Day 2

Sunday, February 17, 2008

SP's Show News

defexpo 08 INDIA
A LAND & NAVAL SYSTEMS EXHIBITION

AN SP GUIDE PUBLICATION

PUBLISHERS OF SP'S MILITARY YEARBOOK, SP'S AVIATION, SP'S LAND FORCES & SP'S NAVAL FORCES

DEFENCE MINISTER INAUGURATES DEFEXPO '08

by Sanjay Kumar

Bright beams of sunlight reflected on rows of dignitaries and delegates at Delhi's Pragati Maidan on Saturday as Defence Minister A.K. Antony inaugurated Defexpo '08. Fifth in the series, the biennial defence exhibition of land and naval forces is jointly organised by India's Ministry of Defence and the CII. Over 475 exhibitors from more than 30 countries are participating at Defexpo this year with 48 official overseas delegations scheduled to attend 16 seminars.

In his inaugural speech, Antony highlighted the growing synergy and cooperation between the government, the public sector and the private sector in the fields of defence products' manufacturing, R&D and the growing trend of sharing technology and alliances in defence production. "A lot of small, medium and large companies from the Indian private sector are now entering into defence production and manufacturing and many of these are tying up with foreign firms for technology and product collaboration. As a result of these alliances and forging of new relationships between Indian companies and foreign firms in the defence sector, many Indian players have evolved from being sub-system suppliers to becoming system integrators," the minister said, speaking highly of the growing capabilities of many Indian companies.

Taking cognisance of the evolving needs and requirements of the defence industry in India, its growing levels of maturity and competence, the minister pointed to the fresh amendments and changes carried out in India's defence procurement and offset policies in recent years. "These policies are constantly under review with the aim to make them more transparent and user-friendly." The Defence Minister was accompanied by the Minister of State for Defence Production, Rao Inderjeet Singh, Secretary of Defence Vijay Singh, Secretary Defence Production Pradeep Kumar and Chairman CII, National Committee on Defence, Atul Kirloskar.

Delivering the vote of thanks, Kirloskar said: "Today, there's an open environment between the public and the private sector, which is conducive to the growth and evolution of R&D." •

"QUOTE"

Defexpo offers a single-window platform for bringing together diverse players in the defence sector to showcase products and technology, to build partnerships and collaboration, to boost exports and promote the reach and growth of R&D besides helping to forge closer interaction among the scientific community and other stakeholders.

—A.K. ANTONY, INDIAN DEFENCE MINISTER

LOCKHEED MARTIN RAISES A TOAST

"Lockheed Martin wants to offer world class technology to the Indian Navy."

—J. Daniel Howard,
Senior Adviser, S.E. Asia & Pacific, Lockheed Martin
Maritime Systems & Sensors

Story on page 2

by the way...

On February 18, the Royal Air Force Cricket Team from the UK, currently touring India, will play a T20 match against members of the Cricket Nursery run by the Department of Sports and District Administration, Faridabad. To be held at Faridabad's Nahar Singh Cricket Stadium, the match heralds the launch of the Indo-British Cricket Foundation.

SP's ShowNews

MANAGING EDITOR AND PUBLISHER
Jayant Baranwal

ASSISTANT EDITOR
Arundhati Das

SENIOR SPECIAL CORRESPONDENT
Sanjay Kumar

SENIOR SUB EDITOR
Priya Tyagi

SUB EDITOR
Bipasha Roy

CONTRIBUTORS
Lt General (Retd) Naresh Chand
Lt General (Retd) V.K. Kapoor
Lt General (Retd) R.S. Nagra
Maj General (Retd) Mrinal Suman
Brigadier (Retd) R. Bhosle
Admiral (Retd) Arun Prakash
Rear Admiral (Retd) S.K. Ramsey
Air Marshal (Retd) V.K. Bhatia
Air Marshal (Retd) B.K. Pandey
Air Marshal (Retd) P.K. Mehra

PHOTOGRAPHER
Sharad Saxena & Ratan Sonal

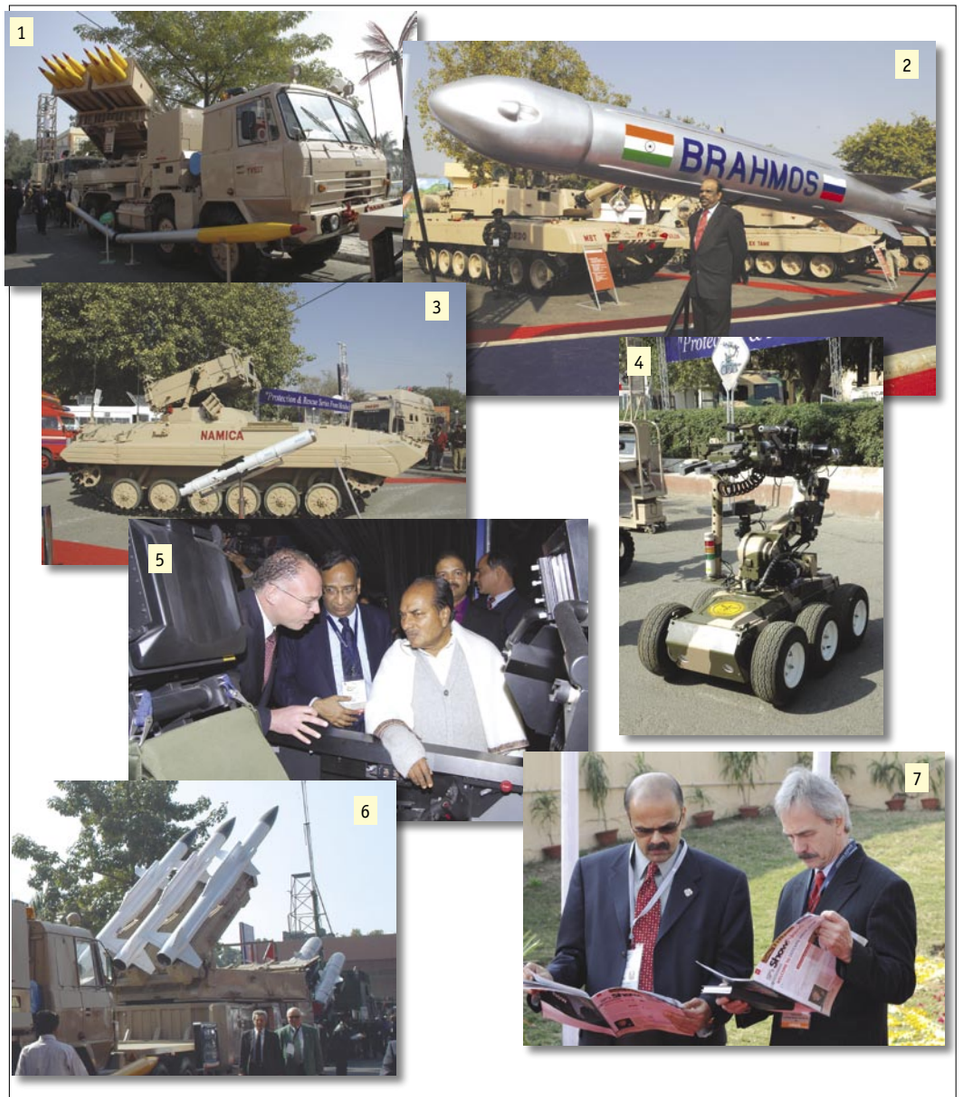
CHAIRMAN & MANAGING DIRECTOR
Jayant Baranwal

DESIGN
Ravijot Singh
Pradeep Kumar

Printed in India by Rave India

SP GUIDE PUBLICATIONS

VIGNETTES FROM DAY ONE



▲ 1. Pinaka MLRS
2. BrahMos
3. NAG Missile System
4. ROBOT on display
5. Defence Minister at the Boeing pavilion
6. Akash
7. Delegates at the venue browse through the first day's edition of *SP's Show News*

LOCKHEED MARTIN RAISES A TOAST

On the eve of Defexpo 2008, Lockheed Martin held a glittering do to highlight the company's growing operations and business in India. Emphasising on the company's efforts to increase its footprint in India, Ambassador Douglas A. Hartwick said, "Ever since the opening of Lockheed Martin's India office early this year, the company is exploring ways to reach out to the government, the industry and the scientific community in the country." Expressing satisfaction at the successful conclusion of the C-130J deal for the Indian Air Force, Hartwick hoped the deal would serve as the catalyst for future deals. "We bring a long-term commitment to India and would look out for forging partnership with the government and the private and public sectors in India."

by the way...

TATA Advanced Systems and EADS Defence & Security have joined forces for Indian Army's Tactical Communications System. The project, combining international lead systems integration expertise with local domain knowledge, will create one of the most sophisticated and contemporary tactical mobile communications systems in the world.

In the course of his presentation, Hartwick observed that the company was very much in the contention for India's proposed Medium Multi-Role Combat Aircraft (MMRCA) deal. "The F-16 is ideally suited to the requirements of India's defence forces and its configurations would optimally match Indian requirements," the ambassador said. He also spoke of how Lockheed Martin's products, like the Patriot missiles, maritime systems like the P-3C Orion, MS2 radar/warning/combat system and the MH60R surveillance aircraft, would ideally match the needs of the Indian Navy. "We are in discussion with the Indian government with regard to some of these products which could lend an edge to surveillance and submarine warfare capability of the Indian forces," he said. •

Over-the-Hill & Urban Intelligence. *Here and now.*

IAI-MALAT's BIRD EYE-400 Mini UAV & MOSQUITO Micro UAV systems - your most rugged force-multipliers

Backed by over 400,000 operational UAV flight hours, these systems feature:

	BIRD EYE-400 Mini-UAV	MOSQUITO Micro-UAV
Mission Payload	TV/Thermal	Color CCD
Operation Ceiling	1,000 ft	300 ft
Endurance	60 - 90 min	up to 60 min
Operational range	10 km	1.5 km

SEE US AT
DEFEXPO, INDIA '08
Israel Pavilion, Hall 11-A

IAI ISRAEL AEROSPACE INDUSTRIES LTD
Let's Partner for Success

E-mail: info.malat@iai.co.il | **www.malat-iai.com**

Sunday, 17 February 2007	
0700 – 1500 Hrs	Defexpo India 2008 Golf Tournament
1000 – 1800 Hrs	Defexpo India 2008 opened to Business Visitors and Official Delegations
1000 – 1730 Hrs	Press Conferences by Exhibitors at the Press Conference Hall, Pragati Maidan, New Delhi
1930 – 2200 Hrs	Defexpo India 2008 Reception and Dinner hosted by President, Confederation of Indian Industry at Hotel Taj Palace, New Delhi

Monday, 18 February 2007	
1000 – 1800 Hrs	Defexpo India 2008 opened to Business Visitors and Official Delegations
1000 – 1730 Hrs	Press Conferences by Exhibitors at the Press Conference Hall, Pragati Maidan, New Delhi
1000 – 1200 Hrs	Defence Technology Forum 1 - Arms & Ammunition at Ball Room, Phoolwari Restaurant, Pragati Maidan, New Delhi.
1000 – 1200 Hrs	Defence Technology Forum 2 – Sighting Equipment (NVDs) at Alta Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi.
1000 – 1200 Hrs	Defence Technology Forum 3 – Helicopters at Evenza Hall at Phoolwari Restaurant, Pragati Maidan, New Delhi.
1000 – 1200 Hrs	Defence Technology Forum 4 – Wheeled and Track Vehicles at Hall 8, Conference Hall, Pragati Maidan, New Delhi.
1400 – 1600 Hrs	Defence Technology Forum 5 – Military Engineering at Ball Room, Phoolwari Restaurant, Pragati Maidan, New Delhi.

Continued...

1400 – 1600 Hrs	Defence Technology Forum 6 – Artillery Technology at Alta Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi.
1400 – 1600 Hrs	Defence Technology Forum 7 – NBC Protection Equipment / Systems at Evenza Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi
1400 – 1600 Hrs	Defence Technology Forum 8 – Battlefield Management System at Hall 8, Conference Hall, Pragati Maidan, New Delhi.

