the Stinger and the Unza, cannot be expected to achieve precision even with rockets and their Gatling guns. Only terminally homing laser-guided and TV-guided bombs with stand-off capability and air-to-surface missiles can provide the necessary reach and accuracy.

Also, the RSTA capabilities required for successful ground strikes must not be lost sight of. In an interview on the eve of Air Force Day, then Chief of Air Staff, Air Chief Marshal S.

Krishnaswamy, had highlighted several emerging technologies that he felt were critical to enable the IAF to maintain superiority in the South Asian region. Among these were "sensors, specifically those that can be employed for target acquisition by night and bad weather... (and) stand-off short/long-range precision guided weapons that could be launched from multiple types of carriers like helicopter and combat aircraft." ("MiGs not Technically Unsound", *Indian Express*, October 6, 2002.)

Superior precision firepower can give ground forces a decisive edge in limited wars. Long-range lethal munitions and precision targeting promise to provide an immense edge to well-equipped ground forces. According to Robert H. Scales Jr., "The lesson from the Gulf War is clear: in a high intensity war, firepower must break the enemy's will to resist before close combat begins. Firepower must so weaken the enemy that close-in killing by infantry and armoured forces becomes a coup de grace rather than a bloody battle of attrition." The same lesson had emerged during the Indian Army's experience in the Kargil conflict. Maximum Indian casualties occurred during initial assaults on the icy mountaintops occupied by regular Pakistani soldiers before the artillery had built up to the level of being able to concentrate 100 guns on each target in turn. Sustained, accurate and high volume concentrated artillery firepower eventually won the battle for India by completely decimating enemy sangars and enabling the infantry to assault virtually unopposed. Tiger Hill and many other objectives were finally recaptured with very few casualties. Air strikes by the IAF also achieved significant results and helped to weaken the enemy's resolve. The battle winning utility of ground and air firepower in limited wars was established beyond doubt.

It can be justifiably argued that India is unlikely to be confronted with a Kosovo-type situation in the foreseeable future. Nor is there is a likelihood of repeated air strikes such as those launched by the US against Iraq on many occasions after Gulf War I or those frequently launched by Israel against Hizbollah hideouts in Lebanon till recently. As such, besides fighting the air war to achieve a favourable air situation, the IAF will be called upon to strike ground targets primarily in support of a limited ground war and it is these ground strike capabilities that need to be further developed and honed.

Like artillery fire, there is now an inescapable need for immediate air support to also be 'on call' so that it can be delivered in real time. Even for preplanned air support, it is unrealistic to ask the corps staff to plan 24 hours in advance. Preplanned air support should be available to a commander in the field at two hours' notice – the usual response time for reacting to emerging situations. If attack helicopters were considered to be the 'fourth squadron' of a combat group, the time has come for dedicated close air support assets to act as the 'fifth squadron', particularly during offensive operations so that fleeting opportunities can be optimally exploited. The efficacy and success of air-to-ground strikes will be enhanced considerably by the acquisition of an optimised ground strike aerial platform that is dedicated for the purpose. ■

*Gurmeet Kanwal is former Director, Centre for Land Warfare Studies, New Delhi.*



Sikorsky's new  
CH-148 Cyclone  
Maritime Helicopter

# Airborne Anti-Submarine Warfare

Sikorsky Aircraft has been selected by the Indian Navy to fulfil its multi-role helicopter requirement for anti-submarine and anti-surface warfare missions

By Rear Admiral (Dr) S. Kulshrestha (Retd)

**STANDOFF ANTI-SUBMARINE CAPABILITIES** continue to be of vital interest to the navies across the world. The current environment of littoral warfare has once again brought in to sharp focus the threat of the lurking diesel submarine and the means of tackling it by the use of helicopters and aircraft. Some of the noteworthy anti-submarine warfare (ASW) platforms are discussed in brief in the succeeding paragraphs.

## Sikorsky CH-148 Cyclone

The Sikorsky CH-148 Cyclone is a twin-engine, multi-role shipboard helicopter being developed by the Sikorsky Aircraft Corporation. CH-148 is designed for shipboard operations and is intended to replace the CH-124 Sea King. It is equipped to search and locate submarines during ASW. The

integrated mission system and the Sonobuoy acoustic processing system are being developed by General Dynamics Canada. The sonar is an L-3 HELRAS, the radar is a Telephonics APS-143B, the electro-optic system a Flir systems SAFIRE III, and the ESM a Lockheed Martin AN/ALQ-210. CMC Electronics provides the flight management system CMA-2082MH aircraft management system. It carries 2 x Mk-46 torpedoes on a bomb rack BRU-14 mounted in folding weapons pylons and a door-arm mounted general purpose machine gun.

## Sikorsky S-70B Seahawk

Sikorsky Aircraft has been selected by the Indian Navy (IN) to fulfil its multi-role helicopter requirement for ASW and anti-sur-

(Below) AgustaWestland's AW101 and (Right) NH90



face warfare (ASuW) missions. The current requirement projected is 16 with an option from additional 8. It has been developed from the US Army's UH-60A Black Hawk. The SH-60B carries a complex system of sensors including a towed Magnetic Anomaly Detector and air-launched sonobuoys. Other sensors include the APS-124 search radar, ALQ-142 ESM system and optional nose-mounted forward looking infrared turret. It carries the Mk 46, Mk 50, or Mk 54 torpedo, AGM-114 Hellfire missile, and a single cabin-door-mounted M60D/M240 7.62mm (0.30 in) machine gun or GAU-16 .50 in (12.7mm) machine gun. The IN's S-70B variant is expected to feature avionics and flexible, open architecture weapons management systems, which are equipped with an advanced sonar, 360-degree search radar, modern air-to-surface missiles and torpedoes for ASW missions.

### AgustaWestland AW101

The AgustaWestland AW101 is a medium-lift helicopter used in both military and civil applications. The AW101's navigation system includes a GPS receiver and inertial navigation system, VHF omni directional radio range, instrument landing system, tactical air navigation system and automatic direction finding. For safety, the aircraft is equipped with obstacle and terrain avoidance warning systems and traffic collision avoidance system. The AW101 is equipped with the Blue Kestrel search and detection radar, which is capable of 360-degree scanning and can detect small targets as far as 25 nautical miles. Most variants of the AW101 are equipped with self-defence systems. Two hard points are present on the underside of the airframe on which it can carry four Sting Ray torpedoes or Mk Mod 3 depth charges.

### NH90

The Airbus/AgustaWestland produced NH90 is designed to fulfill a NATO staff requirement for a multi-role, medium-sized military helicopter for both land and maritime operations. NH90 is the first helicopter in the world to be equipped with full fly-by-wire flight controls. NH90 is either fitted with Rolls-Royce Turbomeca RTM322 or General Electric T700E power plants. The NH90 features a range of customisable avionics systems, dependent on customer selection and purpose. The naval variant is outfitted with dipping sonar and sonobuoy processing equipment.

### Boeing P-8 Poseidon

The Boeing P-8 Poseidon is a military aircraft developed for the US Navy by Boeing Defense, Space and Security. The P-8 conducts ASW, ASuW and shipping interdiction, along with electronic signals intelligence role. The P-8 can carry torpedoes, depth charges, SLAM-ER missiles, Harpoon anti-ship missiles and other weapons. It is able to drop and monitor sonobuoys. IN has acquired eight P-8I which have been adapted as per India's operational requirement.

