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AN SP GUIDE PUBLICATION

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WELCOME TO DEFEXPO INDIA 2008

Defexpo India's primary objective is to promote defence exports from India and exhibit the capabilities of Indian Defence R&D and production. This year, the interest has peaked given the remarkable developments in the defence scenario with the Indian government promoting a major drive to modernise the three wings of the military, foremost of these being the Indian Air Force's (IAF) proposed acquisition of 126 Medium Multi-Role Combat Aircraft (MMRCA).

With major defence programmes under execution and in the pipeline, and considering the factors of offsets neutralisation and India's growing defence commitments and budgets, the general opinion is that there is a large potential for a partnership between Indian and foreign industry now and in the future. Hence, we enthusiastically look forward to Defexpo 2008 to define the contours of defence—industry partnership, both foreign and Indian, for future joint ventures. More than 192 foreign companies and over 92 Indian companies are participating in Defexpo India 2008. (See list of exhibitors on pages 22 and 23.)

Background

International defence exhibition Defexpo India was conceptualised in 1998 by the Department of Defence Production, Ministry of Defence, Government of India in partnership with the Confederation of Indian Industry. Thus, to modernise its armed forces, the Indian government in 1999 decided to embark on a strategy of collaboration with international defence manufacturers through joint ventures. The strategy was aimed at encouraging the participation of domestic private sector to boost the export of arms and equipment besides meeting the needs of the Indian defence forces.

The first edition of Defexpo India, on land and naval systems, was held in Delhi

from October 12 to 16, 1999. The aim was to forge new partnerships with major global players and domestic private sector in co-production of weapon systems in India. About 197 companies (Indian and foreign) from 17 countries displayed their arms and equipment while the Indian defence industry was represented by 39 ordnance factories, eight defence public sector undertakings and 68 private sector companies.

Antony inaugurates show today

● A.K. Antony is known for his integrity and professional approach. A former Union Minister for Civil Supplies and Chief Minister of Kerala, he took over as Defence Minister on October 24, 2006. Antony will inaugurate the event today.



A landmark event in highlighting the capabilities and achievements of various defence industries in the country and abroad, Defexpo India provides an excellent platform for national and international manufacturers of land and naval systems to showcase their weapons and equipment. Further, it also focuses on other areas of defence technology in which significant advances have been made.

India's Defence Market

India is now in the market for acquiring and building ships, maritime surveillance aircraft, submarine rescue vessels and other assets for surveillance, like UAVs, in pursuance of the Indian Navy's modernisation plans. As regards the land systems, for the Indian Army, 347 additional T-90 tanks are on order with Russia while the older fleet of approximately 2,000 T-72 tanks is being upgraded. Artillery requires 300 155 mm self-propelled guns (both wheeled and tracked) apart from upgrading the existing medium artillery units to 155 mm calibre. Army Aviation requires 197 light-utility helicopters, apart from medium-utility and battlefield support helicopters. Military communications have to cater for a digitised configuration of the battle space for obtaining network centrality to ensure inter and intra-service synergy. ●



"However, the LTIPP generally remains an academic document since the recommendations do not receive Central government approval. On the rare occasion approval has been accorded, it was only 'in principle' and a fresh battle had to be fought for financial sanctions."

EXPERTSPEAK

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

PROCUREMENT POLICY

Procurement programmes in the Indian Navy (IN) should rightly be based on the 15-year Long Term Integrated Perspective Plan (LTIPP) which is formulated, keeping in view the following:

- Evaluation of likely threats

- National maritime interests that need to be safe guarded
- Approaching equipment obsolescence
- Force modernisation and expansion plans
- Fast track procurement to meet urgent operational needs

Continued on page 5

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**SP GUIDE
PUBLICATIONS**



"Where is our relationship with Russia going?"
—Chief of Naval Staff Admiral Sureesh Mehta

DAWN OF A NEW ERA

"We live in an uncertain international security environment. We are, therefore, obliged to create adequate defence preparedness to manage any potential challenge to our security and vital national interests".

—India's Prime Minister Manmohan Singh

India's defence industry is on the threshold of a new era. After years of debate between guns and butter, a surging economy provides the company enough resources to ensure security through balanced allotment for defence without necessarily affecting development. The defence industrial sector is no longer seen as a pariah or an outlet for generating employment but an important component of comprehensive national security. A change of mind set from revenue oriented defence budgeting to capital intensive outlays is one part of this transformation. Thus, India's yearly capital budget is likely to vary from \$10 billion (Rs 39,650 crore) to \$15 billion (Rs 59,475 crore) over the 11th Five Year Plan or Rs 40,000 to Rs 60,000 crore and above.

Defence Production & Acquisition

A new found approach to restructure defence production based on defence industry partnership is another factor indicating change. India's military industry is based almost exclusively in the eight defence public sector undertakings (PSUs) and 39 ordnance factories with two more in the planning stage. This seemingly large defence infrastructure has been able to produce military stores worth Rs 17,855 crore for PSUs and Rs 6,445 crore for ordnance factories for the year 2006-07, including items on capital as well as revenue account. A of the sizeable gap of around Rs 25,000 crore to Rs 30,000 crore is plugged through acquisitions ex-import, worth Rs 7,710 crore in 2006-07, while 10 to 12 per cent is invariably surrendered.

Dependence on acquisition exclusively from abroad or the public sector is beset with many problems. Technology dependence, cost escalation, life time support, full scale assurance of supplies, time overruns, redundancy and quality control are amongst the many banes. In a recent report to the Parliament, the defence ministry had indicated that the army has raised deficiencies in some batches of 5.56 mm INSAS Rifle, 5.56 mm Light Machine Gun (LMG), Small Arms Ammunitions, Tank Ammunition and Delay Ignite. The experience of items ex-import is also diverse with difficulties in transfer of technology, fixed contract and life time support guarantees.

Recent events in this field have also raised some qualms. Russia, for example, has asked for annual cost escalation from 2.55 to 5 per cent which for contracts of \$10 billion (Rs 39,650 crore) from Moscow entails an additional burden of \$245 million (Rs 971 crore). In exasperation, Chief of Naval Staff Admiral Sureesh Mehta remarked on the eve of Navy Day, "Where is our relationship with Russia going?" Ironically, Russia could well be one of the more generous suppliers in the defence industry. Another attendant problem of acquisitions has been delays in indigenous production and foreign acquisition. Gorshkov and Phalcon have been delayed by one to three years while Akash and Trishul are still in the trial stage or even on the path of abandonment. BrahMos is a pleasant exception but involvement of a number of private players with joint skills in project management could be considered as a major factor in its success.

A radical transformation of the defence acquisition model is essential to ease the bottleneck created by lack

of indigenous capacity in defence production, increased cost of acquisitions and a slew of big ticket purchases to meet the cutting edge of our defence forces. Dependence on ordnance factories and PSUs on one hand and foreign acquisitions on the other would not be able to meet the challenge of building a networked, technology dominant armed forces of the 21st century. A defence industry partnership may provide an answer. For it will ideally meet the needs of the armed forces, reliability and timeliness of supply with life time support guarantees and periodic upgrades. In turn, this would provide the industry an assured production line to sustain heavy investments made in the defence sector. DRDO Chief M. Natarajan recently indicated, "We feel the government has a clear responsibility to ensure that certain percentage of acquisitions, particularly of products developed indigenously with enormous efforts, are compulsorily sourced by the services from within the country."

Private Sector & Foreign Participation

The Kelkar Committee formed in May 2006 for selection of Raksha Udyog Ratna (RUR) has submitted its report. Considering past records and future projections, it is evident that Indian engineering majors Godrej and Boyce, L&T, Tata Motors, Ashok Leyland, Mahindras and Bharat Forge are likely to be in this list. These are well-established business houses with a high degree of credibility and proven track record. Godrej had been a partner in the BrahMos while Tata and L&T are involved in the manufacture of Pinaka and in artillery upgrade programmes. Company sources reveal that as and when the government gives the go ahead, they are ready to establish production lines for defence equipment.

At another level, large multinational defence corporations, such as Lockheed Martin and Raytheon, are establishing partnership with the DRDO and Indian firms, thereby leveraging technology competencies and project management skills with local expertise and a global perspective. Lockheed Martin Controls Systems, Binghamton, NY and the Aeronautical Development Establishment, Bangalore are jointly developing Engineering Test Station (ETS) for testing onboard Digital Flight Control Computer with all the Onboard Flight Programs (OFP) for the Light Combat Aircraft. During the Dubai Air Show, leading defence major Raytheon is reported to have signed MoUs with L&T, Wipro, Godrej & Boyce and Data Patterns after having inked an agreement with Tata Power in February. The partnership is extending to spheres as diverse as electronics, metal fabrication, test equipment, environmental control, power supplies and automatic mechanisms.

Initial steps towards glasnost in defence production will finally fructify into a Military Industry Network (MIN) rather than a Military Industrial Complex (MIC) of yesteryears. This will comprise all stakeholders in defence production, the defence forces, DRDO, ordnance factories, PSUs and private defence industry majors with the Defence Acquisition Council providing direction and oversight. Such a honeycombed structure would facilitate each silo to develop core competence independently. This will create the right balance between "competing priorities of the developers, producers and users of advanced weapons systems" as denoted by the Prime Minister. Of late, the political leadership seems to be leading with the vision. It is now up to the Defence Ministry, the military, DRDO and the industry, both public and private, to build a sound defence industrial base. •

(The writer is a well-known military analyst.)