Tuesday, 19 February 2007	
1000 – 1800 Hrs	Defexpo India 2008 opened to Business Visitors and Official Delegations
1000 – 1730 Hrs	Press Conferences by Exhibitors at the Press Conference Hall, Pragati Maidan, New Delhi
1000 – 1530 Hrs	One to One business meetings, Pragati Maidan, New Delhi
1000 – 1200 Hrs	Defence Technology Forum 9 – Simulators for Military Training at Ball Room, Phoolwari Restaurant, Pragati Maidan, New Delhi.
1000 – 1200 Hrs	Defence Technology Forum 10 – Warship Design and Production at Alta Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi
1000 – 1200 Hrs	Defence Technology Forum 11 – Naval Armaments at Evenza Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi.
1000 – 1200 Hrs	Defence Technology Forum 12 – Defence Communications at Hall 8, Conference Hall, Pragati Maidan, New Delhi.

Continued...

1400 – 1600 Hrs	Defence Technology Forum 13 – Surveillance Systems and UAVs at Ball Room, Phoolwari Restaurant, Pragati Maidan, New Delhi
1400 – 1600 Hrs	Defence Technology Forum 14 – Submarine and Underwater Technologies at Alta Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi
1400 – 1600 Hrs	Defence Technology Forum 15 – Fire Control Systems at Evenza Hall, Phoolwari Restaurant, Pragati Maidan, New Delhi
1400 – 1530 Hrs	Defence Technology Forum 16 – Missile and Missile Launchers at Hall 8, Conference Hall, Pragati Maidan, New Delhi.
1600 – 1730 Hrs	Defexpo Valedictory Session and Prize Distribution Ceremony

Note: The above calendar is tentative. Speakers and Session Chairmen to be invited subject to approval of the Ministry of Defence.

by the way...

Making its debut at the Defexpo defence trade fair this year, the Rheinmetall Group is also all set to establish its Regional Representative Office in India. Gerhard Hoy, former Vice President Marketing for the Air Defence activities of Rheinmetall's Swiss unit Oerlikon Contraves in Asia, has been appointed head of the new regional office.

The Apache Longbow deters aggression like no other helicopter. With its totally integrated command, control and communication systems and unique payload versatility, the Apache delivers superior performance across the entire spectrum of missions — in adverse weather, day or night. It's the most advanced, most effective combat helicopter. A proven force for keeping the peace.

BOEING

CLEAN & OPEN POLICY

Former Indian Navy Chief Admiral Arun Prakash clarified on a variety of current issues

IN'S MARITIME ROLES

The Indian Navy (IN) is above all, an instrument of state policy, and its primary purpose is to safeguard the nation's vital maritime interests. For a very long time, our strategic elite retained the deeply embedded perception that India was a continental power.

The opening up of our economy in the early 1990s, and its consequent globalisation, has changed these archaic mindsets. It is now obvious that India's economic resurgence, based on overseas trade and energy resources, depends heavily on maritime security. India is as dependant on the seas for economic well-being and security as any island nation.

In such a scenario, the IN has a vast range of roles to play in the arena of maritime security, from peacetime deterrence (both conventional and nuclear) to actual war fighting and destruction of all threats to our maritime security. Navies are unique in that their peacetime role is just as important as wartime missions. It is during times of peace that navies, operating on the borderless medium of the high seas, reach out to neighbours, near and distant and create bonds of friendship through deployments/exercises which can prove useful in times of crisis. The role of navies in swiftly rendering humanitarian aid during natural disasters is just one example of such international cooperation.

Challenges & Conundrums

While the new Defence Procurement Procedure (DPP 2006) has streamlined and codified many processes, it is not yet evident whether it has actually served to simplify, abridge or expedite in any way the torturous acquisition methodology followed in India. The opacity, slowness and non-responsive nature of the Indian system are possibly the biggest challenges faced by foreign companies attempting to deal with India.

Foreigners trying to deal with the Indian system under these conditions definitely need local assistance, but the confusion regarding legality of "middlemen" and the difficult process of registering local representatives continues to confuse them. The most serious question mark, challenge and conundrum for a foreign firm, of course, remains that of political corruption, and whether they need to make illegal payments to gain an Indian contract. This can only be resolved by bringing total transparency into the system, including the murky area of collection of election funds by political parties.

However, the government of India needs to convey a clear and unambiguous reassurance to foreign vendors (perhaps at the RFP stage) that the system is completely clean and open, and that they should not get involved with so called "power-brokers" and "manipulators" who claim to exert influence in high places in return for a percentage. In fact, any approach from such parties must be reported by them so that such influence peddlers can be apprehended and dealt with under the law of the land.

Level Playing Field

A genuine change of heart (and policies) on the part of the Department of Defence Production & Supplies is necessary before a level playing field becomes available to the private sector. Once the private sector becomes a player in the defence production sector, this would open up a major opportunity for foreign defence companies to re-align their marketing strategies. •

by Major General Mrinal Suman, AVSM, VSM, PhD

FAQ Part II

The Indian Policy

Is the policy applicable to all defence imports?
No. The policy is applicable only to those purchases where indicative cost is over Rs 300 crore in respect of 'Buy', 'Buy and Make with Transfer of Technology' and ship-building cases. Thus, offset threshold has been fixed at Rs 300 crore.

What is the value of offset demanded by India?
The minimum level fixed by India is 30 per cent. However, higher value may be stipulated for specific cases. For example, India is demanding 50 per cent offsets in the case of 126 fighter aircraft under procurement.

What happens in case of joint ventures?
In the case of joint ventures where Indian firm is bidding, the foreign partner will have to discharge offset obligation. Offsets are not applicable to indigenously developed products offered by Indian companies.

How is offset obligation calculated in respect of products which contain imported components?
For products which contain imported components, only the value addition in India will count towards offset obligations.

Is there any time limit to complete offset obligation?
Offset obligation is to be completed coterminous with the main contract.

How can offset obligation be discharged?
Through any of the following routes:

- Direct purchase of or executing export orders for defence products and services provided by Indian defence industries.
- Foreign Direct Investment (FDI) in Indian defence industries for industrial infrastructure for services, co-development, joint ventures and co-production of defence products.
- FDI in Indian organisations engaged in defence R&D, as certified by Defence Offsets Facilitation Agency.

What is implied by Indian defence industry?
It includes Defence PSUs, the Ordnance Factory Board and any private defence industry manufacturing these products or components under an industrial licence granted for such manufacture.

Which services count towards the fulfillment of offsets?
Services mean maintenance, overhaul, up-gradation, life extension, engineering, design, testing, and defence related software or quality assurance services.

Does India accept transfer of technology against offset obligations?
Not at present.

Which Government agency deals with defence offsets?
A Defence Offset Facilitation Agency (DOFA) has been established as a 'single window' under the Department of Defence Production (MoD) to facilitate implementation of offset policy, vet offset proposals technically, provide advisory clarifications on policy and procedures (in consultation with the Acquisition Wing, where necessary) and assist vendors in interfacing with industry for identifying potential offset products/projects.

What are the contact details of DOFA?
Director (P&C) is the designated officer for interface with the industry and the Acquisition Wing.
Directorate of Planning & Coordination
Ministry of Defence,
Department of Defence Production
Room No. 15, 'H' Block, DHQ PO,
New Delhi 110 011
Tele. No: 011-2301 1420 Fax No: 011-2379 3032
Email: dofa-mod@nic.in

Is offset banking permitted in India?
Offset banking is not allowed in India at present.

Who selects Indian partners for offsets?
A foreign vendor is at full liberty to select Indian partner/partners for fulfilling offset obligation.

Does a vendor benefit by offering offsets higher than prescribed?
No preference/credit is given for extra offsets offered. In other words, type and quantum of offset offer has no bearing on the determination of the successful vendor. All proposals which meet minimum offset requirement are to be treated at par.

What are the documents that a vendor has to submit?
Based on offset provisions mentioned in Request for Proposal (RFP), a vendor is required to give a simple undertaking to fulfill the obligation with his technical officer. Vendor has to accept that failure to meet obligation will disqualify him at any stage from further participation. Technical Offset Offer (TOO) and Commercial Offset Officer (COO) are to be submitted in two separate covers to the Technical Manager by the date specified in RFP, which will not be later than 3 months of submission of the main offers. TOO should contain details of products, services and investment proposals indicating relative percentages and proposed Indian partners. The commercial values of the offset proposals are not to be indicated in TOO. The Technical Manager will constitute a committee to shortlist vendors whose offset offers meet parameters. COO should contain particulars specifying absolute amount of offsets with a break up of details, phasing, Indian partner, etc. These will be opened with main commercial bids by the Commercial Negotiation Committee.

At what stage is the offset contract signed?
Offset contract is signed with the main contract.

Can a vendor delay execution of main contract on the plea of inability of Indian offset partner to execute offset contract?
No. The vendor has to adhere to contracted schedule.

What happens in case fulfillment of offsets gets delayed?
Vendor may request re-phasing with reasons within the currency of the main contract. Director General (Acquisition) in MoD can accord sanction if the reasons are considered justified. Sanction for extension of offset fulfillment period beyond main contract on exceptional grounds can be given by the Defence Procurement Board. Any further extension needs concurrence of the Defence Acquisition Council (under the chairmanship of the Defence Minister).

A penalty equivalent to 5 per cent of unfulfilled portion of the annual offset obligation will be imposed on the defaulter. It could either be recovered from the bank guarantee of the main contract (subject to replenishment) or deducted from the amount payable under the main contract. Additionally, the unfulfilled offset value will be carried forward to the subsequent year. A vendor failing to complete offset obligation during the period of main contract (or during the period extended) will be debarred by the Acquisition Wing for future, after being giving due opportunity to explain.

How is implementation of offsets monitored?
A vendor is required to submit quarterly reports in a given format. DOFA assists the Acquisition Wing in monitoring implementation of the offset contract. Where necessary, an audit by a nominated official or agency may be conducted to confirm the actual status of implementation.

Is the Indian defence offset policy under revision?
The government is open to suggestions. The offset policy will be reviewed in 2008 when revision of Defence Procurement Procedure–2006 is undertaken. •


ONLY YOU KNOW WHERE YOU ARE.
DESIGN AND PRODUCTION OF ELECTRONIC DEFENCE SYSTEMS.
elt
ELETTRONICA
mind is the first defence

by Rear Admiral (Retd) S.K. Ramsay

Shipbuilding Programmes in INDIA

MAZAGON DOCKS LIMITED

Project	Contract Details	Delivery
P-15A Delhi Class	Three ships Order dated: 27 July, 2001	2010 onwards
P-17 Stealth Frigate	Three ships Order dated: February 1998	2009, first ship; 2010, next two ships
P-75 Scorpene Submarine	Six submarines Order dated: 2005	2012, first submarine; one submarine per year, thereafter

GARDEN REACH SHIPBUILDERS AND ENGINEERS

Landing Ship Tank (Large)	Three ships Order dated: 3 December, 2001	December 2006, first ship delivered; Q1 2008, second ship; Q3 2008, third ship
Fast Attack Craft (Water Jet)	10 ships Order dated: 31 March, 2006	Two ships in 2008; four in 2009; four in 2010
P-28 Anti-Submarine Warfare Corvette	Four ships Order dated: 31 March, 2003	March 2010, March 2011, September 2011, September 2012

GOA SHIPYARD LIMITED

Naval Offshore Patrol Vessel	Four Ships Order dated (three ships): 30 March, 2005 Order dated (fourth ship): 15 November, 2007	2010 (March, September and December, respectively); 2011, fourth ship
Advanced Off-shore Patrol Vessel	Two ships Orders dated: March 2004, August 2005	February 2008, first ship; August 2008, second ship
90 m Off-shore Patrol Vessel	Three ships Order dated: April 2006	April 2009, first ship; October 2009, second ship; April 2010, third ship

COCHIN SHIPYARD LIMITED

Indigenous Aircraft Carrier	One ship Order dated: March 2003	2013

CURRENT SHIPBUILDING PROJECTS

Yard	Project	Contract Details	Delivery Status
Alcock & Ashdown Gujarat Ltd	Survey Vessel (Catamaran Hull Form)	Six ships Order dated: 28 December, 2006	December 2008, first ship; 2009, second to fifth; 2010, sixth
Yantar Shipyard	P-1135.6 Talwar Class–follow on	Three ships Order dated: 18 September 2006	April 2011, first ship; October 2012, second; April 2012, third

FUTURE SHIPBUILDING PROJECTS

Yard	Project	Contract Status	Planned Delivery
Fincantieri Italy	Fleet Tanker	Order likely to be placed shortly	Mid-2010
Goa Shipyard Ltd (with collaborator)	Mine Counter Measures Vessels	Procurement of eight ships. Order to be placed.	2011 onwards
Goa Shipyard Ltd	Sail Training Ship	Order likely to be placed shortly	Early-2011

YARD CRAFTS & BARGES

Type	Total No.	Present Status
Bollard Pull Tugs	10T (Four) 25T (One) 50T (Three)	Request for proposals issued. -do- -do-
Fuel Barges	1,000T (Four) 500T (Two plus three) 200T (Three)	Order likely to be placed shortly on Hooghly Docks. Order placed for two on Shalimar Works, Kolkata. Contractual delivery October 2008 and April 2009. Request for proposal being issued for three additional. Request for Proposal being issued.
Water Barges	500T (Five)	Contract concluded on February 2006 with Vipul Shipyard, Surat. Delivery from end-2008 onwards.
Ferry Crafts	250 men (Two) 50 men (Three)	RFP being issued. Order likely to be placed shortly on Shalimar Works, Kolkata.