Depth charges have again come into focus because of the ASW threat in littorals. These can be very effectively utilized for flushing out the lurking diesel submarines.

### ASW Armament

The ASW armament carried today by maritime aircraft and helicopters includes lightweight torpedoes, depth charges and bombs.

### Air Dropped Depth Charges and Bombs

Depth charges have again come into focus because of the

ASW threat in littorals. These can be very effectively utilized for flushing out the lurking diesel submarines. Two depth charges are worthy of mention, these are the Mk 11 depth charge of UK and the BDC 204 depth charge of Sweden.

The Mk 11 depth charge was developed by British Aerospace (now BAE Systems) for air delivery from maritime aircraft and helicopters. The Mk 11 depth charge was designed for shallow water operations against submarines on the surface or at periscope depths. It is fully compatible for carriage and release from a wide range of ASW helicopters and fixed-wing maritime patrol aircraft. The Mod 3 version incorporates a 4mm mild steel outer case and nose section, which is designed to withstand entry into the water at high velocities without distortion. It has been cleared for carriage on Lynx, Merlin, NH90, Sea King and Wasp helicopters.

The BDC 204 depth charge was developed by Bofors Underwater Systems (now Saab Dynamics) for air delivery from maritime aircraft and helicopters of the Swedish Navy. The depth charge can be deployed in patterns, with different depth charges set to detonate at different depths to achieve profound shock and damage to submarines. They have been cleared for carriage on the Boeing Vertol 107 helicopter and CASA C-212 Aviocar maritime patrol aircraft.

### Air-launched Torpedoes

Few of the prominent air-launched torpedoes are described below:

**Stingray is a LWT manufactured by BAE Systems.** It has a diameter of 324mm, weight of 267 kg, and length of 2.6 m. Its speed is 45 kts with a range of 8 km and its warhead is 45 kg of Torpex. It can dive up to 800 m. Stingray is fed with target data and other associated information prior to its launch, after entering water it searches for target autonomously in active mode and on acquiring the same,

attacks it. It is carried by Nimrod aircraft. Stingray Mod 1 is reported to have a shaped charge warhead and improved shallow water performance.

**Mk 46 Mod 5 torpedo is the mainstay of US Navy's air-launched lightweight torpedoes.** It is manufactured by Alliant Tech systems. It has a diameter of 324mm, length of 2.59 m, with a weight of 231 kg. It runs on Otto fuel, has a range of 11 km with a speed of 40 kts, and can dive up to 365 m. It has a PBXN-103 warhead of 44 kg. It has an advanced digital computer control system with a built-in logic and tactics for search and reattack. It has effectively performed in both deep and shallow waters and can attack both the nuclear as well as the smaller diesel submarine. Over 25,000 Mk 46 torpedoes have been supplied to customers until date. Interestingly the Chinese YU-7 torpedo is said to have been developed from the Mk 46 Mod 2.

**The Mk 54 lightweight torpedo is a hybrid of technologies taken from Mk 46, Mk 48 and Mk 50 torpedoes.** It is supposed to have homing and warhead of the Mk 50 and propulsion package of the Mk 46 torpedo. It has incorporated COTS processing technologies for an advanced guidance and control system. It is stated to have sophisticated shallow water capabilities for littoral threats. The Mk 54 torpedo has been finalised for P-8I aircraft by India.

**The A244/S developed by WAAS and currently manufactured by the Euro Torp consortium is a 324mm diameter, 2.8 m long, and 244 kg weight torpedo.** It has a cruise/surge speed of 30/39 kts, with a range of 6 km and depth up to 600 m. Its homing head can function in mixed, active, or passive modes. It has special signal processing to distinguish target from decoys.

**A244/S Mod 3 is the latest upgrade of the A244/S.** It has more powerful propulsion battery, with an increased number of



PHOTOGRAPH: BAE SYSTEMS

BAE Systems' Sting Ray Mod 1 Lightweight Torpedo on a Merlin helicopter



P-8A Poseidon

cells, which ensures a 50 per cent increase in the endurance of the weapon to 13.5 km. It has an Advanced Digital Signal Processor module to counter sophisticated torpedo countermeasures. The homing head has preformed multiple transmission and reception beams and multi-frequency operating capability. It can classify and track several targets simultaneously, and discriminate between the target and countermeasures.

**MU90/Impact is in mass production for 6 major NATO and Allied Countries.** The MU90/Impact torpedo is 323.7mm 'NATO Standard' calibre, 2.85m long with a weight of 304 kg. It is powered by an aluminium-silver oxide seawater battery using dissolved sodium-dioxide powder as electrolyte with a closed-loop electrolyte re-circulation system, the torpedo is propelled by an electronically controlled high-RPM brush-less motor driving a skewed multi-blade pump jet propulsor allowing a continuously variable torpedo speed automatically selected by in-built logic of the torpedo. The control and guidance electronics has embedded operational and tactical software including the signal processing, the data processing, and the torpedo guidance algorithms, which enable the MU90 to continuously self-adapt its configuration and tactics. The inertial system is based on 'strap-down' technology enabling all-attitudes capability including bottom following capability. The warhead consists of V350 explosive, fully insensitive, shaped charge warhead, with an impact type exploder incorporating two mechanical and six electrical independent safety devices.

Low-cost anti submarine weapon (LCAW) A200/A is a miniature torpedo developed by WASS. LCAW has been developed as an intermediary between air-launched torpedoes and conventional depth charges. It is a low-cost option, which provides propulsion and guidance to a depth charge without the costs of a torpedo. The air dropped version A200/A is deployed from aerial sonar buoy dispensers. The weapon is primarily designed to engage targets in shallow water, like midget submarines. The A200/A version has a length of

914.4mm, weight of 12 kg, and a diameter of 123.8mm. The warhead is a 2.5 kg PBX shaped charge and the LCAW has an operating depth from 15 m to 300 m. It has a speed of about 18 kts with a range of 2 km.

### Indian Navy

The IN has ordered 8 in number of the P-8I Neptune version of the Boeing P-8 Poseidon. The aircraft includes six additional body fuel tanks for extended range from Marshall Aerospace. In-flight refuelling is via a receptacle on top of the forward fuselage, just aft of the cockpit. In order to power the additional electronics, the P-8 has an 180kVA electric generator. The P-8 uses data fusion software to combine its various sensors for target tracking.

The Bharat Electronics Limited Data Link II communications allows the P-8I to exchange tactical data between the Indian Navy aircraft, ships and shore establishments. The P-8I features an integrated BEL-developed IFF system. India has purchased AGM-84L Harpoon Block II Missiles and Mk 54 All-Up-Round Lightweight Torpedoes for the P-8I. The aircraft carries Raytheon APY-10 multi-mission surface search radar and is likely to have Advanced Airborne Sensor surface search radar and SIGINT package in the follow-on programme. It has 5 internal and 6 external stations for AGM-84H/K SLAM-ER, AGM-84 Harpoon, Mark 54 torpedo, missiles, mines, torpedoes, bombs and a high altitude anti-submarine warfare weapon system. Six have been delivered and remaining two will be delivered this year.