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CALENDAR OF EVENTS

Saturday, 16 February 2007

1000 – 1100 Hrs	Defexpo India 2008 Inaugural Ceremony at Hamsadhwani, Pragati Maidan, New Delhi by Hon'ble Defence Minister of India.
1100 – 1200 Hrs	Visit of Hon'ble Defence Minister of India and other dignitaries to the exhibition.
1200 – 1800 Hrs	Defexpo India 2008 opened to Business Visitors and Official Delegations.
1215 – 1300 Hrs	Defexpo India 2008 Press Conference by Hon'ble Defence Minister of India at Hall No. 8, Conference Hall, Pragati Maidan, New Delhi.
1400 – 1730 Hrs	4th India Defence Industry Summit at Hall No. 8, Conference Hall, Pragati Maidan, New Delhi. Session I: DPP 2006 & Offset Policy Session II: Indian Defence Acquisition Programmes – Key Challenges – Army & Navy
1400 – 1730 Hrs	Press Conferences by Exhibitors at the Press Conference Hall, Pragati Maidan, New Delhi.
1930 – 2030 Hrs	Defexpo India 2008 Reception hosted by Hon'ble Secretary (Defence Production), Ministry of Defence, Government of India at Hotel Maurya Sheraton, New Delhi.
2030 – 2200 Hrs	Defexpo India 2008 Dinner hosted by Hon'ble Defence Minister of India at Hotel Maurya Sheraton, New Delhi.

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.
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.
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.

SP'S at DEFEXPO INDIA 2008

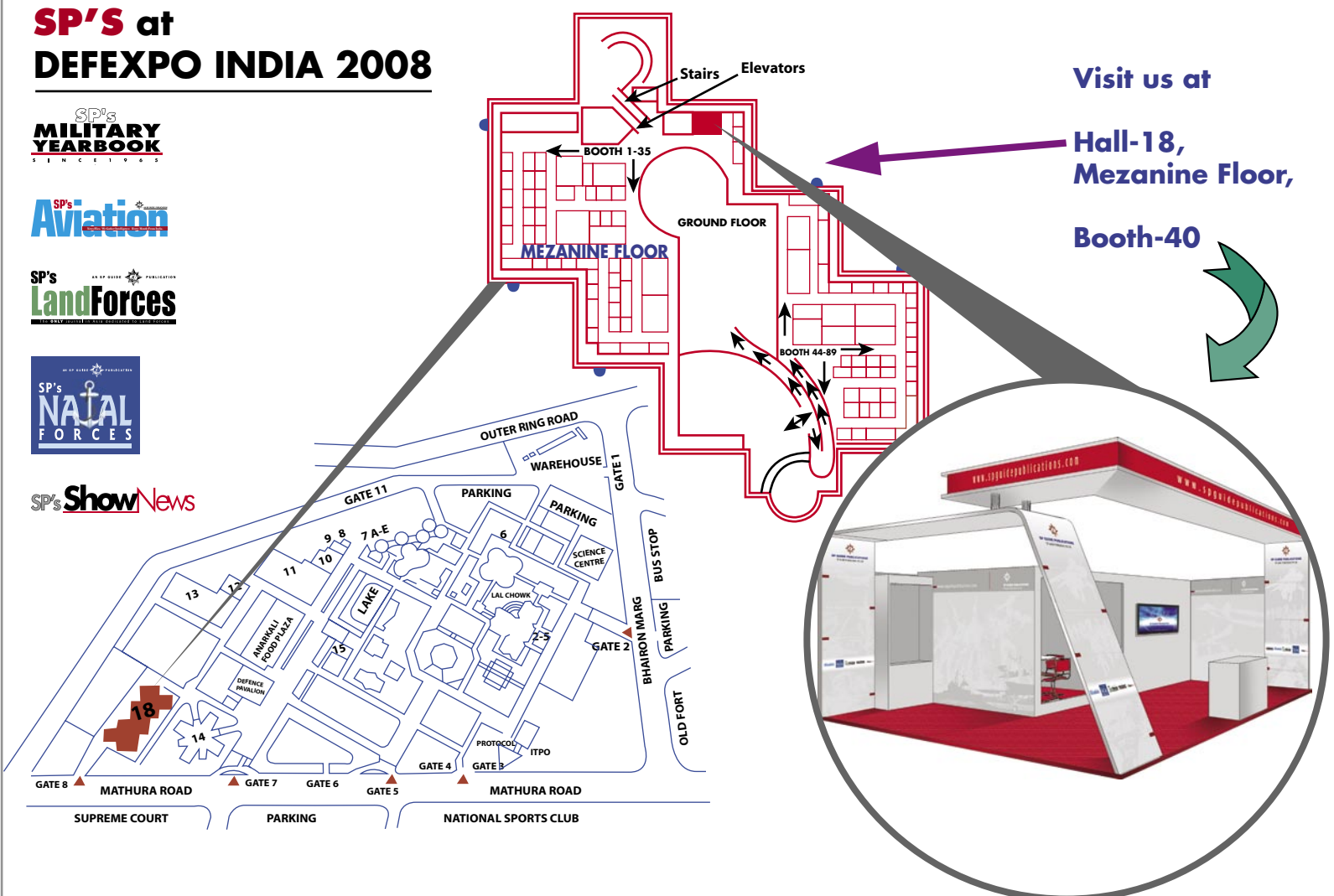
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"We'll work with Indian industry to add value to our product lines"

Richard T. Kirkland, President, Lockheed Martin for South Asia

SP's: Congratulations on the recent success in the C-130J deal with India. Could you outline the history and track record of Lockheed Martin?

Lockheed Martin: With growth markets in Defense, Homeland Security, and Systems/Government Information Technology, Lockheed Martin delivers innovative technologies that help customers address complex challenges of strategic and national importance.

SP's: The activities of your company cover a wide spectrum of defence technologies. What are the areas in which you provide or aim to provide global leadership?

LM: Lockheed Martin has more than 300 alliances, joint ventures and other partnerships in 75 countries. In our approach to global partnerships, Lockheed Martin seeks to develop industrial alliances for growth, and match corporate breadth with customer priorities.

Throughout Europe, Asia, Australia and the Americas Lockheed Martin is partnered with government and industry on such key programs as the F-35 Lightning II advanced combat aircraft; F-100 Frigate; the Aegis Combat System; F-16 combat aircraft; air and missile defense programs; as well as air traffic management, vessel traffic management and positive train control programs in almost a dozen countries. Lockheed Martin brings three indispensable attributes to all these partnerships; transformational technology, financial strength, and proven performance as a systems integrator.

SP's: What is your perception of the market potential in India for your company? What is the current level of engagement with the Indian market?

LM: Lockheed Martin approaches the Indian market with a solid commitment and a dedicated in-country presence. On January 8, 2008, we announced the opening of our India subsidiary, Lockheed Martin India Pvt. Ltd. The establishment of the Indian subsidiary by Lockheed Martin is another step towards emphasizing the



long-term commitment of the company towards the Indian market and industry.

We are working toward the establishment of Memorandums of Understanding, teaming agreements, technical assistance agreements, and manufacturing license agreements

with Indian companies in both the public and private sector.

SP's: Do you have any ongoing collaboration/strategic partnership with companies in the Indian IT or aerospace industry?

LM: To demonstrate the capability of net-centric operations, and to help facilitate Lockheed Martin's own understanding of India's needs in this area, Lockheed Martin partnered with Wipro Technologies. Known as Ambar Jyoti, this lab will develop, demonstrate and experiment with emerging network-enabled capabilities and applications in the Indian environment. Lockheed Martin also has positioned itself as a global market leader in asset tracking technologies suitable for strengthening logistics and supply chain management. Consistent with its capacity for systems integration, it has drawn on its radio frequency identification (RFID) technology for yet stronger network solutions. We have deployed systems that track more than 35,000 containers daily for the U.S. military, and we are building relationships with Indian industry that will permit this technology to be developed, utilized and improved in India.

SP's: How do you assess your chances of bagging the MMRCA deal?

LM: Lockheed Martin is offering the Government of India the advanced, multi-role,

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Expertspeak

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However, the LTIPP generally remain an academic document since the recommendations do not receive Central government approval. On the rare occasion approval has been accorded, it was only "in principle" and a fresh battle had to be fought to obtain financial sanctions.

In view of the above, procurement programmes are often reduced to ad hoc annual exercise. A certain amount of "panic" procurement is also undertaken in the last few months of the financial year when it appears obvious that funds are unlikely to be expended.

OFFSETS CLAUSE

Inclusion of offsets in all future procurement contracts is notionally an excellent concept, but contains many pitfalls which will emerge only when the first deal comes up for negotiations.

- The first grey area is the capability of Indian industry to generate the kind of high-technology/high-quality products that the vendor may require in the quantities specified.
- Many foreign vendors may not have done adequate homework to obtain a factual assessment of the

Indian industry which would enable them to make a realistic bid.

- This may create a sense of desperation among bidders who will resort to "camouflage & deception" and introduce offsets in which there is little value addition by Indian industry. This could include low end products or even CKD, SKD assemblies.
- Other bidders may offer transfer of technology as offset, and place an arbitrary excessive value on the technology.
- The really serious problem will arise in evaluating the different offset bids and then making a comparative matrix for final selection of L1.
- At the end of the day, we may find that the offset clause has made matters very complex and added further delay to our already slothful decision making process.

In view of the foregoing, it seems a bit ambitious to seek as much as 50 per cent offsets as is being done for the Indian Air Force (IAF) Medium Multi Role Combat Aircraft (MMRCA) deal. It would have been prudent to make a modest start with 15 to 20 per cent offsets in the beginning, and then progressively increase the quantum as India and the foreign bidders gained experience. •

(To be concluded)

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Efforts at Modernisation

Background

The Army Aviation Corps (AAC) is about two decades old and is still in the process of evolution in order to fulfill its role in support of the Indian Army. Its future role has widened to be able to support the army's cold start strategy of going in for a limited war against a limited nuclear backdrop; the growing importance of tactical mobility in regional battles and for the proposed mountain corps to be raised in the East, out of area contingencies, counter insurgency and terrorism; and to support special forces. Both utility and attack helicopters are required to support these roles.