A total of more than 100 tugs, barges and other harbour utility crafts are being procured in the current five-year plan. These would be built in private sector yards in the country. A few tugs are also being procured through global tender.

For full report, pick up SP's NAVAL FORCES DEFEXPO '08 Special Vol 3, No 1

BEST IN THE BUSINESS

EADS DEFENCE & SECURITY AWARDED RADIO NETWORK CONTRACT

- **First public security TETRA network in India**
- **Final set up will cover an area of 3,600 square kilometres**

EADS Defence & Security has been awarded India first public security TETRA radio network contract by the police of the state of Andhra Pradesh, India. The new network will cover the region of Cyberabad, the high tech hub that surrounds the city Hyderabad whose multilingual culture, both geographically and culturally, is a very strong root for the current India great economic growth.

EADS Secure Networks, an integrated line of business of EADS Defence & Security (DS), has teamed up with its local partner Sanchar Telesystems to provide the Cyberabad police a complete end-to-end GPS based digital communication solution providing best in class voice and data communication applications. This solution will enable security forces to cover and protect the sixth largest metropolitan area of India. This area is a modern hub for IT, information technology enabled services and biotechnology.

It is a real breakthrough for EADS Secure Networks on the Indian market as the country is going through major investment in infrastructure in general to address and compliment its spectacular economic growth. Modernization of its public security forces to secure the modern high-tech growth regions and financial and commercial centers is thus a top priority both at the federal and local levels. "After a complete and demanding selection process, we opted for EADS Secure Networks for our police network because we know that they will deliver and we appreciated their superior performances. Our policemen on the ground needed such an upgrade to the most modern and robust technology to ensure the security of this very densely populated area" said Ray Vinay Ranjann, Director of Communication of the Andhra Pradesh police.

"We are very honored and happy that Andhra Pradesh police has chosen us, after extensive tests and demonstration, to supply, implement and commission this mission critical state-of-the-art digital communication network. It will clearly upgrade the Cyberabad police capabilities and enable better coverage and protection of the area. Besides, our flexible and interoperable system fits perfectly with the local multilingual melting pot." said Jean-Marc Nasr, President of EADS Secure Networks. •

mission ready

Superiority in today's changed battlespace.

Whether it's air combat, transport, or search and rescue, Honeywell has the experience and leadership needed to rule the skies over today and tomorrow's battle-space. Our most recent advancements include the Power and Thermal Management System on the F-35 and the Joint Precision Approach and Landing System (JPALS). We have the experience, innovation and technology to get the job done. Engage technology. Engage Honeywell.

Honeywell

See us at Defexpo and the Singapore Air Show
For more information contact us at 602.365.3099
or visit **www.honeywell.com/missionready**

by Lt General (Retd) Naresh Chand

BANG on target

A missile can be defined as a self-propelled, explosive projectile used as a weapon to destroy a target. Missiles are typically propelled by rockets, but other engines such as ramjet, turbojet and turbofan engines can also be used. The Fieseler Fi 103, better known as V-1, was the first guided missile used in war and the forerunner of today's cruise missile. On June 13, 1944, the first V-1 struck London next to the railway bridge on Grove Road, Mile End, which now carries this plaque. Eight civilians were killed in the blast. The word missile comes from the Latin verb *mittere*, literally meaning "to send". Missiles that have the ability to manoeuvre through the air can be guided and are known as guided missiles. These have three key system components:

- Tracking
- Guidance
- Flight

A tracking system locates the missile's target. This can be either by a missile crew aiming a sight on the target (remotely from the missile) or an automatic tracker. Automatic trackers use radiation emanating from the target or emitted from the launch platform and reflecting back to it from the target. Passive automatic trackers use the target's inherent radiation, usually heat or light. Active automatic trackers rely on the target being illuminated by radiation. A guidance system takes data from the missile's tracking system and flight system and computes a flight path for the missile designed to intercept the target. It produces commands for the flight system. The flight system causes the missile to manoeuvre. There are two main systems: vectored thrust (for missiles that are powered throughout the guidance phase of their flight) and aerodynamic maneuvering (wings, fins, canards, and so on).

Missile Guidance

Missile guidance can be carried out by a variety of methods and its effectiveness (Single Shot Kill Probability) is dependant upon the accuracy of guidance. Guidance systems are divided into different categories according to what type of target they are designed for. The trajectory that a missile takes while attacking a moving target is dependent upon the movement of the target. Also, a moving target can be an immediate threat and needs to be destroyed well in time. The problem is simpler for a static target.

Moving Target

To engage a moving target, a target tracker, a missile tracker and a guidance computer are required. These three subsystems can be distributed between the missile and the launcher in two different ways:

- **Remote Control Guidance:** The guidance computer is on the launcher. The target tracker is also placed on the launching platform.
- **Homing Guidance:** Guidance computers are in the missile and in target tracker.

Remote Control Guidance

These guidance systems usually need the use of radars and a radio or wired link between the control point and the missile. In other words, the trajectory is controlled with the information transmitted via radio or wire. Systems include:

- **Command Guidance:** The missile tracker is on the launching platform. These missiles are totally controlled by the launching platform that sends all control orders to the missile. The two variants are:
  - –Command to Line-Of-Sight
  - –Command Off Line-Of-Sight
- **Line-Of-Sight Beam Riding Guidance:** The missile tracker is onboard the missile. It has some orientation capability, in order to fly inside the beam that the launching platform is using to illuminate the target. It can be manual or automatic.

▲ PATRIOT PAC-3 MISSILE

Homing Guidance

Active Homing: Active homing uses a radar system on the missile to provide a guidance signal. Active radar systems remain in widespread use in anti-shipping missiles, and in "fire-and-forget" air-to-air missile systems such as AMRAAM and R-77.

Semi-Active Homing: Semi-active homing systems combine a radar receiver on the missile with a radar broadcaster located "elsewhere".

Passive Homing: Infrared homing is a passive system in which heat generated by the target is detected and homed on. Also commonly referred to as "heat seeking".

Retransmission Homing: Retransmission homing, also called Track Via Missile (TVM), is a hybrid between command guidance, semi-active radar homing and active radar homing. The missile picks up radiation broadcast by the tracking radar which bounces off the target and relays it to the tracking station, which relays commands back to the missile.

Static Target

For static targets only navigational guidance is required which does not need a target tracker. There are many types of navigational guidance like Inertial Guidance, Preset Guidance, Celestial Guidance, Terrestrial Guidance, Magnetic Guidance, Satellite Navigation and Hyperbolic Navigation. There are various types of missiles like surface-to-air, surface-to-surface, air-to-surface, air-to-air, ship-to-ship, submarine-to-submarine, and so on. Some examples are as follows.

Patriot Missile Air Defence System

Patriot is a long-range, all-altitude, all-weather air defence system to counter tactical ballistic missiles, cruise missiles and advanced aircraft. Patriot (MIM-104) is produced by Raytheon Lockheed Martin Missiles and Fire Control. Apart from US, Patriot is in service in Egypt, Germany, Greece, Israel, Japan, Kuwait, the Netherlands, Saudi Arabia and Taiwan. Patriot missile systems were deployed by US forces during Operation Iraqi Freedom. The Patriot missile is equipped with a Track-Via-Missile guidance system. Midcourse correction commands are transmitted to the guidance system from the mobile engagement control centre. The range of the missile is 70 km and maximum altitude is greater than 24 km. Raytheon has developed the Patriot Guidance Enhanced Missile (GEM-T), an upgrade to the PAC-2 missile. Another improved version is called Patriot Advanced Capability (PAC-3) missile which has increased effectiveness against tactical ballistic and cruise missiles, through the use of advanced hit-to-kill technology. •

COMPANY BRIEFS

Lockheed Martin sale to France

France and the US have signed a Letter of Offer and Acceptance for the sale of Lockheed Martin's precision-strike laser-guided Hellfire II missiles to France. The agreement authorises the sale of multiple warhead variants of the modular Hellfire II, with options, for the French Army's Hélicoptère d'Appui Destruction (HAD) Tiger attack helicopter fleet.

Raytheon to strengthen ties with India

Raytheon Company will have a major presence at Defexpo. As a global technology leader, Raytheon offers a variety of products and services to meet India's military and commercial needs. Raytheon's efforts in India are intended to foster a long-term relationship that highlights the company's commitment to Mission Support, Mission Assurance and Customer Focused Marketing.

Indian Navy developing new gen UAV

The Indian Navy is working on a 'path breaking' project to develop a new generation and longer-endurance Unmanned Aerial Vehicle (UAV) to have deeper penetration in data collection and reconnaissance mechanism. The rotary wing UAV to be built jointly by the navy and HAL is expected to transform naval warfare.

MOWAG PIRANHA For Brazilian Marines

The Brazilian Navy and MOWAG GmbH have signed a contract for a further batch of 5 PIRANHA IIIC 8x8 in amphibious version. The contract is a follow-on order to the seven vehicles ordered in 2006 (six APCs and one Recovery Vehicle).

'Structures already in place for joint intelligence'

General Deepak Kapoor took over as Chief of Army Staff on October 1, 2007

SP's: What are the key issues on which you will focus during your tenure?

COAS: My thrust areas, in essence reflect 'continuity with change', with emphasis on high degree of operational preparedness at all levels, more focused use of our intelligence assets, sustaining the tempo in low intensity conflicts and a greater attention to modernisation. We will continue to work consciously towards integrating force multipliers into our war fighting machinery.

SP's: *Considering that the challenges faced by India are varied, what parameters are being kept in mind while structuring the army? Are any radical changes being contemplated?*

COAS: The present structure of the army is based on 'threat-based capability', but we are now also looking at 'capability-based requirements'. Therefore, a combination of 'threat-cum-capability requirements' approach is being adopted to evolve the future structure of our army.

SP's: Have our offensive capabilities, especially in the mountains, become more potent as a result of new Force Multipliers?

COAS: Force Multipliers (FMs) are being inducted with a view to achieve superiority over the adversary. Our focus has been on achieving battlefield transparency through improved surveillance, night vision and target acquisition. The impact of these capabilities is multiplied through appropriate interface between 'Seeker' and 'Shooter', reducing the reaction time and ensuring precision engagements.

SP's: What is the status of 'jointness' among the three services?

COAS: The three services have made a good start towards achieving jointness in various operational, training and administrative facets. The structures are already in place for joint intelligence, planning and conduct of operations at the highest level. A joint operational command in Andaman and Nicobar and the Strategic Forces command have already been set up. Additionally, joint doctrines have been formulated to enhance synergy in optimization and application of the efforts of the three Services.

SP's: *Is the army's requirement for close and responsive support being carefully considered before the final choice of the 126 new combat aircraft is made?*

COAS: The proposed Medium Multi Role Combat Aircraft (MMRCA) to be acquired by the IAF are multifaceted aircraft with diverse capabilities for both counter air and surface operations, including provisions for close and responsive air support to ground forces during all stages of operations. Considering the employment of this versatile multi-role platform, all facets of its combat operations, including employment in support of ground forces, have been factored in.

