

**MIRA INFORM REPORT**

<b>Report No. :</b>	532763
<b>Report Date :</b>	02.10.2018

**IDENTIFICATION DETAILS**

<b>Name :</b>	DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION
<b>Registered Office :</b>	Center for Artificial Intelligence of Robotics, DRDO Complex, CV Raman Nagar, Bangalore – 560093, Karnataka
<b>Tel. No.:</b>	91-80-25342646 / 25244298 / 25244288 / 25343165
<b>Country :</b>	India
<b>Financials (as on) :</b>	31.03.2018
<b>Year of Establishment:</b>	1958
<b>Capital Investment / Paid-up Capital :</b>	Not Divulged
<b>PAN No.:</b> [Permanent Account No.]	Not Divulged
<b>GSTN :</b> [Goods & Service Tax Registration No.]	Not Divulged
<b>Legal Form :</b>	Trust
<b>Line of Business :</b>	Subject company is engaged in Developing defence technologies. Covering Various like Aeronautics, Electronics Life Science Missile and Navel Systems (From Indirect Source)
<b>No. of Employees :</b>	Not Divulged

**RATING & COMMENTS**

(Mira Inform has adopted New Rating mechanism w.e.f. 23<sup>rd</sup> January 2017)

**MIRA's Rating :** A++

Credit Rating	Explanation	Rating Comments
A++	Minimum Risk	Business dealings permissible with minimum risk of default

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<b>Maximum Credit Limit :</b>	USD 42000000
<b>Status :</b>	Excellent
<b>Payment Behaviour :</b>	Regular
<b>Litigation :</b>	Clear
<b>Comments :</b>	<p>Subject is an agency of Ministry of Defense and it is headquartered in New Delhi. It was established in the year 1958.</p> <p>It is engaged in developing defense technologies covering various fields, like aeronautics, armaments, electronics, land combat engineering, life sciences, materials, missiles and naval systems</p> <p>Rating takes into consideration, strong financial and managerial support that the subject receives from Department of Defense Research and Development of Ministry of Defense.</p> <p>Rating derives strength from the subject's activities towards enhancing self-reliance in Defense Systems by undertaking indigenously developed weapons, sensors and platforms required by the three wings of the Armed Forces.</p> <p>Rating continues to derive strength from its dynamic training and development policy which is executed through the Continuing Educational Programmes (CEP) for all cadre personnel.</p> <p>Payments seem to be regular.</p> <p>In view of aforesaid, the subject can be considered for business dealings at usual trade terms and conditions.</p>

**NOTES :**

Any query related to this report can be made on e-mail : [infodept@mirainform.com](mailto:infodept@mirainform.com) while quoting report number, name and date.

**ECGC Country Risk Classification List**

Country Name	Previous Rating (31.12.2017)	Current Rating (01.04.2018)
India	A1	A1

Risk Category	ECGC Classification
Insignificant	A1
Low Risk	A2

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Moderately Low Risk	B1
Moderate Risk	B2
Moderately High Risk	C1
High Risk	C2
Very High Risk	D

**EXTERNAL AGENCY RATING**

<b>Rating Agency Name</b>	Not Available
<b>Rating</b>	Not Available
<b>Rating Explanation</b>	Not Available
<b>Date</b>	Not Available

**RBI DEFAULTERS' LIST STATUS**

Subject's name is not enlisted as a defaulter in the publicly available RBI Defaulters' list.

**EPF (Employee Provident Fund) DEFAULTERS' LIST STATUS**

Subject's name is not enlisted as a defaulter in the publicly available EPF (Employee Provident Fund) Defaulters' list as of 31-03-2018.

**BIFR (Board for Industrial & Financial Reconstruction) LISTING STATUS**

Subject's name is not listed as a Sick Unit in the publicly available BIFR (Board for Industrial & Financial Reconstruction) list as of 02.10.2018

**IBBI (Insolvency and Bankruptcy Board of India) LISTING STATUS**

Subject's name is not listed in the publicly available IBBI (Insolvency and Bankruptcy Board of India) list as of report date.