AAC's Wish List

The AAC's fleet of Cheetah and Chetak is many decades old and needs immediate replacement. There is a requirement for 197 utility helicopters at corps level and 185 utility helicopters at division level. In addition, an unspecified number attack helicopters are required to replace MI-35/MI-25 in a decade or so. AAC also wishes to induct 10-12 ton class for carrying out tactical mobility missions. AAC's wish list may be neighbour driven in the sense that Pakistan's Army Aviation gained autonomy in 1958 and thereafter became a full fledged corps in 1977. Today they have 21 squadrons consisting of about 400 helicopters that include Huey Cobra attack and scout versions; Puma; Bell variants; MI-17 and Puma utility and observation helicopters.

Realistic Requirement

About 197 light observation helicopters are required to replace the ageing Cheetah and Chetak. The army also plans to acquire medium lift helicopters of the 10-12 ton class which can provide the field force commander with the requisite tactical troop lift capability within the requisite tactical battle area. Weaponisation of Advance Light Helicopter (ALH) weapon system integrated (WSI) has been carried out, armed with state of art ant-tank guided missiles, air to air missile, rockets and turreted gun system but does not seem to be very successful.

Upgrade of Cheetah & Chetak

HAL has stated that it has successfully replaced the present engine with French Turbomecca 333-2B2 engine of both the helicopters and named them Cheetal and Chetan. The Cheetal had created a record last year when it landed on Saser Kangi peak at an altitude of 25,150 feet. HAL plans to upgrade 40-50 of Cheetals and about 20-25 of Chetans in a decade or so. A light attack helicopter is also being planned by upgrading new airframes of Cheetah and calling it Lancer. It will be fitted with a combination of two jettison-able gun-cum-rocket pods and employed in anti-insurgency operations, close air support and attacking convoys, tanks etc.

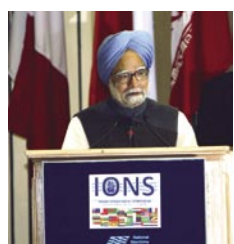
Conclusion

Role of helicopters has widened from utility to attack to provide tactical lift and fire support. It also helps in expanding the battle space. General JJ Singh, former COAS has stated on the modernization of AAC that, "making AAC a truly versatile and fully integrated manoeuvre arm for tactical battles of both the strike and pivot corps. This would involve upgrading its observation and communication capabilities and replacing obsolete helicopters with state-of-art machines." •

RFP FOR CHETAK & CHEETAH

The RFP for the replacement of Chetak and Cheetah was issued in 2001. Bell 407 and Eurocopter's AS350 B3 were short listed and comparatively evaluated during 2006. The General Staff evaluation was forwarded to the Ministry of Defense during Feb/Mar, 2007. Media reported that Eurocopter's AS350 B3 has been selected but it is understood that the civilian versions were offered for trials. The MoD feels that the rules have been flouted. Both companies claim that the versions offered for trials is identical to the military version with very marginal differences. In fact the military versions were demonstrated at the factory location by both companies. Whatever the reasons for cancelling the deal, the Indian Army is in for a long delay in the replacement of their ageing fleet.

Bridges of Friendship



In recognition of the centrality of 'Constructive Engagement' as the primary means of achieving and assuring mutually beneficial maritime security, stability, safety, and consequent collective prosperity amongst all littoral states of the Indian Ocean Region (IOR), the Indian Navy (IN) hosted the inaugural event of a newly-launched cooperative, consultative and inclusive regional initiative, called IONS (Indian Ocean Naval Symposium). The two-day event on February 14 and 15 was conducted jointly with the National Maritime

Foundation, with the theme "Contemporary Trans-national Challenges—International Maritime Connectivity".

Modelled generally on the lines of the Western Pacific Naval Symposium (WPNS), IONS seeks to provide a regional forum through which the Chiefs-of-Navy (or head of the principal maritime agency) of all the littoral states of the IOR can periodically meet to constructively engage one another through the creation and promotion of regionally relevant mechanisms, events, and activities. The response to the "IONS Seminar 2008" has been most encouraging and was attended some 27 to 30 Chiefs-of-Navy of the IOR littoral. In addition, the seminar witnessed active participation by the diplomatic corps; the political establishment; the bureaucracy; serving and retired officers of the defence, paramilitary and police forces; uniformed and civilian maritime agencies; the media; the Indian Higher-Command Courses. The Chiefs-of-Navy will also hold a closed-door 'Conclave-of-Chiefs' session which will later on shift to Goa with a visit to INS Hansa. Delegations from Saudi Arabia, Singapore, Eritrea, Brazil, Seychelles, Kuwait, Qatar, Mauritius, Malagasy, Myanmar, Oman, Sri Lanka, UAE, Kenya, Djibouti, Egypt, Mozambique, South Africa, Sudan, Tanzania, Malaysia, Maldives, Indonesia, Aus-

tralia, Thailand and France are attending the seminar.

In his inaugural address at Vigyan Bhavan, the Prime Minister, Dr Manmohan Singh, highlighted that the IOR spans 28 million square km, hosts a third of the world's population, accounts for 25 per cent of the global mass and 40 per cent of the world's energy resources. Linked by a history of sea faring and a significant share of international trade passes, IOP nations should, therefore, pool their resources and act for the common good of all, he stressed. Taking on from where the Prime Minister left, Defence Minister A.K. Antony said he found the IONS to be uniquely consultative and cooperative initiative, one that holds so much promise for the future for cooperative security within the maritime domain. "It encourages us to view the IOR as bridges that integrate national states and dream the IOR dream of being a coalesced, prosperous and progressive," Antony said. In his address, Chief of Naval Staff Admiral Sureesh Mehta said the IONS is a pan regional construct that does not seek to exclude anyone. The overview provided by the seminar will act as a backdrop against which the abiding characteristics of all our plans and actions will be clearly shown to be cooperative, inclusive, consultative, consensual and progressive. •





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SOARING Might

SP's Naval Forces (01/2007) carried a comprehensive article on the core aspects of Indian Naval Aviation—traditionally referred to as the Fleet Air Arm of the Indian Navy. Elucidating on the growth potential of the aerial dimension of India's maritime power, the analysis afforded an insight into maritime domain awareness from the perspective of naval aviation to fulfil the dual roles of surveillance and combat. Here's an update on the upgrade and modernisation programme of Indian Naval Aviation.

Fixed Wing Aircraft

IL-38s: Modernisation of IL-38s has been undertaken quite successfully, enhancing the surveillance capabilities of the aircraft manifold. The aircraft has been refurbished with state-of-the-art avionics. There are, however, some outstanding issues relating to installed Dragon suites, which are expected to be amicably resolved shortly.

TU-142s: Efforts to identify a suitable replacement for the Long Range Maritime Patrol Aircraft TU-142s has progressed very well. Many globally renowned aircraft manufacturers have enthusiastically participated in the global tender for Maritime Patrol Aircraft. Extensive field trials have been conducted with short listed bidders and the final phase of cost negotiations is expected in the near future, with Boeing's P8I and EADS A319 emerging as frontrunners.

Dorniers: The Dornier fleet has been augmented by inducting 11 more aircraft, some with para-drop capability and the remaining to beef up short- and medium-range maritime surveillance role. To improve upon the identification capability, Forward Looking Infrared (FLIR) system has been installed.

Rotary Wing Aircraft

Sea Kings: Proposed upgradation of Sea King helicopters includes new radar system and indigenous Electronic Support Measure (ESM). Technical evaluation is well underway to find a suitable replacement for Sea King 42 and 42A helicopters in three variants: anti-submarine, anti-surface vessels and commando carrier.

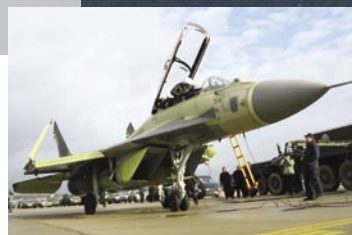
Kamovs: The surveillance capability of Kamov 25 and 28 has been enhanced with the installation of indigenous ESM package. Kamov 31s are the new induction into the helicopter fleet.

ALH: Eight utility version of Advanced Light Helicopter (ALH) constructed at Hindustan Aeronautical Ltd have been inducted into the helicopter fleet. However, Naval Staff Qualitative Requirements prescribed for the utility helicopter to perform anti-submarine warfare and communication roles has not been met by HAL. Hence, fresh Request for Information (RFI) has been issued to leading global helicopter manufacturers like Bell, Boeing and Eurocopter.

Strike Aircraft

MiG-29Ks: Production of MiG-29K, the marine version in Russia for operating on board INS Vikramaditya (formerly Admiral Gorshkov), has progressed successfully. Delivery of the first set of aircraft is expected shortly. Pilot training programme to operate the aircraft has also progressed satisfactorily. The aircraft is expected to be equipped with Extended Range, Beyond Visual Range (ER-BVR) missiles, with smart bombs and mid-air buddy tanking facility from another MiG-29K aircraft for deep penetration role.

Sea Harriers: The contract for limited upgrade of Sea Harriers with HAL is expected to be completed by September this year. Upgrade programme for Sea Harrier aircraft will include Derby—Beyond Visual Range missiles. As many as 14 Sea Harriers will be upgraded at a cost of \$120 million (Rs 472 crore). •



MIG-29K ►



◄ KAMOV



SEA HARRIERS ►



◄ ALH



SEA KING ►



◄ DORNIER

Interview Continued from page 5

“We want mutually beneficial industrial partnerships” Richard T. Kirkland, President, Lockheed Martin for South Asia

and combat-proven F-16 Fighting Falcon in the Medium Multirole Combat Aircraft (MMRCA) competition.