SP's: Comment on the role of air power in predominantly land operations.

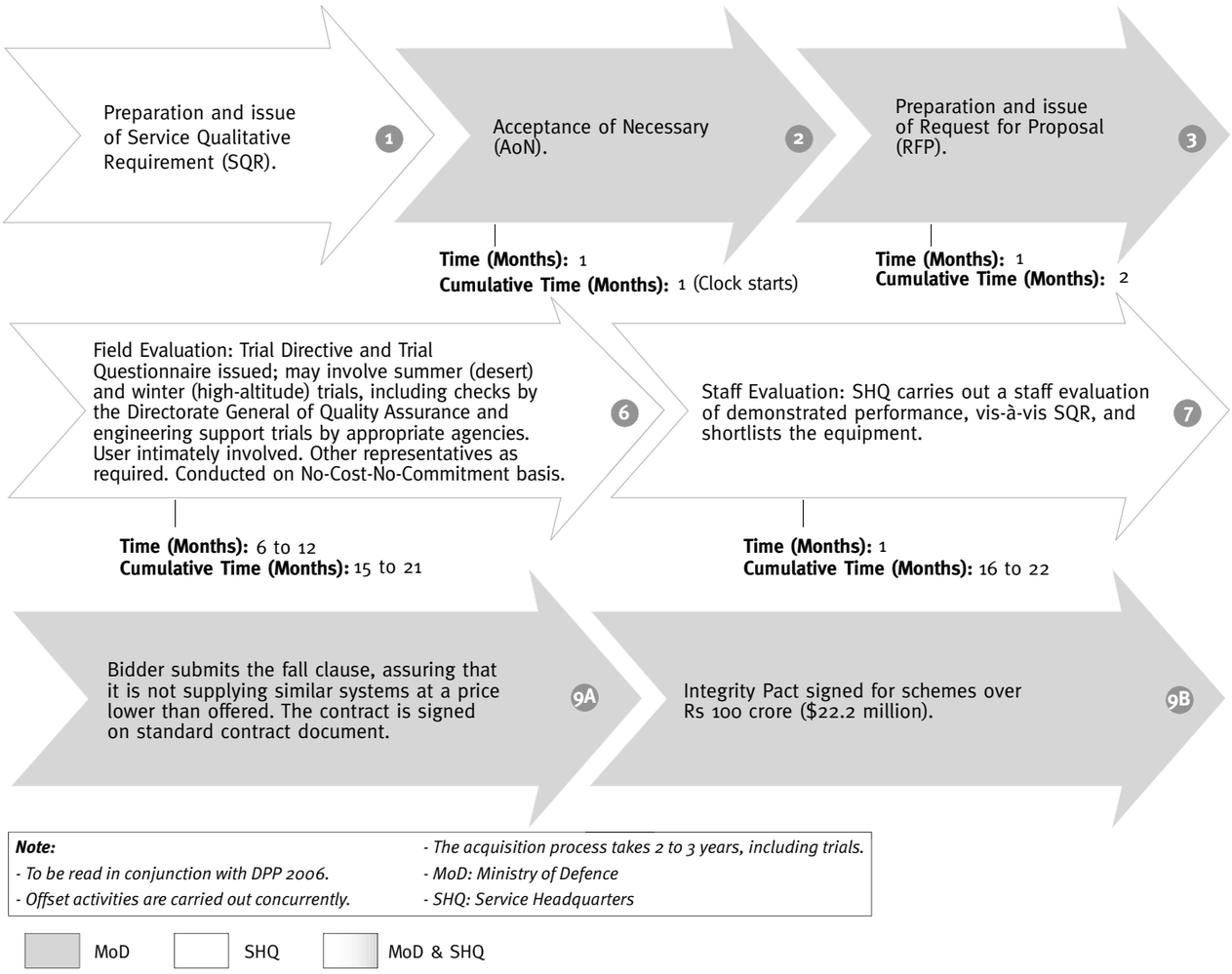
COAS: Air power plays a significant role in shaping the battlefield for conduct of land operations. However, no single service can achieve the stated objectives all by itself. In the prevailing operational environment, total synergy is required between the three services. Air Land Operations Doctrine is being formulated by Headquarters Integrated Defence Staff to optimise the effect of all available resources. We have forwarded our views to incorporate the requirements of land forces for synergised application of the air resources, especially with regard to provision of close air support to the ground forces, on a predominantly land-centric battlefield.

SP's: *Is the Indian Army planning any major increase in the numbers and capabilities of Special Forces?*

COAS: Special Forces are a force multiplier and SF capabilities are factored in our operational scenarios. Based on our operational requirement, the Special Forces are being modernised to include reorganisation, consolidation of existing assets, procurement of state-of-the-art equipment and training. •

***For full interview, read* SP's Military Yearbook 2007-2008**

Flow Chart Depiction of the Acquisition Process



Note:

- *To be read in conjunction with DPP 2006.*
- *Offset activities are carried out concurrently.*
- *The acquisition process takes 2 to 3 years, including trials.*
- *MoD: Ministry of Defence*
- *SHQ: Service Headquarters*

MoD | SHQ | MoD & SHQ

INDUSTRY VIEW

'Raytheon is the leader in torpedo technology'

Upinder Dhinsa, Vice President, Maritime Mission Systems, Raytheon Integrated Defense Systems

SP's: What are the projects being considered by Raytheon and under discussion with officials of the three services and the Indian government?

Dhinsa: In the long run, we hope the Indian government, industry and services will look to Raytheon Integrated Defense Systems as a preferred partner. Fortunately, we have achieved several export approvals for technology and knowledge transfer to India. At the same time, we are listening and learning from the customers here—the coast guard, the navy, the army—to really understand how we can do better, how we can establish partnerships, how we can work with local companies and actually collaborate with them.

SP's: In India, what is the scope or potential in Integrated Defence Systems (IDS)?

Dhinsa: There is massive scope in India for IDS, including in the Navy, the Army, the Air Force and the Coast Guard, domain and situational awareness and asset protection. It can even include some of our applications in the medical field as well as some of the applications that may ultimately go into agriculture.

SP's: What is Raytheon's experience in air space systems?

Dhinsa: IDS would be heavily involved in air defence, as also missile defence. But for electronic warfare in air defence, the requisite expertise within Raytheon rests with space and air borne systems. When we talk about air defence, we are also talking about anti-air warfare. We also address protection of any fleet from an air attack. And that's an area in which IDS boasts of excellent capabilities. In maritime, our command and control systems are fitted on all US submarines. Raytheon is also into a partnership with Australia and delivering systems on the Collins class submarine—a very successful programme. We are the sole providers of torpedoes to the US and have delivered over 30,000 torpedoes worldwide to 27-plus countries. Raytheon is the leader in torpedo technology.

SP's: Indian Navy Chief Admiral Sureesh Mehta recently pointed out that normally, the average ageing for a war ship or carrier is 25 years but can be prolonged to 35. INS Viraat is about 40 years and Kitty Hawk even more. But he also emphasised it needs electronics updation at least once in 10 years.

Dhinsa: A very solid partnership between the shipbuilder and the electronics' provider is absolutely essential. And I don't mean electronic products provider, I mean electronics systems integrator like Raytheon. Raytheon's view has been that first the mission should be defined. What is the mission of a particular ship? An aircraft carrier has a different mission than a destroyer or a frigate. Once the mission is defined, it dictates what systems should be selected and the systems in turn dictate what the hull should be like. One of Raytheon's successes has been in the development of open architecture where we do not have to tear apart the entire ship in mid-life and completely overhaul it. We can actually modernise it without having to tear it apart. So if it's a 25-year lifecycle, we can easily extend it with electronics upgrade once every two to three years as needed. That fast.

SP's: Wouldn't increased frequency of accreditation attract more cost factors?

Dhinsa: Actually it would reduce cost over time because of the pace at which electronics is developing. One does not need to upgrade all aspects of it all the time and instead, improve on the unique aspects of key systems like SATCOM, Radars, Quality of Life, Antenna Systems, Voice Over IP and Automation.

SP's: How does Raytheon hope to exploit India's offset policy?

Dhinsa: We plan to transfer advanced systems engineering knowledge base to India.

(For the full interview, pick up* SP's Naval Forces Defexpo 08 Special *Vol 3 No 1)

Solicitation of offer through RFP. Generally consists of the following four parts:
- General requirement of the equipment
- SQR
- Commercial aspects
- Criteria for evaluation and acceptance

Offers follow the single-stage two-bid system. That is, technical and commercial offers are submitted together but in separate envelopes. 4

Time (Months): 3
Cumulative Time (Months) : 5

Evaluation of technical offers by the Technical Evaluation Committee (TEC).
Headed by officers from SHQ with appropriate representatives, it evaluates technical bids vis-à-vis SQRs. 5

Time (Months): 4
Cumulative Time (Months): 9

Oversight by Technical Oversight Committee (TOC) for acquisition above Rs 300 crore ($66.6 million). TOC checks whether trial evaluations, compliance of SQRs and selection of vendors were executed according to procedure. 8

Time (Months): 1
Cumulative Time (Months): 17 to 23

Commercial negotiations by Contract Negotiations Committee (CNC) carried out after acceptance of the staff evaluation and TOC reports. The CNC will carry out all processes, from opening of commercial bids till conclusion of contract. CNC will prepare a comparative statement of tenders (CST) to evaluate the lowest (LI vendor) offers. 9

The CNC submits relevant documents for expenditure clearance and approval by the competent authority. 9C

Time—from 9 to 9C (Months):
3 to 6 for multi-vendor
6 to 11 for single/resultant single vendor
Cumulative Time (Months):
20 to 29
23 to 34

Contract Administration and Post-contract Management. 10

"India & Boeing Make For Win-Win Relations"

Jim Albaugh, President & CEO, Boeing Integrated Defense Systems

SP's: Briefly trace the history of Boeing IDS since its inception as also the company's association with India.

Jim Albaugh (JA): Boeing has had a long and successful collaboration with India that dates back more than six decades. India entered the jet age on the wings of Boeing jetliners which continue to be the mainstay of the country's domestic and intercontinental commercial fleets. Having made considerable progress Boeing IDS currently finds itself in contention to sell 8 P-8I Maritime Patrol/Anti-Submarine Warfare planes to the Indian Navy, and preparing to offer the F/A-18 Super Hornet to the Indian Air Force. This is a new market for Boeing products and services and Boeing wants to be a key player in it. The Indian MRCA is the biggest international competition in which IDS has been involved. India has a rich portfolio of globally competitive technology and engineering services and Boeing has an equally rich portfolio of defence products and services. We believe selecting Boeing as India's preferred partner in defence would be a win-win opportunity for both India and Boeing.

SP's: What is the extent, structure and size of representation of Boeing IDS in India?

JA: Boeing has an office in Delhi led by country President Dr Ian Thomas, along with other business unit leads. Currently, Boeing has 30 employees in India. IDS staff, led by IDS Vice President and country lead Dr Vivek Lall, include business development and supplier management executives.

SP's: Which are the Indian companies with whom Boeing has entered into strategic partnership or is holding dialogues with?

JA: On the IDS side, Boeing signed an MoU in December 2007 with Hindustan Aeronautics Limited (HAL) with the goal of transferring up to $1 billion (Rs 4,000 crore) in aerospace work to HAL over the coming 10 years. At Aero India in February 2007, we entered into an MoU with L&T to jointly explore business opportunities in the India defence market. We will be announcing additional teaming arrangements in the not-too-distant future.

SP's: What is the current situation with regard to the proposal for acquisition of the Chinook heavy lift helicopters for the Indian Armed Forces?

JA: The MoD has expressed interest in the CH-47 Chinook as part of its heavy lift requirement. As of this moment, an RFP has not been issued but we understand one may be released early in 2008.

SP's: Any major arms contract with India involves a 30 to 50 per cent mandatory offset clause. Would Boeing be able to meet this requirement?

JA: While we acknowledge the complexities and challenges of India's offset requirements, Boeing is enthusiastic and is putting the pieces together to meet the requirements. Boeing does not look at offsets as obligations, but as long term opportunities to bring win-win business and mutual industrial benefits. To date, Boeing has successfully met more than $27 billion (Rs 1,07,082 crore) in offsets around the world. We're anxious to bring that same experience and the same results to India.