IN has selected Sikorsky Aircraft Corp., a subsidiary of United Technologies Corp, to fulfill the multi-role helicopter requirement for ASW/ASuW. Negotiations will now commence to procure 16 S-70B Seahawk helicopters, with an option for eight additional aircraft along with a complete logistics support and training programme. IN has a requirement for 120 NMRH in the 9-12.5 tonnes category. The NMRH is envisaged to carry out the ASW as well as the ASuW roles. ■



IAI's Heron

# IAI's Heron is ISTAR Performer

The Heron I unmanned aerial system is a robust, combat proven multi-mission system, adapted for a broad range of tasks, utilizing diverse mission payloads

**ISRAEL AEROSPACE INDUSTRIES (IAI)**, a world leader for over 40 years in unmanned aerial systems (UAS), has a star performer in the innovative 'Heron' family. A master in performance of ISTAR (intelligence surveillance, target acquisition & reconnaissance) missions, Heron covers hundreds of square kilometres in any terrain scanning deserts, mountains, dense tropical forest, coastal plains, deep sea and more. Heron's

sensors provide optimal sensing for every possible scenario at all times. With mission endurance spanning over days and nights, its electronic intelligence gear continuously sweeps the spectrum for suspicious signals, onboard radars perform wide-area surveillance over land, sea, jungle or urban terrain, while sharp-eyed electro-optical payloads enable operators to positively identify and designate targets for further action.

PHOTOGRAPH: IAI

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### Multi-mission System

The Heron I UAS is a robust, combat proven multi-mission system, adapted for a broad range of tasks, utilizing diverse mission payloads. It carries multiple payloads for line-of-sight missions or beyond line-of-sight using satellite communications and its sensors feed ISR data to the ground segment and to tactical-level end users in real-time.

IAI divisions deliver most of these sensors, while others are provided by third party suppliers. The current Heron represents the fourth spiral development of the system, integrating the latest avionics systems, an advanced ground segment offering the ultimate level of man-machine interface (MMI) through advanced, ergonomic and modular design. A choice of payloads enables Heron I to perform its missions over any terrain where the use of a single payload will render a mission ineffective. For such missions, The Heron can be equipped with communications intelligence (COMINT) radio interception gear, instantly localising radio and cellular transmissions indicating potential activity even under tree canopy.

Similarly, when operating over open terrain, IAI's Synthetic Aperture Radar (SAR) systems provides efficient wide area coverage, automatically spotting moving targets. Once potential targets are located, electro-optical sensors can be deployed to seek out their signature through gaps in the canopy. Alternatively, a new Foliage Penetrating Radar developed by IAI can be used to locate activity and targets hidden in the woods. The airborne satellite communications (SATCOM) link systems extend the operational range of the Heron to range endurance limited only by fuel availability – and enables missions ranging over 1,000 km from its operating base. It also provides for increased flexibility in flight profile, particularly in mountainous terrain and long-range maritime patrols, where the UAV can descend below the data link's line of sight, maintaining uninterrupted communications with the control centre via SATCOM.

### Automated Control Ensures Flight Safety

Heron is equipped with an automatic take-off and landing system (ATOL) based on years of operational experience. The system integrates two redundant reference systems – laser and differential GPS (DGPS), to maintain maximum safety through these critical phases of the mission, in day, night, rain and zero visibility. IAI has deployed the ATOL on eight different autonomous platforms and performed thousands of missions. In contrast to conventional UAS, using automatic flight management for mission control, but often reverting to manual control for take-off and landing, ATOL takes over during these critical phases, defining the pilot a safe 'corridor' for the ascend path. Moreover, the automatic system can respond faster to changes, such as wind gusts or turbulence that may cause sudden altitude drop, by immediately initiating appropriate emergency measures to bring the aircraft back to safe flight in any weather condition.

### World's Safest UAS

The new function also helps avoiding deviation from the pre-planned mission course, preventing potential 'hijacking' of UAVs by electronic deception and interference. These new fea-

tures are becoming imperative for integration in civil controlled airspace, where the unmanned aircraft must follow strictly controlled routes without deviation. In fact, Heron has been demonstrating its capability to operate with manned aircraft in the same airspace for several years, in Israel and in other countries, utilizing internal communications relay and strobe lights, clearly indicating its position to other aircraft. These new features ensure the Heron remains one of the world's safest UAS.

### Impressive Operational Record

IAI has deployed UAS with 50 customers worldwide and they have accumulated over 12,00,000 operational flight hours: in Afghanistan, Iraq, Kosovo, Libya, and the Middle East, from the Asian and North African deserts, through the mountain ranges of the Himalayas and Andes, to the African, Asian and Amazon tropics, to the cold winter of northern Scandinavia and Canada. The Heron family has accumulated more than 2,50,000 operational flight hours worldwide.

Among the operational services currently using the Heron in combat are the German and French Air Forces that have deployed them in Afghanistan while the Australian and Canadian forces are leasing Heron through turnkey service. The French Air Force has used the Heron to support NATO operations in Libya. The Spanish military is operating Searcher UAVs in Afghanistan. The Israel Air Force is operating the Heron and the Heron TP (turboprop) with its operational UAS squadrons.

### Heron in India

Heron and Searcher UAS are operational with all the Indian military branches in a variety of mission profiles and climatic conditions, including operations from the Indian Air Force Station at Leh, one of the highest military airfields in the world, located at an altitude of over 11,000 ft. In Brazil, Herons are supporting the Federal Police forces in law enforcement and border surveillance, demonstrating the advantage of UAS in support of homeland security missions. Heron UAS are also operating in Ecuador and Turkey.

In December 2014, the Republic of Korea selected Heron for its UAS upgrade project, thus joining the prestigious club of over 20 Heron operators around the world.

### Super Heron

IAI in February last presented the new member of the Heron family, developed to meet the growing interest among customers. The Super Heron features a heavy fuel 200 horsepower engine and an advanced propulsion system, which significantly enhances the UAS capacity, rate of climb, and performance. Super Heron's air speed exceeds 150 KTAS (knots true airspeed). Its advanced avionics, triple redundancy and advanced computerised systems enhance its growth potential. Enhanced processing capabilities, increased electrical power and standard interface architecture allow for the simple integration of new payloads. The system consists of multiple proven operational configurations for intelligence, surveillance, target acquisition and reconnaissance missions, maritime patrol and other missions. Multi-sensor capabilities, state-of-the-art communications and proven airspace integration are among its leading features. ■

Boeing  
EA-18G



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# War of the Waves

EW systems includes electronic support measures which identify the parameters of the emission, then counters it by electronic countermeasures

By Lt General Naresh Chand (Retd)

PHOTOGRAPH: BOEING

**AIRCRAFT SURVIVABILITY IS KEY** to effectiveness of the battle in the skies. Airborne electronic warfare (AEW) when combined with stealth or low observable technology, is one of the most effective techniques for increasing aircraft and aircrew survivability.