In competing for this program, Lockheed Martin's approach is to provide an advanced configuration that is tailored to all the Indian MMRCA requirements at the lowest possible procurement and operating costs.

A chief aspect of the F-16 program has been Lockheed Martin's success in developing tailored versions to meet the special requirements of particular customers.

Lockheed Martin views F-16 production as a total package that includes a robust, versatile, and proven combat aircraft. Those attributes are combined with affordability and mutually-beneficial industrial partnerships.

SP's: Is there a likelihood of the F-22 Raptor being offered to India at a future date or has the US Congressional ban negated the possibility?

LM: That is a government policy question that should be directed to the U.S. Government

The response to the RFP for MMRCA is to be submitted by March 3. Is Lockheed Martin on schedule or are you contemplating filing for extension of deadline?

Lockheed Martin intends to file its RFP on schedule.

The F-16 Fighting Falcon is one of the strongest contenders for India's MMRCA deal. As a single engine aircraft developed in the 1970s, do you think it is at a disadvantage vis-à-vis competitors with two engines belonging to the Fourth Generation? The F-16 is the cost-effective solution for India. More importantly than its value proposition, India's F-16 configuration will be tailored to meet India's specific MMRCA requirements, ensuring that the aircraft is mission capable for the unique needs of the Indian Air Force.

No fighter currently available in the international marketplace can match the versatility of the F-16. More than 100 US, European, and Israeli weapons can be integrated in 5,000 different combinations, ensuring the most challenging mission plans are implemented successfully.

SP's: What are your plans for providing offsets in case of fructification of contracts?

LM: Lockheed Martin believes in partnerships as a cornerstone of its foundation and engages in more than 300 partnerships with businesses around the globe. Assembly lines producing the F-16 have been established successfully in five countries and more than 20 nations participate in co-production of components for the F-16. Involvement in F-16 co-production has served as a major catalyst to create and energize the aerospace industry in many of these countries, and Lockheed Martin's proven ability to provide transfer of technology is without

equal. In the case of India, Lockheed Martin understands the requirement for self-reliance in defense production and will work tirelessly in partnership with India to help achieve that vital goal. F-16 direct offset programs have taken several forms, including subcontracts for component manufacturing, the establishment of joint venture companies, and the co-production and licensed production of F-16 aircraft.

Most offset programs include the transfer of relevant technology to participating countries, some of which initially had limited background in aerospace manufacturing.


SP's: Do you see the success of the C130J deal improving the chances of winning the MMRCA contract?

LM: As a policy we evaluate all our programs individually and do not speculate on the effect of one on the other. •

SP'S MILITARY YEARBOOK

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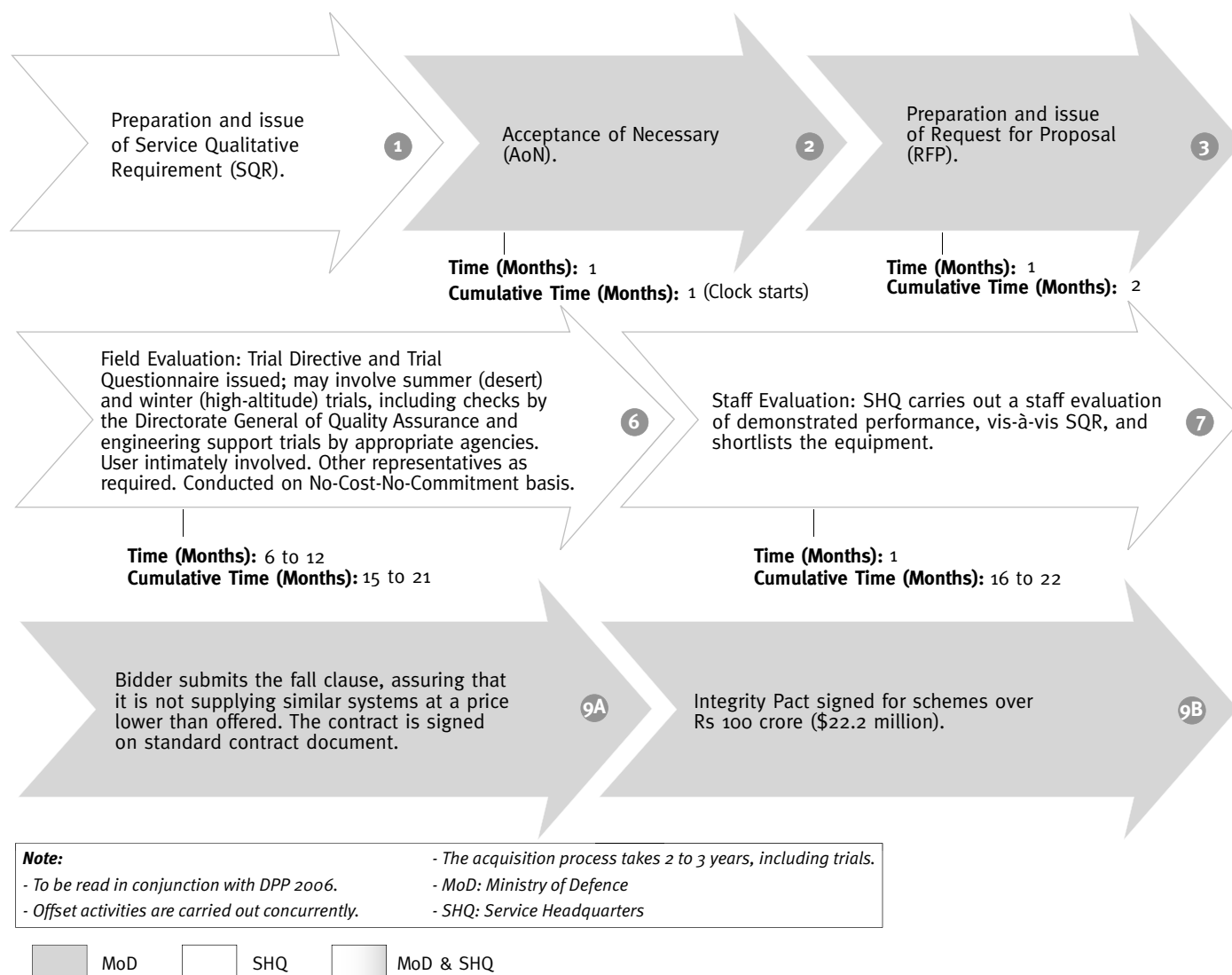
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Editor-in-Chief

Jayant Baranwal



BEYOND COMPARE - The F-16

War fighter combat experience drives the evolution and technology upgrades of the F-16 to create the most effective multi role fighter available today. For India, the F-16IN is uniquely tailored to meet or exceed the specific Medium Multi Role Combat Aircraft (MMRCA) requirements. Having delivered over 4,300 F-16s worldwide, Lockheed Martin understands that by meeting the specific needs of each partner customer, the Company ensures that the F-16 maintains an unmatched record of program performance and mission success.

The ability to incorporate the latest technologies into an aircraft is the key to expanding mission roles, improving combat capability and reducing operations and support (O&S) costs over the life of the aircraft. With a robust upgradation capacity and continuous technology insertion path, the F-16IN will be readily equipped with emerging capabilities throughout its lifecycle. The F-16 is inherently designed to ensure an exceptionally long service life—the F-16IN is designed for an 8,000 hour airframe life. The technology transfer offered with the F-16IN will allow the Indian Air Force to easily maintain, upgrade and sustain the aircraft to provide proven, disciplined performance in peacekeeping and wartime operations.

The F-16 has the latest technologies and capabilities, including the most current avionics, weapons with stand-off and satellite guided capability, advanced AESA radar, internal electronic warfare suite, powerful high thrust engine, and full color all-glass cockpit. User-friendly cockpits and proven pilot/vehicle integration provide pilots with high situational awareness.

The F-16IN AESA radar is fully developed, integrated, and operational. This revolutionary all-weather precision targeting AESA provides outstanding situational awareness and detection, high resolution synthetic aperture radar (SAR) mapping, fully interleaved with automatic terrain following, and air-to-air tracking of multiple targets. The APG-80 AESA radar incorporates the latest technology to a level exceeding that of any available in a multi role fighter today.

The EW System is designed with a high speed fiber channel data communication architecture meeting the demanding war fighter requirements for detection, countermeasures, communications, displays, controls, mission operation and internal installation, resulting in one of the most effective EW systems ever fielded on a

multi role fighter.