SP's: Recently, Boeing signed a $1 billion outsourcing contract with HAL to manufacture military hardware. Is this a trial run in anticipation of the MMRCA contract?

JA: There is no such assurance. There are no contingencies or strings attached to this MoU. It would be nice to get credits, but Boeing has struck this deal with HAL because it makes good business sense for us.

SP's: What is the status of the Indian Navy's (IN) plans to acquire maritime surveillance aircraft? What advantages does the P-8I have over the P3C Orion?

JA: Boeing is offering the IN a unique variant of its P-8A anti-submarine, anti-surface warfare aircraft, currently in production for the US Navy. The P-8I combines the world's most advanced anti-submarine and anti-surface warfare technologies with the world's most reliable airframe, to provide India with advanced electronics, speed and time-on-station and the best solution for protecting India's vast peninsular coast line. The P8-I offers India a maritime patrol aircraft that could enhance US and Indian naval cooperation for the next 30-plus years. The MoD is still evaluating the competitive bids and is expected to make a final downselect decision in early 2008.

SP's: How do you assess your chances of bagging the MMRCA deal with the F/A-18?

JA: We're up against some formidable contenders, some of whom have a longer history in India's defence market than we do. That said, I'd say our chances are good, and here are some reasons why. The Super Hornet is the most capable, combat-proven, multi-role fighter in the world today. It is the backbone of the US Navy's force projection and is called upon to carry out many of the Pentagon's most important and demanding combat missions, while continuing to notch important milestones. Boeing has delivered more than 320 Super Hornets to the US Navy, all delivered on or ahead of schedule. On March 6, 2007, Australia declared its intention to buy 24 Super Hornets for the Royal Australian Air Force (RAAF).

The Government of India has acknowledged the importance of Life Cycle Costs, and will factor this key discriminator into its choice for the Indian Air Force's new, multi-role combat aircraft. A very large part of the Super Hornet's appeal to the USN is affordability. In fact, the U.S. Navy and Boeing have worked together to design the Super Hornet to be a fighter that won't see a scheduled visit to a maintenance depot until it has clocked a minimum of 6,000 hours of flying time. Until then, scheduled maintenance often consists of little more than checking the tires, refueling the aircraft, and cleaning the windshield. The alternatives offered by the Super Hornet's competitors often require removing a fighter from service for months at a time for structural refurbishment and other depot-level requirements.

The F/A-18E/F Super Hornets in the fleet today are already equipped with many next-generation technologies and capabilities.

The Super Hornet also boasts an advanced targeting pod, known as the Advanced Tactical Forward Looking Infrared (ATFLIR), for exceptional air-to-ground performance, as well as a Joint Helmet Mounted Cueing System (JHMCS) for enhanced aircrew situational awareness and combat lethality.

SP's: The response to RFP for MMRCA is expected in by March 2008. Is Boeing likely to submit the response in time or are you contemplating filing for extension of deadline?

JA: Boeing anticipates filing its proposal by March 3rd or before.

SP's: Is Boeing IDS participating in India's Space programme in any way and if so to what extent?

JA: Boeing is not currently participating in India's space program.

SP's: The military industrial complex in the USA is in private hands but there is government control over export of defence related equipment. To what extent does this impinge on the commercial objectives of the industry?

JA: The international release of US defence technology is an issue that we face as a US defence contractor, and which our non-US competitors do not. However, note that the relationship between the United States and India has improved markedly in the last three years, and there is a strategic defence alliance developing between the two countries inspiring increasing trust and greater willingness by the US to consider release of some sensitive US defence technology to India. Of course, that decision belongs to the US government alone.

SP's: Could you please throw some light on Collaboration with Northrop Grumman in projects in India current as well those envisaged in the future?

JA: Boeing's collaboration with Northrop Grumman in India is limited to the Hornet Industry Team (HIT) the consortium of US companies (along with GE, Raytheon, Honeywell, GKN, EFW/Elbit, Moog, Smiths, and Goodrich) whose products and technology will be built into the F/A-18 Super Hornet currently offered to India in the MMRCA competition.

SP's: Does the Blended Wing Body have a military application?

JA: The Advanced Systems organization of Boeing Integrated Defence Systems' (IDS) is closely monitoring the research based on the BWB's potential as a flexible, long-range, high-capacity military aircraft.

The Boeing BWB design resembles a flying wing, but differs in that the wing blends smoothly into a wide, flat, tailless fuselage. This fuselage blending helps to get additional lift with less drag compared to a circular fuselage. This translates to reduced fuel use at cruise conditions. And because the engines mount high on the back of the aircraft, there is less noise inside and on the ground when it is in flight.

We believe the BWB concept has the potential to cost effectively fill many roles required by the Air Force, such as tanking, weapons carriage, and command and control. •

Elbit's latest ground, air and electro-optical systems

Elbit Systems' diverse product range out in full force at Defexpo 08

Elbit Systems continues to offer groundbreaking solutions designed to keep land forces fit to fight in new combat scenarios.

AFV Systems

The systems, based on latest generation technologies, are incorporated into AFV solutions that offer coordinated action, greater maneuverability and mobility. Conforming to new doctrine demands for less manpower, higher firepower and excellent sensor to shooter performance, the systems minimize friendly fire casualties and maximize own-force safety.

Tactical Communication System (TCS)

Tadiran communications, a wholly-owned subsidiary of Elbit Systems will present its TCS system, which is successfully deployed in a number of countries. The TCS offers the most advanced, flexible integrated communications systems for dispersed forces to quickly deploy data and voice infrastructure and open communications arteries in the field.

DominatorTM Integrated Infantry Combat System – This system "dominates" the field and empowers infantry units with full situational awareness, networking them into integrated information systems.

Tactical SDR (Software Defined Radio) – The Software Communication Architecture (SCA) compliant system is adaptable for intra- and inter-force communications. Its features include multi-band, multi-mode, waveform portability and high performance networking.

STAR- Smart Tactical Advanced Rocket

STAR is a Laser Guidance Kit installed on 68/70/80 mm rockets to convert them into one meter precision-guided weapons. It can be launched from a variety of platforms, providing high hit probability and very low collateral damage, at affordable costs.

LILY - The LILY family of uncooled thermal weapon sights consists of short, medium & long range guns for submarine and sniper use.

CORAL CR – is a derivative of the CORAL hand-held 3-5 µm thermal imaging camera with the addition of an integral digital compass, GPS receiver and a laser rangefinder. CORAL CR's light weight, ruggedized construction and excellent picture quality are well suited for security and perimeter defense missions.

IVORY- 3-5 µm Thermal Imaging Camera/Sight – IVORY is designed for remote operation applications with dual FOV or continuous optical zoom. The compact, lightweight unit features full remote control capability and options that include x2 telescope and clip-on laser pointer.

Portable Lightweight Designator / Rangefinder – PLDR – a compact, low-cost, very lightweight laser designation system, which can be easily carried and operated by an individual soldier. The PLDR provides platoon level designation capabilities for all types of laser guided munitions for both stationary and moving targets. The PLDR is an excellent solution for standoff designation, FAC missions, low intensity conflicts and urban warfare applications.

CoMPASSTM - Compact Multi-Purpose Advanced Stabilized System - CoMPASSTM is a highly stabilized, multi-sensor, electro-optical payload. CoMPASSTM delivers superb 24/7 intelligence, surveillance, target acquisition and tactical reconnaissance (ISTAR) capabilities, in harsh weather conditions. •

Eurofighter Typhoon: Partner of choice for India

With more than 140 deliveries, the in-service combat aircraft is respected across the world

The international competition for the Medium Multi-Role Combat Aircraft (MMRCA) in India is in full swing and Eurofighter is working very hard to prepare a robust and attractive answer to India's Request for Proposal. Eurofighter is fully committed to offer India not only a modern combat aircraft with impressive operational capabilities but also several political, industrial and technological advantages. All four Eurofighter partners and the four Governments in Germany, United Kingdom, Spain and Italy will provide their strong support to win this important competition. In addition, the partner nations are prepared to intensify their political relations with India and support its economic and industrial development. The four industrial partners with broad experiences in international cooperation will also join their forces in order to develop a close and longlasting partnership between the Indian and European industry. Therefore Eurofighter should become the partner of choice for the Indian Air Force.

With already more than 140 aircraft deliveries, the Eurofighter Typhoon is an in-service combat aircraft which is respected throughout the world. Since the aircraft's entry into service in 2004, its order book has increased to more than 700 aircraft from six nations including Austria and Saudi Arabia as first export customers. Countries such as Greece, Turkey and Switzerland have also shown strong interest. Most impressive key feature of the Eurofighter Typhoon is its multi- and swing-role capability, which provides military commanders with enormous flexibility. This means that the aircraft can fly either air-to-air missions or air-to-ground missions or both missions at the same time. In terms of weapons payload, this means that the aircraft is always capable of carrying six air-to-air missiles plus additional air-to-surface weapons such as Paveway II or GBU-10/-16, or external fuel tanks on seven further hardpoints.

Thanks to these unique air-to-air and air-to-ground capabilities, the Eurofighter Typhoon has proven itself as an awesome operational weapon system which combines advanced technology with world-class performance. Therefore, the Eurofighter Typhoon is outstanding in its agility, capability and flexibility to meet the challenges of fast-changing operational scenarios. •

▲ THANKS TO UNIQUE AIR-TO-AIR AND AIR-TO-GROUND CAPABILITIES, THE EUROFIGHTER TYPHOON HAS PROVEN ITSELF AS AN AWESOME OPERATIONAL WEAPON SYSTEM

by the way...

Pursuing offset contracts for missiles and aircraft sold by foreign vendors to Indian armed forces, Wipro Limited, India's third largest software services company, will build electronic warfare systems, radars and flight simulators locally for US defence contractors, such as Lockheed Martin and Northrop Grumman.

Warship Building In India: Upgrade Programmes

Maintenance of ships and submarines is a highly technical and exacting job. Manuals reveal details of the frequency and tasks to be covered during the planned maintenance cycles, or refit, as it is called in the navy. Refit can be carried out as early as two years depending upon the type of ship and laid out instructions. Upgrade or modernisation of ships is carried out as part of the mid life update (MLU) and is generally confined to weapons and sensors. A ship's life is generally 25 to 30 years, but in Indian conditions it can be stretched to even beyond the life cycle laid down by the manufacturer. Thus, the MLU update can be any time between 12 to 15 years. At present, a comprehensive modernisation package is being taken up on the SSK/EKM Class submarines, SNF and Godavari Class ships to upgrade weapons and sensors fit during the MLUs. While the EKM class modernisation package is being carried out at Russian shipyards, work on the remaining platforms is progressing in India.

Godavari Class: Godavari, Gomti and Ganga, that came into service around 1985-1988, are due for MLU, especially for weapons and sensors. The update is being carried out at Naval Dockyard, Mumbai largely with fitment of indigenously developed sonars, radars and communication systems.

SNF Class Destroyers: This class has five ships—Rajput, Rana, Ranjit, Ranvir and Ranvijay—which came into service in a phased manner from the early 1980s and are at present undergoing MLUs in India. While surface-to-surface supersonic missile BrahMos would boost the fire power considerably, long range surface-to-air missile capability with Multi Function Radar to be jointly developed by Indian and Israeli industry is also being considered for fitting out. The new generation Sonars HUMSA and USHUS, along with indigenously developed communication and combat management system, would also be taken up in phased manner during the MLUs.

Refit can be carried out as early as two years depending upon the type of ship and laid out instructions. Upgrade or modernisation of ships is carried out as part of the mid life update and is generally confined to weapons and sensors.

SSK Submarines: Of German origin, these submarines were introduced in service in the mid-1980s. MLUs being carried out in India essentially includes indigenously developed surveillance devices like sonars, communication systems and electronic support measures, besides replacement of periscope, fire control system and so on. MLU of two submarines has already been carried out successfully.