During World War II, to negate or degrade ground-based radars, the Allies and Germany quickly developed a number of electronic countermeasures (ECM) like chaff which is still employed. Towards the end of the war, ECM had reduced some of the advantages that radar conferred upon air defenses. Many techniques have been evolved over a period of time to improve aircraft survivability like SEAD (suppression of enemy air defences), anti radiation missiles and airborne jamming platforms such as the Northrop Grumman's EA-6B. The US also started providing jamming decoys, SEAD, etc, to bomber missions for better survivability. Aircraft with stealth material like F-117 also came in service.

Efficient EW systems enable all aspects of the air battle including reconnaissance, surveillance and target acquisition, strike operations, air superiority operations, close air support, and airlift to be conducted smoothly. EW systems includes electronic support measures (ESM) which identify the parameters of the emission, then counters it by electronic counter-measures.

It was but natural that ECM is followed by electronic counter countermeasures (ECCM). While not really a part of electronic warfare, SEAD is an important area that exploits EW techniques, technologies and platforms. The F-16CJ, which is a SEAD aircraft, also shoots the HARM missile.

## AEW SYSTEMS

### Raytheon's Portfolio

**Next-generation Jammers (NGJ):** NGJ provides innovative airborne electronic attack and jamming capabilities. Complex threats require airborne electronic attack to be more precise, be powerful and have a short reaction time. NGJ integrates the most advanced electronic attack technology into the Boeing's EA-18G to ensure superior mission performance. It is built with a combination of high-powered, agile beam-jamming techniques and cutting-edge solid-state electronics.

**AN/ALQ-184:** The AN/ALQ-184 electronic attack pod provides self-protection for the F-16 combat aircraft and crew in a complex radar guided threat environment. It protects aircraft against radio frequency threats by selectively directing high power jamming against multiple emitters. Its computer-controlled multi-beam receivers and mini-TWT amplifiers operate in both receive and transmit modes to selectively direct high power jamming against multiple emitters. The system provides instantaneous RF signal processing that is wide open in angle and frequency. Features such as a high sensitivity multi-beam receiver, continuous wave, pulse and pulse doppler allow a 100 per cent probability of threat detection.

**ALE-50 Advanced Airborne Expendable Decoy (AAED):** The ALE-50 AAED is a towed expendable intended to provide a radar target decoy to an incoming missile. The ALE-50 can be manually operated as a stand-alone device, or it can be integrated and controlled by the ALE-47. This expendable



MALD is a flexible and modular system that has the potential to keep aviators and aircraft out of harm's way

Rafael's  
SkyShield



towed decoy is designed to provide countermeasures against radar guided anti-aircraft threats.

**Miniature Air-launched Decoy (MALD):** MALD is a low-cost, air-launched programmable craft that accurately duplicates the combat flight profiles and signatures of US and allied aircraft. MALD is an expendable air-launched flight vehicle that looks like an US or allied aircraft to enemy integrated air defence systems.

#### Northrop Grumman Solution

**ALQ-131(V):** The ALQ-131(V) ECM pod handles known, emerging and future terminal threats in a variety of complex, dense threat environments. It is modular in design and has undergone mid-life upgrade which includes a transmitter upgrade, advanced technique upgrade and improved sustainment and availability. Currently they are operational on A-10, F/RF-4, F-16 and C-130 aircraft in the US and 11 other countries.

#### SAAB Systems

**Integrated Air Defence Systems (IADS):** IADS can be configured with laser warning, missile-approach warning, as well as the full multi-spectral detection capability for radar; including a Saab digital receiver, DRx, as an option. IADS is fully integrated with BOP-L, Saab's new advanced lightweight countermeasures dispensing system. The modular system architecture allows IADS to be configured for any combination of the three sensor-system types. IADS systems offer cost-effective and lightweight system which can be fitted on a wide variety of aircraft. It has also been fitted on India's Dhruv helicopters.

#### Rafael Shield

**Sky Shield:** Rafael's Sky Shield provides an all-inclusive multi-purpose support jamming system. Sky Shield engages enemy radars in hostile environments providing comprehensive countermeasures against enemy threats. The system creates a safe corridor for multiple attacking aircraft, increasing aircraft survivability in time and attack options. The system can operate autonomously, and automatically detecting, collecting, measuring, identifying and engaging radar emitters.

**Top Scan:** Top Scan is a dual axis interferometer system which can localise RF emitters. The compact and lightweight system is designed to detect, identify and locate radar emitters with high accuracy.

**Lite Shield:** The Lite Shield is a relatively small, electronic attack pod that implements "close protection" to ensure immediate, flexible and constantly available electronic attack capability and response. It is equipped with the most advanced EW components, which shield the strike formation from being detected and engaged prior to completing its mission.

#### Elbit Suites

**Elisra (Elbit owned subsidiary):** Elisra provides cutting-edge AEW suites which deliver a full range of capabilities including radar warning, laser warning ECM, and missile warning systems that integrate chaff/flare, directed countermeasures and more. The systems have modular design and can be matched with a large range of airborne platform types and sizes. Its SPS-20 Radar Warning Receiver (RWR) is for helicopters. RWRs is a wideband receiver covering from 100 MHz to 20 and now even 40 GHz. Detected signals are passed to a processor which measures parameters and compares these with the values associated with friendly and hostile emitters. Details of threat signals are presented to the aircrew via a cockpit-mounted display, which gives an indication of their nature, bearing and priority.

#### LOCKHEED MARTIN EW PLATFORMS

Lockheed Martin is participating for the Advanced Offboard Electronic Warfare (AOEW) system, a proposed extension of the surface electronic warfare improvement programme (SEWIP). SEWIP is the US Navy's programme of upgrades for its SLQ-32(V) shipboard electronic warfare system. Under the AOEW concept, an extension of the shipboard system would be installed in MH-60R and/or MH-60S helicopters. The AOEW would extend the horizon of a ship's detection capabilities, giving the ship more time to counter incoming anti-ship cruise missiles.

### Lockheed Martin Jointly with Raytheon

Lockheed Martin is also installing 20 Raytheon Advanced Countermeasure Electronics System-System Integrity (ACES SI) retrofit kits, modifying 24 radar warning receivers, and procure three electronic warfare memory loader verifiers for the Egyptian combat jets. The Raytheon ACES is an integrated EW suite with situational awareness and jamming capabilities. ACES represents a modern EW digital technology that forms an electronic shield against anti-aircraft missiles and threats from enemy radars, Raytheon officials say.

### Cobham's Offerings

Cobham Aviation Services designs, certifies and manufactures specialised equipment for airborne electronic warfare and operational readiness training requirements. The special mission equipment capabilities include radar jamming and threat simulation, communications jamming, electronic surveillance, platform location and attitude logging, and height-keeping towed targets with controllable radar cross section. Under-wing stores for radar jamming and simulation are available for the C, D, E, G, I and J radar bands. Construction formats include ALQ-167 and AST-9 shells. Advance memory-based and predictive techniques are available. Chaff can also be deployed using the onboard ALE-40 system on any jamming or other sortie. Cabin-mounted equipment for the airborne jamming of communications links is available in the VHF/UHF bands. Cobham can provide systems operator training for electronic warfare pods and systems for live ECM/ESM/ECCM.