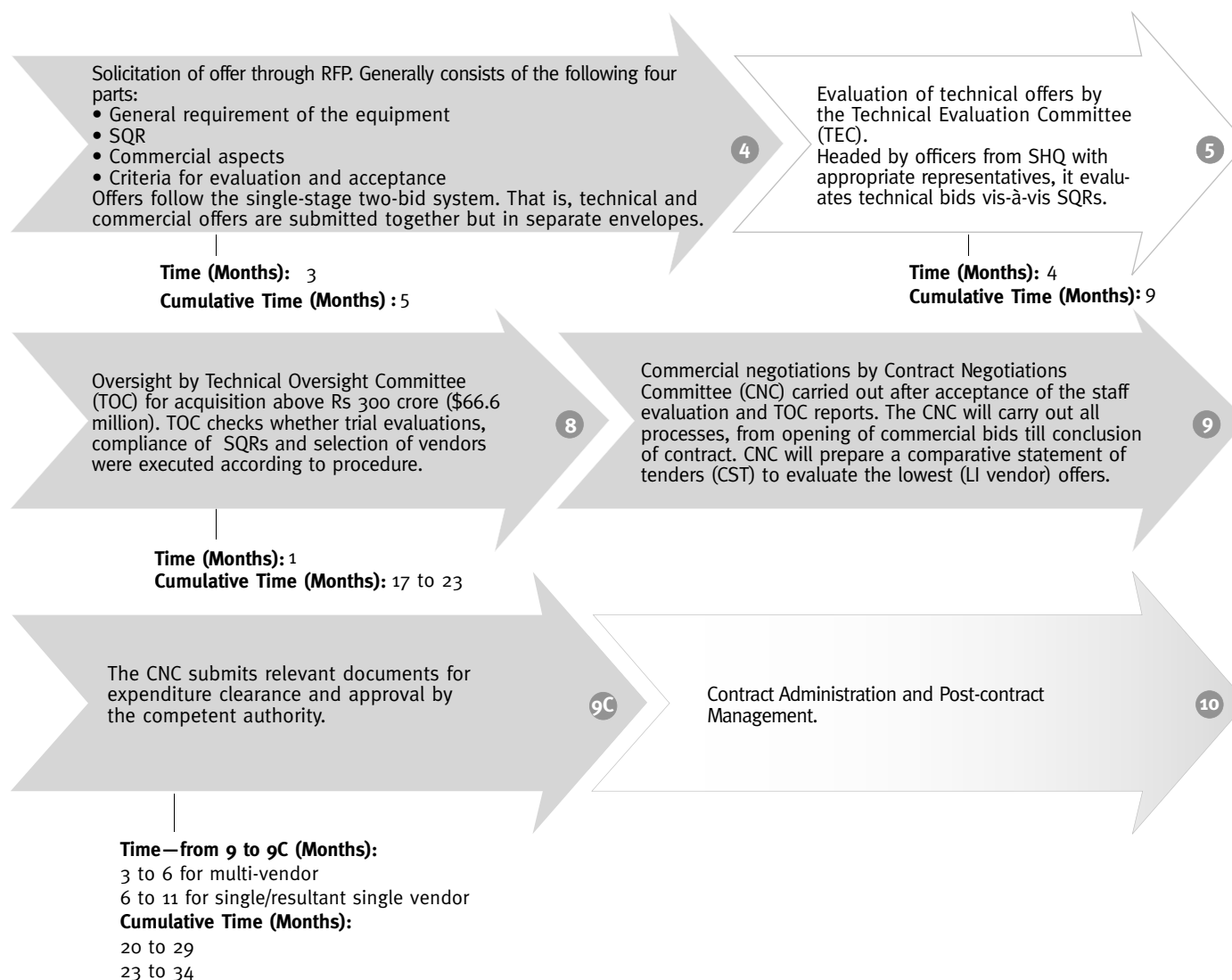
The F-16IN offers one of the world's best fighter engines – the General Electric F110-GE-132A engine in the 32,000-pound thrust class. The GE engine is the most powerful offered in the F-16 and has been proven around the world by demonstrating a record of safety, reliability, maintainability and durability.

The most technically advanced multi role fighter is also the safest and most reliable multi role fighter ever deployed by the USAF.

The fusion of net-centric operation and onboard data provide a total battle space picture and optimizes mission success. With The F-16IN, data is integrated through all phases of the mission – from mission planning, navigation, communication, target prosecution to return-to-base – transforming the pilot from an aircraft systems manager to a tactician. Lockheed Martin has been working closely with the Indian Air Force on its Operational Data Link (ODL) program to ensure that the F-16IN can readily be integrated into the ODL network as it becomes operational, providing unmatched interoperability with the existing Indian Air Force structure.

No multi role fighter available in the international marketplace can match the versatility of the F-16. More than 100 US, European and Israeli weapons can be integrated in 5,000 different combinations on the F-16, ensuring that the most challenging mission plans are implemented successfully. Conformal fuel tanks (CFTs) significantly extend the F-16IN range and persistence. CFTs can be installed and removed easily and are aerodynamically shaped for maximum efficiency without compromising the F-16's legendary handling characteristics. The F-16IN can deliver more than 6,000 pounds of ordnance on targets more than 900 nautical miles away and return home without refueling. •





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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 Subma- rine	Six submarines Order dated: 2005	2012, first submarine; one sub- marine 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, Sep- tember 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 Air- craft Carrier	One ship Order dated: March 2003	2013
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CURRENT SHIPBUILDING PROJECTS

Yard	Project	Contract Details	Delivery Status
Alcock & Ash- down 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 Ship- yard	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 col- laborator)	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 Ship- yard, 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 pro-
cured 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.

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.

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 so-

nars, 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 Sindhusashtra 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. •

—Rear Admiral (Retd) S.K. Ramsay

The background of the advertisement is a photograph of two Bengal tigers. They are lying down on a wide, carved stone ledge. Behind them is a large, intricately carved wooden door or screen, featuring circular and floral motifs. The tigers are looking towards the left of the frame. The overall tone is serious and majestic.

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FREQUENTLY ASKED QUESTIONS

Although the Ministry of Defence (MoD) introduced offsets in high value defence contracts in Defence Procurement Procedure-2005, detailed policy guidelines were issued in May 2006. An approach of gradual, incremental and phased application of offsets has been adopted. The government has kept the application of offsets at base levels for the present. With a view to clarify various issues involved, this paper attempts to answer some of the frequently asked questions.

What are offsets?

Offsets can generally be termed as formal arrangements of trade wherein a foreign supplier undertakes specified programmes with a view to compensate the buyer as regards his procurement expenditure and outflow of resources. In other words, the supplier undertakes programmes to generate benefits for the economy of the buyer country. Offsets can also be called as business deals with built-in reciprocity clauses to provide some relief to the buyer. As it is a formal arrangement with inbuilt contractual obligations, the negotiated package consists of the primary contract and the compensatory offsets contract.

What are the different types of offsets?

Offsets can be direct or indirect. In direct offsets, the trade arrangement is related to the primary product sold. It implies that the compensatory dispensation remains confined to the main weapon system, its sub-assemblies and components. It does not transcend other economic or social activities. On the other hand, indirect offsets have a much wider scope and are not restricted to the product sold.

What are the benefits of direct offsets?

Direct offsets in their simplistic form may include buy-back or co-production or licensed production or sub-contracts of the system and its sub-systems. In this arrangement, the seller helps the buyer produce the product or a part thereof and purchases it back for incorporation in all similar systems sold by him elsewhere in

the world. Technology transfer is by far the most common and generally accepted to be the best form of direct offsets. Therefore, countries seeking to develop their own defence industrial base generally seek direct offsets. Most of the European countries follow this path.

Why are indirect offsets getting popular?

Over the years a definite shift is discernible towards indirect offsets. Today, indirect offsets outnumber direct offsets by two to one, as the buyer countries have realised the immense economic and social potential of offsets. Indirect offsets are more broad based and transcend all economic or social activities and generally take the form of compensatory trading (reciprocal trade, counter purchase, switch trading, counter deliveries and parallel trade). Indirect offsets are highly popular with developing nations.

What are the current trends in defence offsets?

Not all offsets are duly published as sellers are wary of the future clients raising their demands and adverse local opinion due to likely transfer of jobs to the purchasing country.

However, the US, being the oldest and the largest provider of offsets in the world, has a very exhaustive system in place to compile data on offsets and to monitor them. All firms with more than \$5 million (Rs 20 crore) offset liability are required to report to the Secretary of Commerce.

It is generally estimated that the US defence industry has offset obligations of over \$10 billion (Rs 39,414 crore). As per the US reports, the average offset percentage demanded by the 17 European countries involved in offset activities was 92.6 per cent of the export contract values. The UK and Finland were the two largest recipients of offsets worth \$4.4 billion (Rs 17,340 crore) and \$3.2 billion (Rs 12,613 crore) respectively. Austria obtained 174.2 per cent offsets from the US. It was by far the highest. The Netherlands, Greece and Sweden varied from 120 per cent to 104 per cent. •

“Building of the Scorpene Class submarines proceeding apace”

Admiral Sureesh Mehta, Chief of Naval Staff

Courtesy SP'S MYB 07-08



SP's: *What is the state of preparedness of the Indian Navy to meet its expanding roles?*

Chief of the Naval Staff (CNS): As the principal enabling instrument of the nation's maritime power, the Indian Navy is a major contributor to the attainment of national objectives and functions in four characteristic roles, namely, military, diplomatic, policing (or constabulary) and benign which are constructed around the central issue of the freedom for use-of-the-sea. The state of preparedness of the Indian Navy in all four of these roles is a matter of great personal and professional satisfaction and one that ought to bring both comfort and cheer to my countrymen here in India as well as the substantial Indian diaspora.

SP's: *From the maritime perspective, the commissioning of INS Jalashwa (ex-Trenton) marks a major milestone in the growing Indo-US relations. It is reported that the US has offered the sale of some more ships like LPDs and Mine Sweepers. Are there any plans to pursue further acquisitions?*

CNS: The induction of Jalashwa is certainly a seminal event because this is the first major acquisition by the Indian Navy from the US. The ship was commissioned at Norfolk on June 23, 2007 and is currently on her maiden passage to India. It is also true that at different points in time, the US Navy has indicated that other ships such as Mine Sweepers and LPDs were available should the Indian Navy desire to pursue such inductions.

SP's: *What is the present status of acquisition of new maritime surveillance aircraft and the progress made on modernising the naval air arm?*

CNS: The modernisation of the air arm is planned through acquisitions, upgrades and mid-life updates (MLUs) and is a matter of priority for the Indian Navy. We have made reasonable progress in each of these areas. For example, field trials of

the products offered by certain short-listed global contestants for Long-Range Maritime Patrol and Anti-submarine Aircraft are expected to be completed soon. Simultaneously, the refurbishment programme in respect of our fleet of IL-38 aircraft is proceeding apace. The acquisition of additional Dornier aircraft as replacements for the old Islander is under process.