EKM Submarines: Russia's Type 877 Kilo Class diesel-electric submarines have gained the reputation of being extremely quiet boats and are in service in various countries, including India. India's Type 877EKM Sindhugosh Class submarines are being sent to Russia for modernisation refits since 1997. The package includes torpedo tube-launched missiles, radars, fire control systems, electronic support measures, periscope, sonar and communication systems. The goal is to bring them at parity with the more advanced Type 636 improved Kilo Class variants, INS Sindhushastra and Sindhurakshak. Reportedly, some problems have cropped up relating to the performance of submarine-launched Klub missiles which is being referred back to the contractor for rectification during the refit. •

(For the full story, pick up *SP's Naval Forces Defexpo 08 Special* Vol 3 No 1)

—Rear Admiral (Retd) S.K. Ramsay

LISTINGS

TIMEOUT - OUTSIDE DEFEXPO '08

EATING OUT

FOOD FACILITIES AROUND DEFEXPO

Taj Restaurant, opposite Defence Pavilion
Olive Bar & Kitchen: Ph: 011- 26642552; Mobile: 0-9910488104
Epicurean Hospitality Services Pvt Ltd: Ph: 011-65797789; Mobile: 9871144443,
Subway: Ph: 011- 41757605/ 606; Mobile: 0-9818209152
McDonald's: Ph: 66000666; 66234045/ 46, 9899795805; Mobile: 0-9873402912
Dominos: Ph: 23416880-85; Mobile: 0-9910519522, 0-9818755888

NORTH WEST FRONTIER CUISINE

Bukhara: ITC Hotel The Maurya, Sardar Patel Marg. Ph: 2611-2233

Average meal for two: Rs. 1500-2000

Bukhara has been voted one of the 50 best restaurants in the world. The delectable, melt-in-your-mouth Rann is its speciality.
Choice Dish-Dal Bukhara

Frontier: Hotel Ashok 50 B, Chanakyapuri. Ph: 2611-0101

Open: 7:30-11:30pm
Average meal for two: Rs. 2000

Come here for barbeques and grills from the North Western regions of the subcontinent.
Choice Dish-Pathar Kebab

Paatra: Hotel Vasant Continental, Vasant Vihar. Ph: 2614-8800

Open: 2:30-11:30pm
Average meal for two: Rs. 2000

Paatra specialises in pan-Indian cuisine. It has a separate vegetarian kitchen for those who are particular.
Choice Dish-Prawn Chilly Butter Garlic

BUSINESS

GOLF COURSES

Army Golf Club, Dhaula Kuan; Ph: 2569-1972/3830
Golf Course, Delhi Golf Cub, Dr Zakir Hussain Marg; Ph: 2436-2768
Golf Course Noida, sector-38 Noida; Ph: 95120-2431467, 95120-2431468
Jaypee Greens Golf Club, G Block Surajpur Kasna Road, Greater Noida; Ph: 95120-2326533
Qutub Golf Course, Press Enclave Road, Lado Sarai; Ph: 26965597-9127
Golden Greens Golf & Resorts, Village Sakatpur, Gurgaon; Ph: 95124-2394101-02

PUBS/BARS & LOUNGES

Elevate: L1 Centrestage Mall, Sector 18 Noida; Ph: 95120-4364611

Open: 10 pm onwards
Price Details: On Fridays and Saturdays cover charges are Rs. 1500 per couple. This is an extremely popular and happening club in Noida, half an hour away from New Delhi. You'll find over 14000 square feet of space to party in, all night long. Price per Bottle Rs. 200/-

Ministry of Sound: Vasant Kunj; Ph: 4604-5319

Happy Hours: 10:30 pm onwards (every Thursday)
Price Details: On Fridays and Saturdays cover charges are Rs. 2500/- per couple. This internationally famous club fosters cutting edge music. Come here for a mind blowing musical experience amidst remarkable decor. Price Per Bottle Rs. 210/-

Aura: The Claridges, 12, Aurangzeb Road; Ph: 4133-5133

Open: 4.00pm-1.00am
Aura is the only vodka bar in town serving over 60 varieties of the finest and the rarest vodkas from around the world; Price per Bottle Rs. 175/-

Rolls-Royce Trent bags contracts worth $1.5 bn

MNG Airlines, Turkey's leading cargo operator, has chosen the Trent for two firm and one option A330 Freighters

Rolls-Royce recently announced that four customers in Europe, Asia and the US have selected three variants of the Trent aero engine family to power passenger and freighter aircraft. All the engines will be supported by TotalCare contracts. The potential value of the business is worth more than $1.5 billion at list prices to Rolls-Royce.

This new development brings the total amount of Trent engine and TotalCare business for Airbus and Boeing aircraft announced since the start of 2008 to more than $5.5 billion. Aircraft deliveries are scheduled to begin between 2009 and 2016.

Two of the new orders are for Trent 700s to power A330 Freighter aircraft from MatlinPatterson Global Advisors LLC of the US and Turkey's MNG Airlines, confirming the engine's position as the market leader with 70 per cent of orders. MatlinPatterson, through an affiliate, is acquiring six freighters for leasing to some of its aerospace portfolio companies. With TotalCare, the value of the business is more than $500 million at list prices.

MNG Airlines, Turkey's leading cargo operator, has chosen the Trent for two firm and one option A330 Freighters, with a potential value of $180 million at engine list prices, including a TotalCare contract. This is also the first Trent order from Turkey. Spanish flag carrier Iberia has confirmed Trent 500s to power an additional three firm and three option Airbus A340-600s, which would bring the airline's Rolls-Royce powered A340 fleet to 19 aircraft if all the options are exercised.

The potential value of this additional business at list prices, including TotalCare, is $600 million. Bangkok Airways has placed orders for four firm and two option A350 XWB aircraft powered by the Trent XWB to power up to six A350 XWB aircraft. With TotalCare, the value of the business at list prices is up to $250 million.