### DEDICATED AEW AIRCRAFT

**Boeing's EA-18G Growler:** EA-18G is the cornerstone of the naval Airborne Electronic Attack (AEA) mission. Derived from the combat proven F/A-18F aircraft, the EA-18G incorporates advanced AEA avionics bringing transformational capability for suppression of enemy air defences and non-traditional electronic attack operations. The EA-18G is highly effective in the traditional stand-off jamming mission

but with the speed and agility of a Super Hornet, it is also effective in the escort role. With its advanced electronically scanned array radar, digital data links and air-to-air missiles, the EA-18G has self-protection capability and is also effective for target identification and prosecution. Its ALQ-218 wideband receiver combined with the ALQ-99 Tactical Jamming System is effective against any radar-guided surface-to-air threat.

**Northrop Grumman EA-6B Prowler:** It is the tactical jamming aircraft of the US Navy, US Air Force and the US Marine Corps. The aircraft were to be retired and replaced by the EA-18G Growler by 2012 but its service has however been extended beyond 2014. The mission of the aircraft is to accompany the strike forces and to carry out armed reconnaissance, electronic warfare and jamming operations. The Prowler is carried on all classes of the US Aircraft Carrier fleet. It carries ALQ-99 which is an extremely comprehensive tactical jammer. The Prowler is armed with the Raytheon HARM high-speed anti-radiation missile, AGM-88. For employment in Iraq they were fitted with Northrop Grumman's Litening AT targeting pod. The upgraded version carries AN/ALQ-218 electronic warfare receiver and LR-700 with selective reactive jamming capability to counter frequency-hopping intercept radars, Link 16 data link and an integrated communications jamming system.

**EC-130H Compass Call:** EC-130H Compass Call is an airborne, wide area tactical weapon system developed primarily for the US Air Force by collaboration between Lockheed Martin, L3 Communications and BAE Systems. The Compass Call completed 10,400 combat missions and 64,200 flight hours as of February 2014. The EC-130H role is to execute electronic warfare, tactical air and countermeasure missions. It can extensively deny and disrupt enemy command and control networks. The EC-130H Compass Call airframe is an upgraded version of that of Lockheed Martin's C-130 Hercules. The EC-130H is further modernised to the Baseline-2 standard to achieve improved precision and electronic attack capability. ■



EC-130H Compass Call is an airborne, wide area tactical weapon system

PHOTOGRAPH: US AIR FORCE



HAL's Intermediate Jet Trainer

## The Elusive Star

Hopefully, the Raksha Mantri would appreciate the predicament of the IAF and fast-track the procurement of an IJT from abroad as an interim solution

By Air Marshal Dhiraj Kukreja (Retd)

**THE HINDUSTAN AERONAUTICS LIMITED** a Navratna company and the largest defence public sector undertaking (DPSU) under the Ministry of Defence (MoD), is also the premier aeronautical complex in South East Asia, but with a dubious record and some credits. It had proposed the development of a replacement to its HJT-16 Kiran trainer aircraft for the intermediate training stage (Stage 2) of the trainee pilots of the Indian Air Force (IAF) as far back as in 1984. For some reasons, buried in the files of the Ministry of Defence (MoD), the proposal did not find favour and was shelved. However, in 1997, HAL once again resurrected the project on its own initiative and commenced designing an intermediate jet trainer (IJT). The MoD accorded

approval in 1999, after the IAF had reviewed the project details. Two prototypes were cleared with an initial budget of ₹180 crore which was subsequently increased to ₹465 crore in 2005. The expenditure so far is ₹635 crore. The IAF has been committed to the project from its inception and has even placed an order for 73 aircraft. It has also promised to provide additional funds to the programme, if so required.

### Plagued with Problems

It goes to the credit of HAL that the first prototype of the HJT-36 the PT-1, christened as Sitara (meaning 'Star'), took to the air on March 7, 2003, and the second or the PT-2, a year



IJT in flight

later. There was palpable excitement in the aviation circles as it was only four years since project approval that the aircraft had flown. The aircraft was then displayed at the Paris Airshow in 2005. Considering that the prototypes were ready and had been displayed at an international airshow, it was expected that it would enter service with the IAF by the end of the decade. Alas, it was not to be. As often happens in the development of a new aircraft, unforeseen occurrences derailed the programme to such an extent that today, one does not know when it will enter service.

The Larzac engines from France powered the first two prototypes of the HJT-36 Sitara. However, the IAF felt the aircraft was underpowered as the engine developed only 14.1 kN thrust. It is standard practice that an engine is decided during the initial design phase itself, when the designers, giving margin for some additions, estimate the all-up weight. It is also accepted that the final weight of an aircraft will be slightly higher than the earlier estimates. In the case of the HJT-36, however, the final weight was much higher than the earlier approximation, leading HAL to turn to Russia for another engine with a higher thrust rating. The NPO Saturn AL-55I engine, which produces 16.9 kN thrust, was selected and a contract signed for an initial production of 250 engines, with the option for more. The agreement also included assistance in setting up production in HAL's Koraput Engine Centre. The first of the engines was delayed by two years, the first of the many delays to follow

and was delivered only in December 2008. Fitted with the new engine, the PT-1 flew on May 9, 2009.

Although the new engine performed well on the aircraft, it has problems. First, the engine is yet to be certified; second, it is reported that this engine has a very short 'flight-life'. It requires an overhaul at every 150 hours of flying, when ideally it should be around four times this figure and with a total life of about 1,800 to 2,400 hours. Considering the intensity of flying that the aircraft would be subjected to in training, the short lifespan translates to an overhaul every two months or so, which further translates to extended down time for every aircraft, at a colossal utilization of man-hours. This would inflict extra pressure on the maintenance staff and engine production factories and would require an increased buffer stock of engines. As per the manufacturer, subsequent to flying a certain number of hours, the engine life may be increased. The change, however, in the overhaul schedule can be incorporated only after a strip examination of each component and exhaustive ground testing. The Russians are confident that the requirement of 600 hours between overhauls and a total lifespan of 1,800 hours can be achieved as the IAF gains experience on the maintenance of the engine. One can be optimistic, but should not take it at face value.

### Endemic Delay

Apart from the engine, there are other reasons for the delay. In February 2007, during a flight display at the Aero India show at

the Yelahanka, the first prototype aircraft, PT-1, suffered serious damage when its canopy opened during take-off causing the aircraft to veer off the runway, thus damaging the right wing. In the process of regaining control of the aircraft, and getting back on to the runway, one of the tyres burst. The accident caused a delay, although the aircraft flew again after extensive repairs.

The second accident occurred exactly two years later, on February 4, 2009, when after a routine test sortie, the aircraft landed on its belly, damaging the structure, undercarriage and the wing tips. The investigation into the cause of the accident delayed the project further. Yet another accident occurred after two years in April 2011, wherein the pilots ejected and the aircraft was lost. The remaining aircraft were grounded and major changes had to be initiated in the flight control system, leading to associated design changes for recovery and resolution. Apart from these three major accidents, which have considerably delayed the certification of the aircraft, there was another incident, comparatively very minor, when one of the ejection seats fired inside the hangar. Though there was no damage to the aircraft per se, the flight testing process was delayed as another ejection seat had to be imported; till the seat arrived, the aircraft remained on the ground.