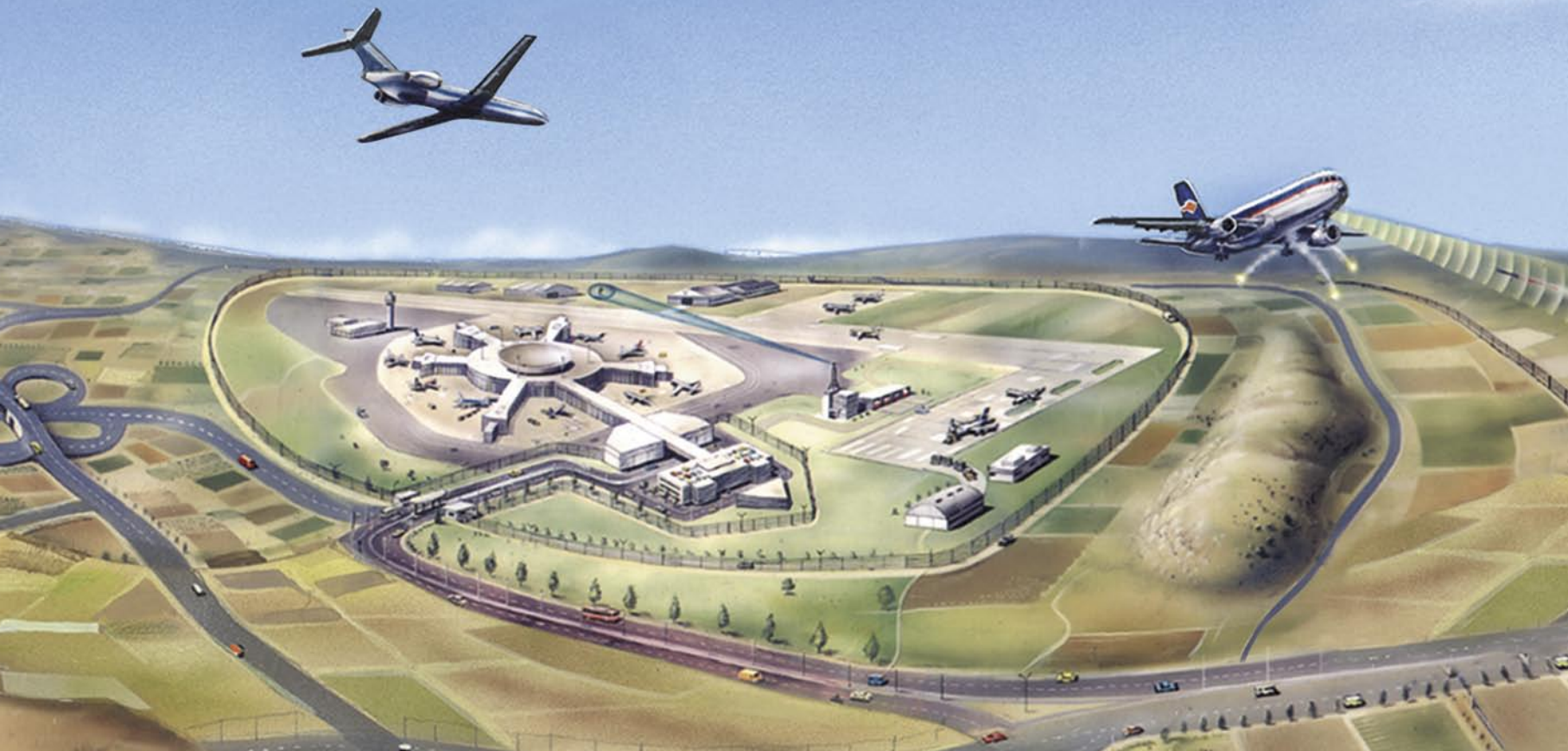
SP's: *The IN has prepared a maritime perspective plan that outlines the total requirement of ships, submarines and so on up to 2020. What is the progress made on implementing the modernisation plans and the adequacy of budgetary support to execute these plans?*

CNS: The force-accretion programme of the Indian Navy is guided by a classified Maritime Capability Perspective Plan (MCP) that seeks to retain the Indian Navy's essential structure as a balanced force. But it abandons the old philosophy of measuring force-levels simply by the number of platforms in favour of one where force-levels are planned and acquired so as to provide a range of 'capabilities' that are assessed as being needed. Following a top-down, capability-dominant, mission-based approach, that is mindful of the dictates of financial affordability and fiscal prudence, it, as such, seeks to stretch every rupee to provide for the optimum utilisation of resources.

SP's: *How is the construction of the Scorpene Class submarines progressing?*

CNS: All requisite activities involved in the building of the Scorpene Class submarines at M/s MDL, Mumbai are proceeding apace. Many preliminary activities relate to the procurement and placement of heavy machinery by the yard and these are being progressed by them. The 30-Year Submarine Plan is certainly our fundamental guidance document, but you would appreciate that much of what we do next in terms of additional submarine building lines will be shaped by the kind of augmentation that is achieved by our shipyards in terms of our in-country shipbuilding. •

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A model of the Multi-Role SIGINT Aircraft will present on Gulfstream G-550 aircraft.

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The system is designed to cope with the challenges of modern dense non-communication (mostly radars) and communication network environments and to perform long-range, high-endurance SIGINT missions.

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The LORA is a Long Range Missile Weapon System capable of engaging strategic targets deep in the enemy's territory from land or maritime platforms. Typical targets are fixed or transportable including infrastructure assets. The warhead can be delivered accurately within less than 10 meters (CEP) from a designated target, regardless of the target's range.

The missile can be equipped with a 400 Kg. high explosive warhead or with 600 Kg. penetration warhead to hit hardened targets.

The missile can be launched within few minutes from unprepared positions. Any target whose location is known within the range of the missile can be attacked within less than 10 minutes from the launch decision.

The LORA is a GPS/INS guided missile using a shaped trajectory flight mode.

LORA is stored in a sealed canister with shelf life of seven years without maintenance



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The LAHAT is a multi-mission missile fired from wide variety of Land Vehicles, Helicopters, and Tanks.

LAHAT, with a length of just one meter and weight of less than 13 kg, is very

well suited for use on light-weight helicopters. A LAHAT launcher fully loaded with four missiles weight less than 80 kg.

Despite its small size and light weight, LAHAT is highly effective against a variety of target types, including tanks, at ranges well over 8 km. LAHAT can accurately hit moving targets, including enemy helicopters. LAHAT's long range enable helicopters to engage and destroy enemy forces while avoiding the enemy's air defenses.

In its tank version LAHAT is handled by the 105mm or 120mm gunner, as a standard gun round. The missile performs precision homing on a laser-designated target, ensuring first shot, tank-kill at ranges over 6Km.

LAHAT can accurately hit moving targets, including helicopters



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I-VIEW MK50 Mobile Tactical UAV System

The I-VIEW MK50 is a close range UAV system that is intended for operation with low tactical echelon levels. The system has a minimal footprint based on a single (HMMWV like) vehicle and is designed for simple operators, and easy operation by two operators.

The system configuration includes a Ground Control Station (GCS) that is equipped in a S-250 type shelter, two packed UAV's, mini POP (Plug-in Optronic Payload), two operator stations and a roof-mounted launcher.

BIRDEYE 400 MINI UAV

The Bird Eye 400 is an advanced affordable Mini UAV system, providing real-time imagery for military and law-enforcement squads. The system provides "over the hill" reconnaissance covering a typical area of up to 10 Km. The fully automated flight path with "in-flight" waypoints practically nullifies the operational workload. The "flying wing", electrically powered platform is extremely quiet and has very low visual and practically no acoustic signature at all. •



Ultra Electronics Tactical Communication

Ultra Electronics is a group of specialist businesses designing, manufacturing, and supporting electronic and electromechanical systems, sub-systems and products for defense, security and aerospace applications worldwide. Ultra Electronics - Tactical Communication Systems announces its new common platform software-defined tactical radio to address the needs of the Indian Army's TCS program. The HCR common platform radio is a state-of-the-art Software Defined Radio (SDR) using the Software Communications Architecture (SCA) open framework. The HCR radio hosts the spectrum-efficient waveform from the high capacity HCLOSTM (34 Mb/s AN/GRC 245) radio and the ECCM anti-jamming waveform from the AN/GRC-512 to form a software defined radio that can perform multiple roles with the same platform. Ultra-TCS has delivered thousands of HCLOSTM and AN/GRC-512 radios to major armies throughout the world. The HCR product meets the evolving communications requirements of military area systems and will carry on Ultra's legacy of being the dominant supplier in international markets for such products and systems.

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Top weapon systems on offer to India from Boeing IDS

The Boeing Company will highlight its extensive portfolio of defence products and services at DefExpo 2008, which will demonstrate its offer of advanced technology and military capability available today.

The IDS portfolio extends to the C-17 Globemaster III strategic lift cargo plane, and C4ISR platforms and Airborne Early Warning & Control systems. IDS is also a leading provider of aerospace support systems and network-centric operations that have high relevance to India's requirements. The Boeing exhibit, located in the American Pavilion across from the U.S. Department of Defence exhibit, also will showcase the Harpoon, JDAM and SLAM-ER missiles, Support Systems programs and an F/A-18E/F simulator. Senior Boeing executives will attend the show and brief customers and the news media.

Also on offer are the combat-proven F/A 18 E/F Super Hornet multi-role combat fighter, the P-8I multi-mission maritime patrol aircraft (MPA), the heavy lift CH-47F and MH-47G heavy-lift Chinook helicopters, and the combat-proven attack helicopter, the AH-64D Apache Longbow.