NAME OF THE COMPANY	HALL NO.	BOOTH NO.
A.I.A.D	11	11-14 & 16
AARJAY INTERNATIONAL PVT LTD	18 MEZ. FLR	26
AARON TECH-PRO. PRIVATE LIMITED	18 GF	25
ADVENTURES (INDIA) PVT LTD	18 MEZ. FLR	76
AERIAL SERVICES PVT LTD.	18 GF	61-G
AERIAL SERVICES PVT LTD.	18 GF	61-H
AEROVIRONMENT (AV INC), USA	18 MEZ. FLR	34
AGILENT TECHNOLOGIES	18 GF	48-49
AGMATEL GETAC	18 GF	61-B
AGUSTA WESTLAND	11	11-14 & 16
AIRBORNE SYSTEMS, USA	14	14.112
ALCATEL LUCENT	18 GF	17-37
ALCONE EXPORTS	18 GF	E17
ALENIA AERONAUTICA	11	11-14 & 16
ALKAN	12	12.215
ALLEN VANGUARD	10	1&1A
ALPHA DESIGN TECHNOLOGIES	09	1
ALTAIR ENGINEERING INDIA PVT. LTD.	18 GF	23
ALTAIR PUBLIC JOINT STOCK COMPANY "NAVAL RADIO ELECTRONICS SCIENTIFIC RESEARCH INSTITUTE, (PJSC "NRESRI "ALTAIR")	11	10 & 17
AM GENERAL, USA	OUTDOOR 14	14.01-OD-1
AMA SPA	11	11-14 & 16
AMERICAN EMBASSY	14	14.107
AMITEC ELECTRONICS LTD.	18 GF	E26
AMPEX DATA SYSTEMS CORPORATION, USA	18 MEZ. FLR	24
AMPHENOL INTERCONNECT (I) PVT LTD	14	14.11
AMRITLAKSHMI OVERSEAS AGENCIES	18 MEZ. FLR	69
ANALYTICAL GRAPHICS, INC	14	110A
ANDHRA ELECTRONICS LIMITED	18 GF	E 20
ANJANI TECHNOPLAST	OUTDOOR 14	14 OD
ANJANI TECHNOPLAST LTD	09	4
APPLIED ELECTRO MAGNETICS PVT LTD.	18 GF	E4,5,6
ARGON ELECTRONICS LLP	10	1&1A
ARMET ARMORED VEHICLES (INDIA) LTD	14	14.207
ARMET ARMORED VEHICLES LTD, CANADA	14	14.207
ARSENAL 200 JSC CO, BULGARIA	18 MEZ. FLR	89
ARYA COMMUNICATIONS & ELECTRONICS SERVICES PVT. LTD.	18 GF	45
ASB AEROSPATIALS BATTERIES, FRANCE	14	14.2A
ASHOK LEYLAND LTD	11	15-A
ASIAN MILITARY REVIEW, THAILAND	18 MEZ. FLR	75
ASKA EQUIPMENTS LTD.	18	
ASSOCIATION OF THE DEFENCE INDUSTRY OF THE CZECH REPUBLIC	18 MEZ. FLR	39
ASTRA MICROWAVE PRODUCTS LTD	18 MEZ. FLR	7
ASTRA MICROWAVE PRODUCTS LTD	18 MEZ. FLR	17
ATLAS ELEKTRONIK GMBH	12-A	14,15 &25
ATN (AMERICAN TECHNOLOGIES NETWORK, COPRPN), USA	14	14.115
AUDO VISO PVT LTD	14	14.209
AUSTIN ENGINEERING COMPANY LTD	18 MEZ. FLR	21
AVIATION & RADIOELECTRONICS CAPITAL GROUP, POLAND	18 MEZ. FLR	84-85
AVIO	11	11-14 & 16
AVON PROTECTION SYSTEMS	10	1&1A
AVRORA CORPORATION S&P	11	10 & 17
AZIMUTH TECHNOLOGIES LTD	11	1-4 & 6
BAE SYSTEMS	10	1&1A
BARRET FIRE ARMS MANUFACTURING INC, USA	14	14.2
BASANT AEROSPACE PVT LTD	18 MEZ. FLR	30-30A
BELOMA	18 MEZ. FLR	33
BELTECH EXPORT, BELARUS	18 MEZ. FLR	33
BEML LTD.	OUTDOOR 8-11	OD-5&6
BENGAL WATERPROOF LIMITED	18 MEZ. FLR	31
BERGEN ELECTRONICS	18 GF	E27
BERTIN	12	12.214
BETH-EI ZIKHRON YA'AKOV INDUSTRIES LTD	11	1-4 & 6
BHARAT DYNAMICS LIMITED	18 GF	59
BHARAT ELECTRONICS LTD	11	8
BOEING, USA	14	14.114
BONN-HUNGARY KFT.(BONN-HUNGARY LTD.)	18 GF	56
BRUKER DALTONICS LTD	10	1&1A
BUMAR, POLAND	18 MEZ. FLR	35
BUTLER INTERNATIONAL	14	14.12
CADES DIGITECH P LTD	18 MEZ. FLR	19-20
CALZONI	11	11-14 & 16
CAPRO	18 GF	64-A
CARINEX KFT. (CARINEX LTD.)	18 GF	56
CARL ZEISS OPTRONICS	12-A	14,15 & 25
CASCADE MICROTECH, INC.	14	110A
CBS TECHNOLOGIES	18 GF	E14
CCO CREATIVE CONSULTING GMBH, GERMANY	12-A	14,15 &25
CENTRUM ELECTRONICS LTD.	18 GF	71-72
CESKA LETECKA SERVISNI A.S	18 MEZ. FLR	39
CHANAKYA AEROSPACE, DEFENCE & MARITIME REVIEW	18 MEZ. FLR	34-D
CHEMRING GROUP PLC	10	1&1A
CMC LTD	12-A	3
CMT DYNAMICS, UK	18 MEZ. FLR	34-C
CNIM	12	12.214
COBHAM PLC	10	1&1A
COLT DEFENSE, USA	14	14.200
CONCEPT SHAPERS & ELECTRONICS P LTD	12-A	23
CONNEKT ELECTRONICS P LTD	11	7A
CONTROP PRECISION TECHNOLOGIES LTD	11	1-4 & 6
CORAL TELECOM LIMITED	18 GF	42
CRIMSON TRACE CORP, USA	18 MEZ. FLR	2
DASS HITACHI LTD	OUTDOOR 12	OD-2
DATA PATTERNS (INDIA) PRIVATE LIMITED	12-A	21&21A
DCI/DESCO	12	12.203
DCI/NAVFCO	12	12.203
DCNS	12	12.202
DEFENCE EXPORT SERVICE ORGANISATION -UNITED KINGDOM MINISTRY OF DEFENCE	10	1&1A
DEFENCE MANUFACTURERS ASSOCIATION, U.K	10	1&1A
DEFENCE RESEARCH DEVELOPMENT ORGANISATION	OUTDOOR 8-11	OD-4
DEFENSE RESEARCH DEVELOPMENT ORGANISATION	10	2 &2A
DEFENSEWORLD.NET	18 MEZ. FLR	33-B
DESO MEETING ROOM	10	1&1A
DGA/DDI	12	12.215
DIEHL VA SYSTEMS STIFTUNG & CO.KG	12-A	14,15 &25
DIRECTORATE GENERAL RESETTLEMENT	12-A	21-B
DISASTER MANAGEMENT SYSTEMS PVT. LTD.,(A DIVISION OF YOUNG INDIA FILMS)	18 MEZ. FLR	33-A
DISTANT RADIOCOMMUNICATION SCIENTIFIC RESEARCH	11	10 & 17
DOLGOPRUDNY RESEARCH & PRODUCTION ENTERPRISE JSC	11	10 & 17
DOMO LTD / ARKARA ENGG PVT LTD	11	19-C
DSM DYNEEMA, THE NETHERLANDS	18 GF	67-69
DSR KFT. (DSR LTD.)	18 GF	56
DUNMORE CORPORATION	14	110A
DYNALOG INDIA LIMITED	18 GF	3-5
EADS DEUTSCHLAND GMBH, EUROPE	12	3
EADS, EUROPE	OUTDOOR 12	OD-1
ECA	12	12.206
ECIL	18 GF	57
EDICONSULT INTERNATIONAZIONALE, ITALY	11	11-14 & 16
EDS TECHNOLOGIES PVT. LTD.	18 GF	32
EFFTRONICS SYSTEMS PVT. LTD.	18 GF	E10
EICHER ENGINEER SOLUTIONS	18 GF	61-D&E
ELBIT SYSTEMS LTD	11	1-4 & 6
ELECTRONAVALE	12	12.206
ELECTROSOLVE	18 GF	E12
ELEKTRONIK LAB	11	9-A
ELETTRONICA	11	11-14 & 16
ELGI EQUIPMENTS LTD.	18 GF	94
ELKOSTA SECURITY SYSTEMS	18 GF	33A&D
ELSAG DATAMAT	11	11-14 & 16
EMGEPRON, BRAZIL	18 GF	54
ENERTECH GROUP OF COMPANIES	18 GF	6
ETIENNE LACROIX	12	12.214
EURENCO	12	12.204
EUROCOPTER, FRANCE	12	3
EUROFIGHTER GMBH, GERMANY	12	3
EURONAVAL	12	12.215
EUROSATORY	12	12.214
EUROTORP	12	12.211
EVOLUTION,WIRKS PTE LTD, SINGAPORE	14	14.14B
EXPLOSIA A.S	18 MEZ. FLR	39
FEDEGARI AUTOCLAVI	11	11-14 & 16
FINCANTIERI	11	11-14 & 16
FINMECCANICA	11	11-14 & 16
FISCHER CONNECTORS LTD	10	1&1A
FLIR GOVERNMENT SYSTEMS, USA	14	14.101
FLÜ (DEVELOPMENT AND LOGISTICS AGENCY)	18 GF	56
FORCE	14	14.3
FTE CENZIN CO. LTD.	18 MEZ. FLR	84-85
FUTURA AUTOMATION PVT LTD	11	18
GALILEO AVIONICA	11	11-14 & 16
GAMMA ZRT. (GAMMA EXCLUSIVE GROUP)	18 GF	56
GARDEN REACH SHIPBUILDERS & ENGINEERS LTD	14	14.16
GE AVIATION (GENERAL ELECTRIC), USA	14	14.304
GE SECURITY	14	14.6
GENERAL DYNAMICS, USA	14	14.302
GENESIS EW LTD	11	1-4 & 6
GICAN	12	12.215
GICAT	12	12.214
GOENKA ENGG & INDUSTRIAL PVT LTD.	18 GF	E8
GOODRICH	12	12.208
GRANIT-ELECTRON CONCERN JOINT STOCK COMPANY	11	10 & 17
GRINTEK EWATION, SOUTH AFRICA	18 GF	8
GRINTEX INDIA LIMITED	18 GF	22
GROZ ENGINEERING TOOLS (P) LTD	18 MEZ. FLR	34-E
HALL 14 OUT DOOR		
HAMMER LASER INSTRUMENTS INDIA PVT LTD	14	14.201
HECKLER & KOCH GMBH	12-A	14,15 &25
HIAB, UK	18 MEZ. FLR	8-10
HINDUSTAN AERONAUTICS LIMITED	18 GF	58
HM ARZENÁL ZRT. (MOD ARZELNÁL EXCLUSIVE GROUP)	18 GF	56
HONEYWELL, USA	14	14.103
HR SMITH GROUP OF COMPANIES,(TECHMECH) UK	18 GF	60-A
HYPERTAC (DVN OF JOHN CRANE SEALINGS INDIA SYSTEMS)	18 MEZ. FLR	88
HYPRECISION HYDRAULIK	18 GF	E11
IAI ISRAEL AEROSPACE INDUSTRIES LTD	11	1-4 & 6
ICE- ISTITUTO PER IL COMMERCIO ESTERO	11	11-14 & 16
ICOMM TELE LTD.	18 GF	50
ICX TECH, USA	14	14.104
IMI ISREAL MILITARY INDUSTRIES LTD	11	1-4 & 6
INDIA STRATEGIC	14	14.203
INDIAN ARMOUR	18 GF	E23&24
INDIAN DEFENCE REVIEW	18 GF	61-1
INDIAN REGISTER OF SHIPPING	18 MEZ. FLR	11
INDRA, SPAIN	18 MEZ. FLR	4-5
INPP	12	12.207
INTEGRATED DIGITAL SYSTEMS	18 GF	E34
INTEL DESIGN SYSTEMS (INDIA) PVT. LTD.	18 GF	E-3
IROBOT INDIA PVT LTD	18 MEZ. FLR	33-D
ISREAL WEAPON INDUSTRIES (IWI) LTD	11	1-4 & 6
IT GLOBAL INC.	14	110A
ITI LIMITED	18 GF	31
ITL OPTRONICS LTD	11	1-4 & 6
ITT CORPORATION, USA	14	14.210'
IZHMASH CONCERN JSC	11	10 & 17
J.P. SAUER & SOHN GMBH, GERMANY	18 MEZ. FLR	2
JANES INFORMATION GROUP, SINGAPORE	18 MEZ. FLR	33-C
JCB INDIA LTD	14	14.9
JOHNSON CONTROLS (INDIA) PVT LTD	18 MEZ. FLR	43
JOHNSON MACHINERIES LTD	12-A	2
JOSEPH LESLIE DRAGER MANUFACTURING PVT LTD	18 MEZ. FLR	86-87
JUPITER STRATEGIC TECHNOLOGIES PVT LTD	18 MEZ. FLR	73
KAERCHER FUTURETECH GMBH, GERMANY	12-A	16
KAZAN GUNPOWDER PLANT	11	10 & 17
KBP INSTRUMENT DESIGN BUREAU	11	10 & 17
KERMEL INDIA	18 MEZ. FLR	55
KIA MOTORS CORP	18 MEZ. FLR	48
KIMOHA ENTREPRENEURS LTD, UAE	18 MEZ. FLR	69
KINTEX, BULGARIA	11	7
KIRLOSKAR PROPRIETARY LTD	12	4
KOMMLABS DEZIGN PVT. LTD.	18 GF	34
KONSTRUKTA - INDUSTRY A.S	18 MEZ. FLR	39
KOREAN DEFENSE INDUSTRY ASSOCIATION,KOREA	18 MEZ. FLR	46
KRASNY MARINE SERVICES PVT LTD	14	14.14A
KRAUSS-MAFFEI WEGMANN GMBH & CO KG	12-A	14,15 &25
KVH INDUSTRIES INC, USA	14	14.120
L-3 COMMUNICATION EOTECH, INC, USA	14	14.102
LAMBDA MICROWAVES PVT. LTD.	18 GF	E35&36
LANDROVER, UK	12-A	30
LARSEN & TOUBRO LTD	12-A	1
LITEF GMBH	12-A	14,15 &25
LOCKHEED MARTIN CORPORATION, USA	14	14.301
LOTUS MACHINES (P) LIMITED	18 GF	E25
LPS BOSSARD PVT. LTD.	18 GF	63