**INFORMATION DENIED**

**MANAGEMENT NON-COOPERATIVE: Tel. No.:91-80-25244298 / 25342646 / 25244288 / 25343165**

**LOCATIONS**

<b>Registered Office :</b>	Center for Artificial Intelligence of Robotics, DRDO Complex, CV Raman Nagar, Bangalore – 560093, Karnataka, India
<b>Tel. No.:</b>	91-80-25342646 / 25244298 / 25244288 / 25343165

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<b>Website :</b>	<a href="http://www.drdo.gov.in">http://www.drdo.gov.in</a>

**MEMBERS**

NOT DIVULGED

**BUSINESS DETAILS**

<b>Line of Business :</b>	Subject company is engaged in Developing defence technologies. Covering Various like Aeronautics, Electronics Life Science Missile and Navel Systems (From Indirect Source)
<b>Brand Names :</b>	Not Available
<b>Agencies Held :</b>	Not Available
<b>Exports :</b>	Not Available
<b>Imports :</b>	Not Available
<b>Terms :</b>	Not Divulged

**GENERAL INFORMATION**

<b>Suppliers :</b>	<b>Reference :</b>	Not Divulged
	<b>Name of the Person :</b>	--
	<b>Contact No.:</b>	--
	<b>Since How Long Known :</b>	--
	<b>Maximum Limit Dealt :</b>	--
	<b>Experience :</b>	--
	<b>Remark:</b>	--
<b>Customers :</b>	<b>Reference :</b>	Not Divulged
	<b>Name of the Person :</b>	--
	<b>Contact No.:</b>	--
	<b>Since How Long Known :</b>	--
	<b>Maximum Limit Dealt :</b>	--
	<b>Experience :</b>	--
	<b>Remark:</b>	--
<b>No. of Employees :</b>	Not Divulged	

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<b>Bankers :</b>	<b>Bank Name</b>	Not Divulged
	<b>Branch</b>	--
	<b>Person Name (With Designation)</b>	--
	<b>Contact Number</b>	--
	<b>Name of Account Holder</b>	--
	<b>Account Number</b>	--
	<b>Account Since (Date/Year of Account Opening)</b>	--
	<b>Average Balance Maintained (If Possible)</b>	--
	<b>Credit Facilities Enjoyed (If any)</b>	--
	<b>Account Operation</b>	--
	<b>Remarks (If any)</b>	--

<b>Auditors :</b>	Not Divulged
<b>Memberships :</b>	Not Available
<b>Collaborators :</b>	Not Available
<b>Sister Concern:</b>	Not Divulged

**CAPITAL STRUCTURE**

<b>Capital Investment :</b>	
<b>Owned :</b>	Not Divulged
<b>Borrowed :</b>	Not Divulged
<b>Total :</b>	<b>Not Divulged</b>

**FINANCIAL DATA**  
*[all figures are in INR Million]*

<b>Particulars</b>			<b>31.03.2018</b>
Sales Turnover (Approximately)			148180.000

The above information has been taken from Indirect Source.

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**Note :** Sole Proprietary and Partnership concerns are exempted from filing their financials with the Government Authorities or Registry.

**LOCAL AGENCY FURTHER INFORMATION**

Sr. No.	Check list by info agents	Available in Report (Yes/No)
1	Year of establishment	Yes
2	Constitution of the entity	Yes
3	Locality of the entity	Yes
4	Premises details	No
5	Buyer visit details	--
6	Contact numbers	No
7	Name of the person contacted	No
8	Designation of contact person	No
9	Promoter's background	No
10	Date of Birth of Proprietor / Partners / Directors	No
11	Pan Card No. of Proprietor / Partners	No
12	Voter Id Card No. of Proprietor / Partners	No
13	Type of business	Yes
14	Line of Business	Yes
15	Export/import details (if applicable)	No
16	No. of employees	No
17	Details of sister concerns	No
18	Major suppliers	No
19	Major customers	No
20	Banking Details	No
21	Banking facility details	No
22	Conduct of the banking account	--
23	Financials, if provided	Yes
24	Capital in the business	No
25	Last accounts filed at ROC, if applicable	No
26	Turnover of firm for last one year	Yes
27	Reasons for variation <> 20%	--
28	Estimation for coming financial year	No
29	Profitability for last three years	No
30	Major shareholders, if available	No
31	External Agency Rating, if available	No
32	Litigations that the firm/promoter involved in	--
33	Market information	--
34	Payments terms	No
35	Negative Reporting by Auditors in the Annual Report	No

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## PROJECTS

### Aeronautics

- The DRDO is responsible for the ongoing Light Combat Aircraft. The LCA is intended to provide the Indian Air Force with a modern, fly by wire, multi-role fighter, as well as develop the aviation industry in India. The LCA programme has allowed DRDO to progress substantially in the fields of avionics, flight control systems, aircraft propulsion and composite structures, along with aircraft design and development.
- The DRDO provided key avionics for the Sukhoi Su-30MKI programme under the "Vetrivel" programme. Systems developed by DRDO include radar warning receivers, radar and display computers. DRDO's radar computers, manufactured by HAL are also being fitted into Malaysian Su-30s.
- The DRDO is part of the Indian Air Force's upgrade programmes for its MiG-27 and Sepecat Jaguar combat aircraft, along with the manufacturer Hindustan Aeronautics Limited. DRDO and HAL have been responsible for the system design and integration of these upgrades, which combine indigenously developed systems along with imported ones. DRDO contributed subsystems like the Tarang radar warning receiver, Tempest jammer, core avionics computers, brake parachutes, cockpit instrumentation and displays.
- HAL AMCA: Aeronautical Development Agency of DRDO is responsible for the design and development of the fifth generation aircraft. In 2015, 700 ADA employees were working on the project along with 2,000 employees of DRDO.
- Avatar (spacecraft)