F/A-18 Super Hornet

- On March 3, Boeing will submit its bid for India's Medium Multi-Role Combat Aircraft competition. The F/A-18 Super Hornet offers India the most advanced see-all, do-all combat fighter in production today, capable of defending the nation from the Himalayas to the Indian Ocean with unmatched lethality, pilot safety and the promise of 30+ years of US Navy-funded upgrades.

P-8I

- Boeing IDS is in discussions with the Indian Navy to offer the P-8I, the next generation of Maritime Patrol Aircraft to India. The P-8I is the world's most advanced anti-submarine and anti-surface warfare plane, offering India the reach, speed, technology and endurance necessary to protect 7,000 kilometers of coastline, and to extend beyond India's shores to protect crucial international shipping lanes.

- The P-8I offers any country tremendous capability advances over legacy systems. The exceptional range of the P-8I makes it ideally suited to patrolling the vast Indian coastlines and lanes of sea traffic. Couple this capability with the excellent reliability of the 737 commercial platform and the P-8I is a great choice for India.

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- 737 AEW&C can offer India's armed forces a precise picture of the battlefield for enhanced decision-making. The 737 AEW&C expands the AWACS family to include a high-performance, affordable system with designed-in payload, space, power, cooling and computing capacity reserves which provide substantial future growth capability

C-17

- The C-17 is the new global airlift standard with strategic capabilities. It's the airlifter of choice in the Global War on Terrorism and the airlifter of choice for hu-



▲ F/A-18 SUPER HORNET



▲ C-17

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▼ P-8I



▼ AEW&C



manitarian and disaster relief efforts world-wide. It's the only remaining widebody military airlifter with an existing U.S. production line.

Harpoon

- The U.S. Navy and Boeing have extensive experience in integrating Harpoon missiles on domestic and international aircraft. Integrating Harpoon on the India Air Force Jaguar aircraft is low risk and provides the IAF with exceptional ASuW (Anti-Surface Warfare) capabilities. Harpoon Block II expands the capabilities of the Harpoon anti-ship weapon. Harpoon, the world's most successful anti-ship missile, features autonomous, all-weather, over-the-horizon capability.

Harpoon Block II provides accurate long-range guidance for ship targets (note: land targets are not releasable to India) by incorporating the low-cost inertial measuring unit from the Boeing JDAM program; and the software, mission computer, integrated Global Positioning System/Inertial Navigation System, GPS antenna and receiver from the SLAM-ER. More than 7,000 Harpoons have been delivered to 28 customers.

Boeing's Media Briefing Schedule for Defexpo 08

Sunday, February 17

12 p.m.—F/A-18E/F Super Hornet Briefing at DefExpo Media Briefing Center

Chris Chadwick, President, Boeing Precision Engagement and Mobility Systems, will update the media on Boeing's advanced F/A-18E/F Super Hornet multirole combat aircraft.

3 p.m.—P-8I Briefing at DefExpo Media Briefing Center

Richard Buck, international program manager for the P-8 program, will offer an update on the production status of the U.S. Navy's P-8 program and discuss the P-8I variant for the Indian Navy.

Monday, February 18

3 p.m.—C-17 and Global Mobility Briefing at DefExpo Media Briefing Center

Mike Marshall, senior manager, Global Mobility Systems Business Development, will brief the media on Boeing's C-17 Globemaster III strategic lift aircraft.

Modernisation Programmes

Modernisation plans for the Indian Navy (IN) are based on the following policy documents:

- **Maritime Doctrine**, released in 2004.
- **Maritime Capability Perspective Plan**, brought out in May 2006.
- **Vision statement of the IN**, highlighting the strategic guidelines for transformation, released in September 2006.

The Maritime Capability Perspective Plan:

The Maritime Capability Perspective Plan outlines the force structure of the IN till 2022 and highlights the types of platforms (ships, submarines and aircrafts) required to be maintained with the state of art technology weapons and sensors. The emphasis is in acquiring these through indigenous capabilities in the country. The plans have been drawn up keeping in mind, the envisaged budgetary support required to maintain a force level of approximately 140 ships with a greater thrust on quality of the punch of the platform as opposed to mere quantity. Ministry of Defence approval exists for a 30 year submarine building plan with the goal of developing two separate lines for submarine construction in India.

Ongoing Programmes/Acquisitions:

While the construction programme of six Scorpene Class submarines is already underway at the Mazagon Docks, Mumbai plans are at a fairly advanced stage to start a second submarine construction line, likely to be in the private sector. It is also understood that the IN is looking for six additional submarines for which the process has already been initiated. The present order books of the three defence shipyards are very healthy with the construction of 6 submarines and about 27 ships currently in progress. These include, in addition to the Scorpene submarines, Air Defence Ship, Stealth frigate P-17, Destroyers P-15A, Anti-submarine warfare corvette P-28, Offshore Patrol Vessels, Fast Attack Crafts, and other auxiliary vessels. On the foreign acquisition front, a landmark event was the signing of the contract for three follow-on Talwar Class frigates from Russia. These ships will be equipped with indigenous sonar and communication suite as also Indo-Russian joint venture BrahMos cruise missile. INS Jalashwa (ex USS Trenton) acquired from the US has already joined the India fleet after extensive repairs at a US shipyard. INS Vikramaditya (ex Gorshkov) refit/re-furbishing is progressing at the Russian shipyard; recent reports indicate a delay and cost overrun in project completion. She is now likely to join the Indian fleet by 2009-2010.

Major shipbuilding projects in the pipeline include construction of Mine Counter Measure Vessels at the M/S Goa shipyard, fleet tankers, survey vessels, submarine rescue vessels and another aircraft carrier at the Cochin shipyard. In light of the planned decommissioning of INS

VIRAAAT in 2012, the navy is pursuing early sanctions for another carrier to maintain the force level. It is expected that the order for this will be placed by 2010 with an expected delivery date of 2017.

In addition to the ship construction programme, a comprehensive modernisation package is also being taken up on SSK/EKM Class submarines, SNF and Godavari Class ships to upgrade their weapons and sensors fit during the medium refits. While the EKM Class modernization package is being taken up at Russian shipyards, work on the remaining platforms is progressing at Indian shipyards. •



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COMPANY BRIEFS

Boeing Signs Agreement with Tata's TAL

The Boeing Company announced it has entered into an agreement with India-based TAL Manufacturing Solutions Ltd., a wholly owned subsidiary of Tata Motors Ltd., for manufacturing structural components for Boeing's 787 Dreamliner airplane program.

Under the agreement, TAL Manufacturing Solutions will build floor beams for the 787 using new technology with advanced titanium and composite materials. These floor beams will be used on the 787 Dreamliner and provide for a best-value solution and significant weight savings. The floor beams for the 787 airplane will be produced at TAL's new facility in Nagpur, India, and then transported to Boeing partners in Japan, Italy and the United States for further assembly.

ATR 72-500s for Lornho's Fly540

An agreement between ATR and the pan-African investing conglomerate Lornho was signed by Lornho's wholly-owned subsidiary, Lornho Air, for the purchase of 2 ATR 72-500s. These ATR 72-500s will be deployed by Fly540, an airline belonging to the conglomerate. All the aircraft will be configured with 66 seats, including 12 in first class, and will be equipped with higher rated PW 127M engines, with the "Elegance Cabin" and with In-Flight Entertainment (IFE).

Lornho's Fly540, is developing an expanding aviation network across Africa, providing much needed air transportation at international standards of comfort and service. Fly540 will be operating in eight African countries by early in 2008 and these new aircraft will allow the airline to continue its rapid expansion to develop its network linking African countries with quality regional service.

With its ATR 42-500 and ATR 72-500, ATR supplies state-of-the-art aircraft with the highest standards of comfort. The advanced six-blade propeller provides remarkably low noise levels. Low fuel burn and gaseous emissions contribute to make the ATR environment friendly. All ATR models are compliant with noise regulations and have a large margin with regard to Chapter IV (ICAO) noise regulations, effective 1st January 2006.

Contract to Babcock Engineering for Navy Super Carriers

The signing of a £35m contract by Babcock Engineering Services with Glasgow-based subcontractors Edmund Nuttall Limited to modify the docks in order to accommodate the building of the carriers and widen its direct entrance took place recently.

The two 65,000 tonne aircraft carriers, HMS Queen Elizabeth and HMS Prince of Wales, are to be constructed in sections in shipyards at Portsmouth and Barrow-in-Furness, Glasgow, with final assembly at Babcock's Rosyth in Scotland. The total investment in Rosyth will amount to £50m which will also provide for the necessary equipment to be purchased, such as the 'Goliath' crane, the largest in the UK, and hauling gear.

Raytheon's \$22 Million French Contract

The government of France awarded Raytheon Company a contract worth \$22 million for the combat-proven Enhanced Paveway II (EP2) dual-mode GPS/laser-guided precision munition and weapons integration for its air force's Mirage 2000D fighter aircraft.

EP2 first achieved initial operational capability on the French Navy's Super Etendard fighter aircraft in 2007, which also benefited the French Air Force.

The contract calls for Raytheon to provide the French Air Force with upgrade kits to convert 500-pound P2 laser-guided bombs into the more capable dual-mode GBU-49 and includes additional options for more EP2 systems. The GBU-49 is a precision weapon that has been extensively employed by U.S. and allied forces in both Afghanistan and Iraq. EP2 is already in operational use on several other U.S. and NATO military aircraft including the French Navy's Super Etendard.

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

MUGHLAI CUISINE

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

Open: 12.00-2.45pm (only weekends) and 7.30pm-11.45pm

Average meal for two: Rs. 3000-3500

Dumpukht is famous for its authentic Awadhi food. The decor helps transport you into the Mughal era.