**CONSIDERING THE INTENSITY OF FLYING THAT THE AIRCRAFT WOULD BE SUBJECTED TO IN TRAINING, THE SHORT LIFESPAN TRANSLATES TO AN OVERHAUL EVERY TWO MONTHS OR SO**

There are other causes for delay, apart from the three accidents. Any trainer aircraft has to have safe stalling and spinning characteristics. This is essential as inexperienced trainee pilots could get into a difficult situation due to mishandling of controls. Even inexperienced pilots should have the confidence to effect a safe recovery from a stall or spin. As per reports, stall tests were aborted on the HJT-36, as the aircraft was rolling 16 degrees at the point of stall. This was a very undesirable characteristic and had to be rectified on priority. On July 5, 2014, Shiv Aroor, a defence correspondent, had filed an exclusive report in a journal (Livefist, "Exclusive: Totally Cornered, HAL to Redesign Lumbering Intermediate Trainer"): "The HJT-36 aircraft presently weighs around 4,150 kg in its normal training configuration....HAL is envisaging achieving maximum possible weight reduction/optimisation for the aircraft....The design of the above need to be revisited, analysed and the scope for weight reduction/optimisation studied while ensuring the required strength, stiffness and fatigue criteria.... Towards this HAL is looking forward for partnership/technical assistance/consultancy from a well experienced airframe design house....This weight reduction/optimisation study must be comprehensive, encompassing all the Structure, Mechanical Systems and Electrical Avionics Systems."

The then Defence Minister, Arun Jaitley, made it official on August 5, 2014, in response to a Rajya Sabha question: "HAL, which has been developing the IJT to replace the Kiran aircraft,

has not so far been able to resolve critical wing and airframe design and development issues related to stall and spin. On account of the inordinate delay in the IJT project, the IAF initiated the process for extending the technical life of the Kiran aircraft. The IAF has also initiated action to look for alternative options for the IJT."

According to a report in the *New Indian Express* on October 10, 2013, "Engineers and designers at HAL's Aircraft Research & Design Centre have the daunting task of identifying and correcting the inherent asymmetry of the aircraft. HAL hopes to get the initial operational clearance for the IJT by the end of December 2013, though insiders said the deadline might get pushed to next year." The HAL had hired BAE Systems to act as consultants to evaluate the stall and spin tests of the aircraft. Unconfirmed information of October 2014 is that the tests have been successful and all issues in this regard have been resolved. If this is so, there is still some hope of the aircraft flying with the IAF by 2016.

### Alternative Options for the IAF

Apart from the accidents and asymmetry issues, there is also the issue of increasing weight from the initial design estimates. While it is acceptable for the weight to increase from the initial approximations, here is a case of "obesity"! It is rather difficult to reduce weight when the aircraft has completed a major share of the flight-testing and is heading towards certification. One can only hope that along with the asymmetry corrections, the foreign design experts that the HAL hired, have also been able to resolve the problems of increased weight, failing which, the IAF would have to accept an underpowered aircraft for its training purposes.

The HAL hopes to get the initial operational clearance in 2015. While the IAF has been patiently waiting for the aircraft, gaps are developing in its training programme. The HAL has to live up to its commitment of delivering the 12 limited series production aircraft to the IAF and later the balance 73 of the series production. The time frame for delivery of the IJT however remains uncertain.

In the meanwhile, the IAF has reportedly published a non-binding global request for information (RFI) regarding the IJT. The delivery of the HJT-36 is nowhere confirmed, hence, in the interim, the present trainer, HJT-16, planned to be phased out of service in 2016, has been given a fresh lease of life to 2018, albeit with maintenance support problems. The induction of a limited number of new trainer aircraft from abroad has been done earlier too, when in 1974, 50 Iskra jet trainers were purchased to plug training gaps due to the delayed induction of the HJT-16!

Training is an important phase in a pilot's life. The basic and advanced training in the IAF has been taken care of with the induction of the Pilatus PC-7 and the Hawk respectively. Hopefully, the Raksha Mantri would appreciate the predicament of the IAF and fast-track the procurement of an IJT from abroad as an interim solution. One also hopes that the Sitara does not go the LCA way and is indefinitely delayed. Any further delay, for reasons whatsoever, would give acceptance to the old nursery rhyme, "Twinkle, twinkle, little star. / How I wonder what you are"! ■

# LUH – Will It Ever Fly?



The decision of the MoD to scrap the tender for 197 helicopters has given a chance to the private industry in India to enter the defence market in a big way

HAL's  
Light Utility Helicopter

By Air Marshal Dhiraj Kukreja (Retd)

**THE INDIAN ARMED FORCES** have the need for light utility helicopters (LUH) for a variety of tasks. The Indian Air Force (IAF) initially acquired the French Alouette helicopters in the 1960s, which were later upgraded and manufactured under licence by the Hindustan Aeronautics Limited (HAL) and renamed as Chetak. This multi-purpose, versatile machine has been in service for long. Simple in design and highly manoeuvrable, it is best suited to fly over sea, desert, in the high mountains and in tropical conditions. Several variants of this platform have been manufactured, namely Cheetah – a light skeletal version, Chetan and Cheetal primarily for the Army Aviation Corps (AAC). Although the manufacture/overhaul/upgrade of the helicopters is continuing, a need was felt for their replacement with modern helicopters, these having lived their life and fast approaching obsolescence.

## Replacement for the Obsolescent Fleet

The Army HQ has been raising the issue of replacing obsolete machines since 2003, when it wrote a letter to the then Raksha Mantri highlighting obsolescence-related issues dogging the fleet such as component failures, low reliability, accidents and structural failures. Soon after a tender for 197 LUH was floated. On receipt of bids, technical and flight evaluation of

the helicopters in the race for the contract were carried out in 2005-06 in which Airbus Helicopters, AS550 C3 Fennec and Bell Helicopter's B-407 participated. Russia's Kamov Ka-226T was eliminated in the technical evaluation as its engines were then not certified. In the first round, while Airbus emerged as the winner at the end of 2007, on the day of signing the contract with Eurocopter (now Airbus Helicopters), the tender for 197 AS550 C3 Fennec was cancelled following allegations of wrongdoing in the selection process.

A fresh tender for the LUH was floated in 2008. This time, of the total 197 helicopters tendered for, 64 were for the IAF and the rest were for the Army. The Airbus Fennec, which had already been selected in 2007, underwent fresh field trials in 2010 along with the Kamov. Both companies promised the moon for manufacture, assembly and maintenance, but did not impress the Ministry of Defence (MoD), as once again, charges of corruption surfaced, which made the Defence Minister A.K. Antony view the entire proceedings with suspicion. The second tender too was held in abeyance due to investigations into the process of evaluation once again for misdemeanour.

With defence as one of the priority areas for the current government, the \$1.5-billion deal for fresh acquisition of the LUH was expected to be put on fast track, as the Services had pro-

jected the urgency for their procurement. However, following a probe by the Central Bureau of Investigation (CBI) into allegations of corruption, came the decision by the Defence Acquisition Council (DAC), headed by the then Raksha Mantri of the new government, Arun Jaitley, on August 29, 2014, of cancellation of the entire order for 197 LUH. The dithering by the MoD has not gone down well by the manufacturers, especially Airbus Helicopters twice selected for the contract.