NAME OF THE COMPANY	HALL NO.	BOOTH NO.
LUCAS TVS LIMITED	18 GF	60-I
M.O.D	11	11-14 & 16
MACHINERY SALES CORPORATION	18 GF	52
MACMET TECHNOLOGIES LTD	11	5
MACTAGGART SCOTT & CO LTD	10	1&1A
MAGNUM (CHOGORI)	18 GF	61-C
MAGYAR VÉDELMIIPARI SZÖVETSÉG (HUNGARIAN INDUSTRIAL DEFENSIVE ALLIANCE).	18 GF	56
MAHINDRA DEFENCE SYSTEMS	09	6
MARLOG MARINE LOGISTIC	12-A	14,15 & 25
MASPACK LTD	14	14.14C
MATCON		60-G
MAURY MICROWAVE CORPORATION	14	110A
MBDA	12	12.201
MEGGITT DEFENSE SYSTEMS, USA	14	14.118
MEL SYSTEMS & SERVICES LTD.	18 GF	E1&2
MEMORY ELECTRONICS PVT. LTD.	18 GF	19-21
MEPROLIGHT (1990) LTD	11	1-4 & 6
MERLINHAWK ENGINEERING PVT LTD	18 MEZ. FLR	66
MESSAGE TIME A.S, CZECH REPUBLIC	18 MEZ. FLR	39
META COPPER & ALLOY LTD.	14	14.202
METALTECH MOTOR BODIES PVT LTD	OUTDOOR 8-11	OD-3
MIC OFFICE	14	14.106
MICROTURBO	12	12.212
MIDIVISANA LTD	18 MEZ. FLR	33
MILITARY-INDUSTRIAL COMPANY LLC	11	10 & 17
MINISTRY OF DEFENCE, REPUBLIC OF HUNGARY, HUNGARY	18 GF	56
MINISTRY OF INDUSTRY AND TRADE OF THE CZECH REPUBLIC	18 MEZ. FLR	39
MISHRA DHATU NIGAM LIMITED	18 GF	55
MISTRAL SOLUTIONS PVT LTD.	18 GF	61
MKU PRIVATE LIMITED	12-A	19
MOH-9 ARMOUR CERAMICS, SOUTH AFRICA	18 GF	7
MOOG MOTION CONTROLS PVT. LTD.	18 GF	53
MOTLEY EXIM CO	12-A	17
MOTOR SICH JSC (NEXPO)	18 MEZ. FLR	60
MTU FRIEDRICHSHAFEN GMBH	12-A	14,15 &25
MUSTHANE	12	12.216
NACRE AS, NORWAY	18 MEZ. FLR	2
NATIONAL INSTRUMENT	18 GF	61-J
NATRAJ PUBLISHERS	18 MEZ. FLR	47
NAVAL SHIPYARD GDYNIA S.A	18 MEZ. FLR	84-85
NAVANTIA, SPAIN	18 GF	2
NDMA	18 GF	60-D&E
NELCO LIMITED	12-A	3
NEW NOGA LIGHT (2000) LTD	11	1-4 & 6
NEXTER	12	12.210
NORTHROP GRUMMAN CORPORATION, USA	14	14.303
NOVATOR EXPERIMENTAL MACHINE DESIGN BUREAU	11	10 & 17
NOVOSIBIRSK CARTRIDGE PLANT	11	10 & 17
NUDELMAN PRECISION ENGINEERING BUREAU	11	10 & 17
OASIS WEAR TECH INDUSTRIES LLC, UAE	12-A	21-C
OMNIPOL A.S	18 MEZ. FLR	39
OPTIWAVE PHOTONICS LIMITED	18 GF	60-B
ORDNANCE FACTORY BOARD	12-A	20
OTO MELARA	11	11-14 & 16
OXLEY GROUP LTD, UK	11	19
PALADION NETWORKS	18 GF	36
PALL	12	12.208
PAN INTELLECOM LTD.	18 GF	103
PASSAPONTI	11	11-14 & 16
PAUSLTRA	12	12.215
PEARSON ENGINEERING	10	1&1A
PELENG JSC	18 MEZ. FLR	33
PERMALI WALLACE PRIVATE LIMITED	18 GF	E21
PHASE MATRIX INC.	14	110A
PHOTONIS NETHERLANDS B.V, THE NETHERLANDS	18 MEZ. FLR	14
PLANSEE - CIME BOCUZE, FRANCE	18 MEZ. FLR	77
PLASAN SASA LTD	11	1-4 & 6
POLICSKE STROJIRNY A.S	18 MEZ. FLR	39
POLISH CHAMBER OF NATIONAL DEFENCE MANUFACTURERS, POLISH	18 MEZ. FLR	30D
POLISH CHAMBER OF NATIONAL DEFENCE MANUFACTURERS, POLISH	18 MEZ. FLR	30E
POMPE GARBARINO	11	11-14 & 16
PRECISION ELECTRONICS LTD	09	2
PRECISION OPERATIONS SYSTEM (INDIA) PVT. LTD.	18 GF	E28,29,30
PRINCETON MICROWAVE TECHNOLOGY INC.	14	110A
PROENGIN INDIA	18 MEZ. FLR	70
PRONAL	12	12.208
PULSE E TECHNOLOGIES PVT LTD	18 MEZ. FLR	18
PZL-HYDRAL S.A.	18 MEZ. FLR	84-85
QMAX TEST TECHNOLOGIE	18 GF	E18-19
R K & SONS	14	14.204
RADIALL PROTECTRON (P) LTD	18 MEZ. FLR	53
RADIOZAVOD INCORPORATED STATE COMPANY	11	10 & 17
RADMOR S.A.	18 MEZ. FLR	84-85
RAFAEL ADVANCED DEFENSE SYSTEMS LTD	11	1-4 & 6
RAJASTHAN METAL SMELTING CO.	18 GF	61-A
RAYTHEON COMPANY, USA	14	14.206
RB COMTEC PVT. LTD.	18 GF	30
RDI COMMUNICATIONS (PTY) LTD, SOUTH AFRICA	18 GF	9
REEBOK INDIA COMPANY	18 GF	60-F
RELLUMIX	12	12.215
RHEINMETALL AG	12-A	14,15 &25
RICOR CRYOGENIC & VACCUM SYSTEMS	11	1-4 & 6
RINA	11	11-14 & 16
RIPPLE EFFECT WEAPON SYSTEMS PTY LTD, SOUTH AFRICA	18 GF	11
ROCHEM SEPARATION SYSTEMS (I) PVT LTD.	18 GF	101
ROHDE & SCHWARZ GMBH & CO KG	12-A	14,15 &25
ROLTA INDIA LIMITED	18 GF	1
ROOTS MULTICLEAN	18 GF	99
ROSOBORONEXPORT STATE CORPORATION, RUSSIA	11	10 & 17
ROSOBORONSERVICE (INDIA) LIMITED	11	10 & 17
ROTOMOTION LLC, USA	OUTDOOR 14	14 OD
ROXEL	12	12.204
ROXTEC INDIA PVT. LTD.	18 GF	24
RUBIN STATE OWNED ENTERPRISE "CENTRAL DESIGN BUREAU FOR	11	10 & 17
RUE <<DB RADAR>>	18 MEZ. FLR	33
RUSRE<<LUCH>>	18 MEZ. FLR	33
S M CREATIVE ELECTRONICS LTD.	18 GF	E 16
SAAB, SWEDEN	11	15
SAARC TOOL TECH PVT. LTD.	18 GF	64-E
SAFRAN	12	12.212
SAFT	12	12.209
SAGAX KFT. (SAGAX LTD.)	18 GF	56
SAGEM DEFENSE SECURITE	12	12.212
SAINT GOBAIN CERAMIC	12	12.215
SAINT GOBAIN SULLY	12	12.215
SAMSUNG THALES CO LTD	18 MEZ. FLR	47
SAMTEL COLUR LTD	12-A	18
SAN SWISS ARMS AG, SWITZERLAND	18 MEZ. FLR	2
SANDEEP METALCRAFT PVT LTD	18 MEZ. FLR	12
SAP MEDIA WORLDWIDE	14	14.5
SAP MEDIA WORLDWIDE PVT LTD	12-A	3A
SATCON POWER CONTROLS LTD.	18 GF	E22
SCD SEMICONDUCTOR DEVICES, ISRAEL	18 MEZ. FLR	83
SCHLEIFRING GMBH	12-A	14,15 &25
SDS ELECTRONICS PVT LTD	14	14.17-19
SDV	12	12.205
SECURITY SHOPPE (INDIA) PVT. LTD.	18 GF	60-J
SELEX SENSORS AND AIRBORNE SYSTEMS	11	11-14 & 16
SELEX SISTEMI INTEGRATI	11	11-14 & 16
SERO KFT. (SERO LTD.)	18 GF	56
SESM	12	12.214
SEVERNOYE DESIGN BUREAU FSUE, ST. PETERSBURG	11	10 & 17
SHIVA INDUSTRIES	18 MEZ. FLR	16
SIBAT - DEFENCE EXPORT & DEFENSE COOPERATION, ISRAEL	11	1-4 & 6
SIEMENS AG, GERMANY	18 GF	33-C
SIKORSKY AIRCRAFT, USA	14	14.401
SIMRAO OPTRONICS ASA, NORWAY	18 MEZ. FLR	82
SINGAPORE TECHNOLOGIES KINETIC, SINGAPORE	11	16A
SIREHNA	12	12.202
SKL INDIA PVT LTD	12-A	16
SM GROUP	14	14.22
SMITHS DETECTION	10	1&1A
SOFEMA	12	12.208
SOFRADIR	12	12.213
SOGENA, FRANCE	12	12.201 TO 12.217
SOLTAM SYSTEMS LTD	11	1-4 & 6
SOUTHWEST MICROWAVE, INC.	14	110A
SP GUIDE PUBLICATIONS PRIVATE LTD	18 MEZ. FLR	40
SPECK SYSTEMS LTD	11	20
SPECK SYSTEMS LTD	OUTDOOR 8-11	OD-1
SPETSTECHNOEXPORT COMPANY, UKRAINE	18 MEZ. FLR	60
SPLAV FEDERAL STATE UNITARY ENTERPRISE STATE RESEARCH AND	11	10 & 17
SRG TECHNO (P) LTD	18 MEZ. FLR	2
SRITECH ELECTRONICS & SYSTEMS PVT. LTD.	18 GF	18
STARWIRE INDIA LTD	12-A	24
STRONGFIELD TECHNOLOGIES LTD	10	1&1A
SURE SAFETY SOLUTIONS PVT. LTD	18 GF	46-47
SYSTEM & EQUIPMENT MAINTAINES CO.	18 GF	E9
SYSTEM CONTROLS	18 GF	E-7
SYSTEMS SUNLIGHT S.A, GREECE	12-A	26
TAMBOV GUNPOWDER PLANT FEDERAL FISCAL ENTERPRISE	11	10 & 17
TASER INTERNATIONAL (NASDAQ: TASR) USA	18 MEZ. FLR	2
TATA ADVANCED MATERIALS LIMITED	12-A	3
TATA ADVANCED SYSTEMS LTD	12-A	3
TATA BP SOLAR LIMITED	12-A	3
TATA COMMUNICATIONS LTD	12-A	3
TATA CONSULTANCY SERVICES LIMITED	12-A	3
TATA INDUSTRIAL SERVICES LTD	12-A	3
TATA MOTORS LTD	12-A	3
TATA POWER LIMITED - STRATEGIC ELECTRONICS DIVISION	12-A	3
TATA SONS LTD	12-A	3
TATA TECHNOLOGIES LTD (INCAT)	12-A	3
TATA TELESERVICES LIMITED	12-A	3
TDI ISRAEL, ISRAEL	18 MEZ. FLR	2
TECHNOPOL INTERNATIONAL, A.S, , SLOVAKIA	11	9
TEIJIN TWARON	12-A	14,15 & 25
TEKTRONIX INDIA PVT LTD.	18 GF	61-F
TELCON	12-A	3
TELLUMAT PTY LTD, SOUTH AFRICA	18 GF	10
TENCATE ADVANCED ARMOUR ROSHIELD A/S, DENMARK	18 MEZ. FLR	22
TENCATE ADVANCED COMPOSITES, USA INC.	14	110A
TEXPLUS FIBRES PVT. LTD.	18 GF	60-C
TEXTAS INSTITUTE, USA	14	14.108
THALES	12	12.217
THALES TRAINING & SIMULATION LIMITED, FRANCE	OUTDOOR 14	14 01-OD-2
TIP TOP GENERAL AGENCIES PVT. LTD.	11	19 B
TITAN INDUSTRIES LIMITED	12-A	3
TRIDENT INFOSOL PVT. LTD.	18 GF	27
TRIJICON INC, AUSTRALIA	18 MEZ. FLR	2
TSNIITOCHMASH (CENTRAL SCIENTIFIC-RESEARCH INSTITUTE OF	11	10 & 17
TTC TELEKOMUNIKACE, S.R.O	18 MEZ. FLR	39
TULA CARTRIDGE WORKS, JSC	11	10 & 17
TULIP IT SERVICE LTD	09	5
TURBOMECA	12	12.212
TYCO ELECTRONICS CORPORATION	18 MEZ. FLR	71-72
TYPHOON RESEARCH AND PRODUCTION ENTERPRISE JSC	11	10 & 17
U S DEPT. OF DEFENCE (US ARMY) USA	14	14.111
U.S. ORDNANCE, USA	14	14.116-117
ULMER	12	12.208
ULTRA ELECTRONICS	10	1&1A
ULTRA LIFE BATTERIES, USA	18 MEZ. FLR	81
ULYANOVSK CARTRIDGE WORKS OPEN-END JOINT-STOCK COMPANY	11	10 & 17
UNDERSEA DEFENCE TECHNOLOGY, UK	18 MEZ. FLR	42
UNEX POWER POINT P LTD	12-A	21-D
UNIVERSAL FLEXIBLES PRIVATE LIMITED	18 GF	60
VAYU AEROSPACE & DEFENCE REVIEW	14	14.12A
VECTRA	12	1
VECTRONIX (GIC)	18 MEZ. FLR	6
VEM TECHNOLOGIES P LTD	18 MEZ. FLR	23
VICTORINOX INDIA P LTD	18 MEZ. FLR	61
VIJAY SABRE SAFETY P LTD	18 MEZ. FLR	74
VINVISH TECHNOLOGY	18 GF	35
VOICE OF BOARD, USA	14	14.110'
VOICECOM TECHNOLOGIES PVT LTD.	18 GF	28
VOLVO PENTA	18 MEZ. FLR	27-28
VS CONSULTANTS	18 MEZ. FLR	54
W.L. GORE & ASSOCIATES	14	110A
WHITEHEAD ALENIA SISTEMI SUBACQUEI	11	11-14& 16
WSK "PZL-SWIDNIK" S.A.	18 MEZ. FLR	84-85
WSK PZL-KALISZ S.A.	18 MEZ. FLR	84-85
YENTREK INTERNATIONAL	18 GF	E 15
YEONHAB PRECISION CO LTD	18 MEZ. FLR	46
YUGOIMPORT, SERBIA	18 MEZ. FLR	48,49,50
ZAPOROZHYE MACHINE-BUILDING DESIGN BUREAU PROGRESS STATE	18 MEZ. FLR	60
ZEN TECHNOLOGIES LTD	12-A	22
ZETATEK INDUSTRIES LTD.	18 GF	E31,32,33
ZVEZDA, JSC	11	10 & 17

The C-130J.

There when you need it.
Just ask the Air Forces of the United States, United Kingdom, Australia, Italy, Denmark and Norway.

The C-130J will be there when you need it, bringing time-sensitive and mission-critical cargo to virtually any location, under any condition. In a combat zone or natural disaster area, in a dirt clearing or on a paved runway, the C-130J gets down and dirty supporting deployed troops, carrying more cargo, more efficiently and in less time. The C-130J is ready today to meet those defining moments that just won't wait. The C-130J – any mission, anywhere, any time.

www.lockheedmartin.com

LOCKHEED MARTIN

We never forget who we're working for