Choice Dish-Kakori Kebab

Haveli: Taj Mahal Hotel, 1 Man Singh Road. Ph: 2302-6162

Open: 12.30pm-2.45pm and 7.30-11.45pm

Average meal for two: Rs 2000

Haveli offers you flavoured kebabs and biryani. The walls of this eatery are adorned with the art of renowned painter Anjolie Ela Menon.

Choice Dish-Kareli Roganjos

Singh Sahib: Intercontinental Eros, Nehru Place. Ph: 2622-3344

Open: 12-3pm and 7pm-12am

Average meal for two: Rs 1500

This restaurant serves authentic North Indian food and is known for its wide range of kebabs and biryanis.

Choice Dish-Balti da murg

SERVICE APARTMENTS

Enkay Condominiums: Enkay House 3 and 4, Malcha Marg Shopping Centre, Diplomatic Enclave, Chankyapuri; Ph: 24105815-16

These apartments are fully furnished and have provision for both short and long stay. Their proximity to the embassy and the commercial centres makes it a suitable vantage point for stay in the city

Tulip House: B 471, New Friends Colony; Ph: 9899406363, 9312281422

Tulip House provides pick and drop to the airport along with grocery delivery service. They offer all modern amenities like air-conditioned apartments, telephone, kitchen with refrigerator and color TV

Radiant Apartments:

C-6/8, Safdarjung Development Area; Ph: 2651-4693/95

These service apartments offer a choice in one studio and four one bedroom and six two bedroom fully furnished apartments

BUSINESS

FOREX DEALERS

LKG Forex, E-35, Lajpat Nagar-1; Ph: 2981-7722/4466

Personnel Network, 405 Saraswati House27, Nehru Place; Ph: 2647-1745

Corporate Consultants, 108 Madhuban, 55 Nehru Place; Ph: 2629-1036

R.R.Sen & Brothers Pvt Ltd, 50 & 68 World Trade Centre Ground Floor, Babar Road; Ph: 23412180/3044, 41606791-2

Deutsche Bank, 28 ECE House, KG Marg & G-26 Main Ring Road, South Ext.Part 1; Batra Car Care Centre C/o HPCL, Humayum Road

Northrop Grumman Showcases E-2 Hawkeye, VisionMaster

"India represents one of Northrop Grumman's largest potential growth markets for defence products in Asia"—John Brooks, President Northrop Grumman International Inc. and Vice-President Business Development, Northrop Grumman Integrated Systems.

Northrop Grumman Corporation will highlight its range of key capabilities, including airborne early warning and control systems, fire control radars, unmanned aerial vehicles, ships and naval systems at stand 837-N3.

Among the exhibits will be an E-2 Hawkeye airborne warning and battle management system crew workstation and flyable cockpit simulator.

Also highlighted will be Northrop Grumman's world-leading capabilities in advanced airborne early warning and fire control radar sensors for a variety of platform applications. Northrop Grumman is showing the LPD 17 San Antonio Class amphibious transport ship, which has superior capability for India Navy. Northrop Grumman Sperry Marine's new generation of navigation and ship control technology, VisionMaster FT, will also be on display. Its German subsidiary, LITEF, will display navigation systems for land vehicles, sensors for weapon stabilisation, inertial guidance systems for missiles and AHRS/navigation systems for fixed and rotary wing aircraft. •



▲ A SAN ANTONIO CLASS SHIP



▲ E-2D ADVANCED HAWKEYE2

Bags MDA contract to develop laser

Northrop Grumman Corporation has received a Missile Defence Agency (MDA) contract for the second phase of a five-and-a-half year programme to develop the Advanced Track Illuminator Laser, or ATILL—a six-kilowatt-class, solid-state, pulsed laser with excellent beam quality for advanced MDA missions. The entire four-phase programme will support MDA and Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL) in building the next generation Cryo Yb:YAG (ytterbium:yttrium aluminum garnet) solid-state laser track illuminator while significantly improving packaging density and electrical efficiency. During Phase 1 of the contract, Northrop Grumman supported the MIT/LL effort with laser system modeling and analysis, performed trade studies and presented options at a conceptual design review in December. Following the 12 months of Phase 2, MDA will down-select to a single industry partner for the remaining two phases. The fourth phase will culminate in 2012 with delivery to the government of a flight-qualifiable brassboard laser system. During Phase 1, the Northrop Grumman team conducted a four-month study focusing on system engineering and design trade-offs for the development of a packaged brassboard laser.

Raytheon Lends AESA Capabilities to F/A-18s

The US Navy is retrofitting 135 Super Hornets with Raytheon's APG-79 active electronically scanned array radar. An initial contract authorises Raytheon to supply 19 AESA systems, spares and maintenance. This ensures Super Hornets manufactured before installation of the APG-79 will benefit from Raytheon's new advanced sensor technology.

The APG-79 programme is moving toward full-rate production in anticipation of delivering 415 systems plus spares to the Navy and 24 systems to the Royal Australian Air Force in coming years. "The retrofit programme further enhances the Navy's airborne capabilities, ensuring our customer has game-changing sensor technology across the majority of its airborne assets," said Dr. Tom Kennedy, vice president for Raytheon's Tactical Airborne Systems business. "Our operational AESA radar delivers a range of advanced options including non-traditional intelligence, surveillance and reconnaissance, high-speed transfer of actionable information, unparalleled situational awareness, and targeting capabilities at greater ranges than ever." Two AESA-equipped fleet squadrons are training for deployment expected in 2008. They are the Black Lions of VFA-213 at Naval Air Station Oceana and the Fighting Redcocks of VFA-22 at Naval Air Station Lemoore. AESA-equipped Super Hornets are also being added to two training squadrons so aircrews can learn how best to maximize the advanced capabilities of the APG-79.

"The APG-79 AESA radar is the key sensor in the flight plan for the Block

II Super Hornets that will keep these aircraft dominant for decades," said Capt. Mark W. Darrah, F/A-18 and EA-18G Navy programme manager. The APG-79 AESA radar provides our warfighters with sensor data that will revolutionize how we employ the F/A-18E/F block II and EA-18G platforms. The radar serves as the key enabling capability to field F/A-18/ and EA-18G flight plan elements. "From operational and maintenance viewpoints, we believe this new technology sets us apart and will give us the edge we need in the challenging battlespace in which we expect to operate well into the future."

Raytheon, with 2006 sales of \$19.7 billion, is a technology leader specialising in defence, homeland security and other government markets across the world. With a history of innovation spanning 85 years, Raytheon provides state-of-the-art electronics, mission systems integration and other capabilities in the areas of sensing, effects, and command, control, communications and intelligence systems. •



Raytheon aligns with Precision Electronics

Raytheon Company has signed a memorandum of understanding with Precision Electronics Limited to forge strategic alignments that jointly develop and provide superior communications technology for India's military forces.

The MoU represents another step toward establishing a strong collaborative working relationship, encouraging joint pursuit of emerging business opportunities, and providing for in-country production, offset and long-term support. This agreement will pave the way for more exchanges of communications technology and business know-how between India and Raytheon.

PEL is a market leader in India providing communication solutions to both the military and civil sectors. Backed by a strong design and engineering team and a Ministry of Defence-approved manufacturing infrastructure, PEL is strongly poised to garner substantial defence business in the near future and is well positioned to take active part in the offset programme.

EXHIBITORS A-Z

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	14.01- 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 OD
ANJANI TECHNOPLAST LTD	14	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	OD-5&6
BENGAL WATERPROOF LIMITED	18 MEZ. FLR	31
BERGEN ELECTRONICS	18 GF	E27
BERTIN	12	12.214
BETH-EI ZIKHRON YAAKOV 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

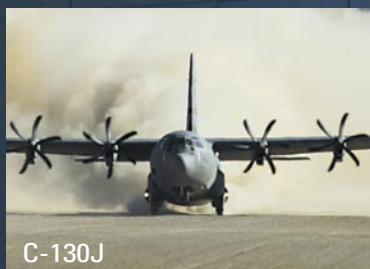
NAME OF THE COMPANY	HALL NO.	BOOTH NO.
CARINEX KFT. (CARINEX LTD.)	18 GF	56
CARL ZEISS OPTRONICS	12-A	14,15 & 25
CASCADE MICROTECH, INC.	14	110A
CBS TECHNOLOGIES	18 GF	E14
CCO CREATIVE CONSULTING GMBH, GERMANY	12-A	14,15 &25
CENTRUM ELECTRONICS LTD.	18 GF	71-72
CESKA LETECKA SERVISNI A.S	18 MEZ. FLR	39
CHANAKYA AEROSPACE, DEFENCE & MARI- TIME 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	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 OR- GANISATION	OUTDOOR	OD-4
DEFENSE RESEARCH DEVELOPMENT OR- GANISATION	8-11	
DEFENSE RESEARCH DEVELOPMENT OR- GANISATION	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 SCIEN- TIFIC 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	OD-1
ECA	12	12.206
ECIL	18 GF	57
EDICONSULT INTERNAZIONALE, 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
ELECTRONAVAL	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
EXPLOSION 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

NAME OF THE COMPANY	HALL NO.	BOOTH NO.
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 & ENGI- NEERS 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 EXCLU- SIVE 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
TROBOT 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	18&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	OD-3
	8-11	
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
OPTIWAWE 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	18&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
POLISCKE 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

NAME OF THE COMPANY	HALL NO.	BOOTH NO.
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
ROTMOTION LLC, USA	OUTDOOR	14 OD
	14	
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	18&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	OD-1
	8-11	

NAME OF THE COMPANY	HALL NO.	BOOTH NO.
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 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	18&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



how

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