The implications of this cancellation, it is hoped, are known to the decision makers, for the results are certainly ominous and have created serious difficulties for the Indian armed forces. There seems to be no alternative except that the LUH will now be manufactured in India. The Services will now have to stretch the life of the already obsolescent fleet of helicopters held on their inventory and with HAL overloaded with orders and never ever meeting deadlines, it is going to be an extremely difficult task.

While this decision and the subsequent statements of indignant manufacture are in conformity with the Prime Minister's new thrust of 'Make in India', the depressing record of the Indian defence and aerospace industry does not inspire confidence. The government has opened doors to the Indian aerospace industry in the private sector. However, the response so far has not been encouraging. Whosoever ventures into this contract will have a windfall and can look forward to build at least 400 helicopters initially to meet the demands of the three Services, but without any dilution in the quality standards and stretching of timelines. Development of a new LUH in terms of design, manufacture and delivery has set the programme back at least by five years. In the interim, the armed forces have no option but to continue to fly the antiquated machines that are afflicted with eroding capability and increasing maintenance difficulties.

Interestingly, some newspapers and journals have carried news that the Cheetah/Chetak helicopters are now death traps and 'flying coffins' – an infamous sobriquet once reserved for the now obsolescent MiG-21. A group of wives of Army officers, whose husbands fly these helicopters, want the phasing out of the archaic machines that have reportedly been involved in 191 crashes over the past two decades and have petitioned the current Defence Minister and even the Prime Minister. On February 2, 2015, there are reports of a crash of a Cheetah in Dimapur with the Corps Commander on board luckily with no fatalities. The latest accident has reinforced the desperate situation that the Services are facing.

### Effort at Indigenisation

Owing to delays in the finalisation of contract for the 197 helicopters, in February 2013, the Army and the IAF placed orders on HAL for 20 Cheetal helicopters and associated equipment worth \$70 million. These machines will be updated version of the HAL-manufactured Cheetal helicopter (Cheetah with and upgraded engine), delivery schedule extends to 2017 and includes training of both air and technical crew.

The LUH project is now placed in the 'Buy and Make (Indian)' category of the Defence Procurement Procedure (DPP), permitting Indian manufacturers to make helicopters with foreign vendors under joint ventures. HAL has also been working on a three-tonne class light helicopter, but is nowhere near success. The project for 187 helicopters, in addition to the

import of the 197 earlier planned, was sanctioned in February 2009 and HAL had undertaken to make them "within 60 months"! As per latest reports, while the design-freeze stage has been reached, the first flight planned for 2013 has been delayed.

The decision of the MoD to scrap the tender for 197 helicopters has given a chance to the private industry in India to enter the defence market in a big way. Not only can it manufacture the LUH to meet the requirements of the Indian armed forces, it can go in for exports as well. The DPP 2013 (paragraphs 71-73) offers five avenues. One, 'Buy Global', wherein it is an outright purchase from a foreign vendor; that door has been closed. The second option of 'Buy and Make' is also ruled out as under this option the request for proposal (RFP) goes out to foreign vendors for an outright purchase of a certain quantity of the equipment, followed by manufacture of the remaining quantity in India by a production agency nominated by the MoD. The 'Make' procedure is the third choice, which gives pre-eminence to Indian companies, but it is meant for indigenous research, design and development of the prototype of 'high technology complex systems'. Such projects entail a long gestation period. Of the remaining two alternatives, 'Buy (Indian)' is also eliminated as it is meant for an entire purchase from an Indian company, with a rider that the equipment must have at least 30 per cent indigenous content. There is no Indian company which makes what the armed forces need. The last option, 'Buy and Make (Indian)', is therefore the only alternative available to the armed forces and the industry. Under this option, Indian companies receive the RFP, who can then form a joint venture with a foreign manufacturer to produce the equipment/weapon system/platform as per the specifications laid down by the user service and approved by the MoD.

### Uncertainties Ahead

With the cancellation of the current RFP and the selection of LUH and a vendor, a fresh RFP would now have to be issued. The question arises – to whom? The arrow points towards HAL, as the most favoured defence public sector undertaking since there are no entities in the private sector that yet have the capability, individually or in collaboration with a foreign company, though there are some beginnings. As per reports, one such facility is operational, near Hyderabad, for the production of the AugustaWestland AW119Ke, the advanced version of the Koala helicopter. Would the MoD like to venture into a 'single-vendor' situation?

The LUH programme of HAL, as and when it really takes off, is expected to manufacture around 440 helicopters for all the three Services. With the present government committed to include private players in the defence-manufacturing sector, it is likely that HAL will have to participate with private players and maybe foreign manufacturers too. It is, however, difficult to visualise as to when the project would be realised. Until then, the Indian armed forces would have to continue to display their best professionalism in flying and maintaining the outdated helicopters.

It is no small wonder why this motley group that fly the obsolete helicopters in the armed forces is referred to as "Those Magnificent Men in their Flying Machines"! ■

# Sky is the Limit

There are airlines floundering and there are airlines doing fairly well. There are airlines shutting down and there are airlines starting operations. It is a mixed bag.



IndiGo airlines'  
Airbus A320

By R. Chandrakanth

## THE INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

has projected that globally airlines would post a collective net profit in 2014 of some \$19.9 billion (up from the \$18 billion projected in June) and is expected to touch \$25 billion in 2015. IATA said lower oil prices and stronger worldwide GDP growth are the main drivers behind the improved profitability.

This is indeed good news. And the consumer who is the king will benefit from such activity. It is estimated that after adjusting for inflation, average return airfares (excluding taxes and surcharges) are expected to fall by some 5.1 per cent on 2014 levels and cargo rates are expected to fall by 5.8 per cent, which is welcome by passengers and the trade. However, in India it is a different story that air fares are coming down. Airlines here are dropping fares as a means of survival. At the time of writing, SpiceJet, which is going through financial turbulence, has offered all-in-one fares of ₹599 to

different destinations and the website crashed due to heavy traffic movement.

Is this going to be the story of India's civil aviation? Yes and no. There are airlines floundering and there are airlines doing fairly well. There are airlines shutting down and there are airlines starting operations. It is a mixed bag.

## IndiGo Shows the Way

The good news is that IndiGo has been doing well in terms of performance. Its revenues and its aircraft orders are growing. Recently, the low-cost airline created a record of sorts again by placing order for 250 Airbus aircraft. While IndiGo has been having a good run, one time leader Jet Airways is awaiting finalisation of its deal with Etihad Airways to revive its sagging fortunes. And positive movements are the start of two new airlines (AirAsia India and Vistara, both having equity from the

## QUICK FACTS

- Indian carriers handled over 140 million passengers (102.70 million domestic and 37.40 million international) between April-December 2014 (source AAI).
- Passenger growth – 11 per cent change from 2013.
- Indian carriers expected to post losses of \$1.3-1.4 billion in 2014-15, according to CAPA.
- Air India joins Star Alliance, opening more international destinations.
- IndiGo orders 250 Airbus aircraft.
- AirAsia India and Vistara, new airlines in 2014.
- Regional airline Air Costa announces pan-India operations.
- Government to develop 50 new low-cost airports.

Tata group), joining the five scheduled operators. State-run Air India is being restructured and its joining Star Alliance is likely to help the airline connect to more international destinations.

### Air Cargo Needs Boost

In India, there is only one dedicated air freighter – Blue Dart Aviation, while the other airline operators have been using belly capacity as part of its cargo business. Air India recently shut down its cargo unit, in its restructuring moves. Recently, the government approved six airlines. One of them is Delhi-based MSD Aviation Pvt Ltd which intends to launch a cargo carrier. MSD Aviation is India's first of its kind company to lease flight crew internationally, majorly ab initio First Officers. The company is currently in the process of receiving its certification from the Directorate General of Civil Aviation (DGCA). Recently, Vijayawada-based one-year-old regional airline Air Costa has started taking cargo, adding to its revenue stream.

### Second Fastest

IATA has stated that India is the second fastest growing air cargo market after the Middle East and is expected to grow at a compound annual rate of about seven per cent over the next five years. IATA further stated that India would be among the 10 largest international freight markets by 2018 led by the United States supplying over 10 million tonnes and China with more than 5.6 million tonnes. Apart from the US and China, the remaining eight largest international freight markets would be the UAE (5 million tonnes), Germany (4.8 million tonnes), Hong Kong (4.6 million tonnes), Republic of Korea (3.5 million tonnes), Japan (3.5 million tonnes), the United Kingdom (2.8 million tonnes), Chinese Taipei (2.4 million tonnes) and India (2.2 million tonnes). The potential of the Indian air cargo sector is enormous, except that all the stakeholders have to get their act right to realise that.

While Indian air cargo traffic witnessed consistent growth till 2010-11 at over 10 per cent CAGR, decline in economic growth rates have resulted in a drop in traffic for 2011-12 and 2012-13. This is largely due to drop in international cargo volumes that accounts for two-thirds of the total air cargo. In 2012-13, air freight traffic stood at 2.20 million tonnes. In 2013-14, all operational airports taken together had handled two million tonnes of cargo – 1.4 million tonnes international and 0.8 million tonnes domestic – registering a 4 per cent growth over the previous year.

The Twelfth Five Year Plan projections suggest that overall volumes of cargo will grow at 10.6 per cent CAGR to 4.4 million tonnes by 2016-17. As the economy revives, air cargo volumes are expected to grow with industry estimates putting the growth at 8 to 10 times.

### Airports

There is growing realisation among the decision makers that aviation infrastructure has to be developed and the first point is airports. The Airports Authority of India (AAI) maintains 125 airports comprising of 21 international airports (3 civil enclaves and 3 joint venture), 78 domestic airports, seven customs airports (four civil enclaves) and 19 other civil enclaves. In addition, AAI



A320 of Vistara

also provides Air Navigation Services (ANS) at all civil airports in the country. Indian airports are poised to handle 217 million domestic and 76 million international passengers by 2020.

Recently, AAI identified 29 airports for marketing globally and these airports are Amritsar, Chandigarh, Jaipur, Lucknow, Leh, Srinagar, Varanasi, Bhubaneswar, Gaya, Kolkata, Port Blair, Ranchi, Raipur, Guwahati, Ahmedabad, Aurangabad, Bhopal, Indore, Goa, Pune, Surat, Chennai, Coimbatore, Calicut, Madurai, Mangalore, Trivandrum, Trichy and Visakhapatnam.

The Government of India is focusing and pushing for development of airport infrastructure in Tier-III cities. The Minister of State for Civil Aviation, G.M. Siddeshwara, has stated that the government has so far identified 50 locations with potential for small airports in various states, namely: Kadapa, Tirupati, Vijayawada (Andhra Pradesh); Along, Daparizo, Pasighat, Tezu (Arunachal Pradesh); Jorhat, Rupsi, Silchar (Assam); Gaya, Raxaul (Bihar);



Embraer E170  
of Air Costa

## AVIATION PRIORITIES

**Infrastructure development:** Airports, air traffic management systems, etc, need to be modern and cost-effective.

**Regulatory reforms:** Urgent reforms are required in sync with airline requirements, both commercial and general aviation.

**Aviation Turbine Fuel:** Urgent need to revisit high levels of taxation both by the Central and State Governments on ATF.

**Airport Charges:** Parking and landing charges at Indian airports are said to be the highest in the world, calling for airports to look at non-aeronautical revenues and not aeronautical revenues.

**Low-cost airports:** Urgent need to build low-cost airports as to develop regional and general aviation sectors.

**Regional Connectivity:** Need to connect Tier-II and Tier-III cities as to enhance pan-India air connectivity which in turn is going to be an economic enabler.

**Air cargo incentives:** Urgent need to develop air cargo hubs, cold storage facilities and improved handling of air cargo with rationalisation of taxation.

**Development of MRO sector:** Incentivise MRO sector as to have aircraft go through maintenance and repair within the country, thus saving outgo of foreign exchange.

**Training:** With aircraft acquisitions on the rise, demand for personnel at all levels is going to go up, requiring continuous and updated training facilities.

**International Operations:** Allow domestic airlines to operate on international routes, relaxing the 5/20 rule (five years and 20 aircraft).

**Duty on import of aircraft:** Rationalisation of tax structure essential to make imports easier and also help the sector become viable business models. ■

Bilaspur, Raigarh (Chhattisgarh); Daman, Diu (Daman & Diu); Bhawanagar, Jamnagar, Kandla, Keshod (Gujarat); Hisar, Karnal (Haryana); Kishtwar (J&K); Deoghar, Jamshedpur (Jharkhand); Belgaum, Hubli (Karnataka); Gwalior, Jabalpur, Rewa (Madhya Pradesh); Akola, Amravati, Jalgaon, Kolhapur, Solapur (Maharashtra); Jharsuguda (Odisha); Ludhiana (Punjab); Bikaner, Kishanganj, Kota (Rajasthan); Thanjavore (Tamil Nadu); Warangal (Telangana); and Agra, Allahabad, Bareilly, Faizabad, Kanpur, Meerut, Moradabad and Saharanpur (Uttar Pradesh).

### General Aviation

The domestic general aviation market is on the threshold of catapulting itself into the global arena. It is expected to grow at 10 per cent per annum to cross \$4.5 billion by FY'17. It is estimated that around 120 business jets, 150 small aircraft and 180 helicopters will be added by FY 2017, according to global consultancy firm PricewaterhouseCoopers.

In 2012, the country became the second-largest business jet market in the Asia-Pacific region, after China's 220, with a fleet of 165 (up from 26 in 2005). Despite this, the report notes that the domestic general aviation market is small and underdeveloped compared to its global peers, with a meagre 15 per cent of the total aircraft movement. Compared to the US, which has the largest number of general aviation planes at around 2,55,000 operating from across 5,110 airports, India has only around 150 active airports and around 700 such planes. Over \$40 billion investment is expected to be made in the general aviation during the Twelfth Five Year Plan.

There is enormous promise but it is for the stakeholders to get the jigsaw puzzle right. As IATA has stated that the Asia-Pacific region is going to be a driver of the aviation sector. Tyler concludes "it is no understatement to say that air connectivity underpins modern economies. Aviation and aviation-enabled tourism accounts for over 24 million jobs and over \$500 billion in economic activity across the Asia-Pacific region. And that contribution has tremendous potential to grow." ■

# Indispensable

# Reference

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