## ELECTRONICS AND COMPUTER SCIENCES

### Electronic warfare

ECM stations for both communication and non-com (radar etc.) systems. The Indian Army has ordered its Signal Corps to be a prime contributor in the design and development stage, along with the DRDO's DLRL. The scale of this venture is substantial – it comprises COMINT and Electronic intelligence stations which can monitor and jam different bands for both voice/data as well as radar transmissions. In contrast to other such systems, Samyukta is an integrated system, which can perform the most critical battlefield EW tasks in both COM and Non-COM roles. The system will be the first of its type in terms of its magnitude and capability in the Army. Its individual modules can also be operated independently.[35] A follow on system known as Sauhard is under development.

The Safari IED suppression system for the army and paramilitary forces and the Sujav ESM system meant for high accuracy direction finding and jamming of communication transceivers.

### EW systems for the Air Force

- Radar warning receivers for the Indian Air Force of the Tarang series. These have been selected to upgrade most of the Indian Air Force's aircraft such as for the MiG-21, MiG-29, Su-30 MKI, MiG-27 and Jaguar as well as self-protection upgrades for the transport fleet.
- The Tranquil RWR for MiG-23s (superseded by the Tarang project) and the Tempest jamming system for the Air Force's MiG's. The latest variant of the Tempest jamming system is capable of noise, barrage, as well as

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deception jamming as it makes use of DRFM. The DRDO has also developed a High Accuracy Direction Finding system (HADF) for the Indian Air Force's Su-30 MKIs which are fitted in the modular "Siva" pod capable of supersonic carriage. This HADF pod is meant to cue Kh-31 Anti radiation missiles used by the Su-30 MKI for SEAD.

- DRDO stated in 2009 that its latest Radar warning receiver for the Indian Air Force, the R118, had gone into production. The R118 can also fuse data from different sensors such as the aircraft radar, missile/laser warning systems and present the unified data on a multi-function display. The DRDO also noted that its new Radar Warner Jammer systems (RWJ) were at an advanced stage of development and would be submitted for trials. The RWJ is capable of detecting all foreseen threats and jamming multiple targets simultaneously.
- Other EW projects revealed by the DRDO include the MAWS project (a joint venture by the DRDO and EADS) which leverages EADS hardware and DRDO software to develop MAWS systems for transport, helicopter and fighter fleets. DRDO also has laser warning systems available.
- A DIRCM (Directed Infra Red Countermeasures) project to field a worldclass DIRCM system intended to protect aircraft from infrared guided weapons.
- The DRDO is also developing an all new ESM project in cooperation with the Indian Air Force's Signals Intelligence Directorate, under the name of "Divya Drishti" (Divine Sight). Divya Drishti will field a range of static as well as mobile ESM stations that can "fingerprint" and track multiple airborne targets for mission analysis purposes. The system will be able to intercept a range of radio frequency emissions like radar, navigational, communication or electronic countermeasure signals. The various components of the project will be networked via SATCOM links.
- Additional DRDO EW projects delivered to the Indian Air Force have included the COIN A and COIN B SIGINT stations. DRDO and BEL developed ELINT equipment for the Indian Air Force, installed on the service's Boeing 737s and Hawker Siddeley Avro aircraft. DRDO has also developed a Radar Fingerprinting System for the IAF and the Navy.
- Another high accuracy ESM system is being developed by the DRDO for the AEW&C project. The Indian Air Force's AEW&C systems will also include a comprehensive ESM suite, capable of picking up both radars as well as conducting Communications Intelligence.

### Radars

The DRDO has steadily increased its radar development. The result has been substantial progress in India's ability to design and manufacture high power radar systems with locally sourced components and systems. This began with the development of short-range 2D systems (Indra-1) and has now extended to high power 3D systems like LRTR intended for strategic purposes. Several other projects span the gamut of radar applications, from airborne surveillance (AEW&C) to firecontrol radars (land based and airborne). A list of the tactical programs is as follows:

### Army

- Multifunction Phased Array Radar and 3D Surveillance Radar for Akash Missile Weapon

### System (Rajendra & 3D CAR respectively)

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- Low Level Light weight 2D Radar for mountainous terrain Air Defence (Bharani)
- 3D -Tactical Control Radar for Air Defence (3D TCR)
- Short Range Battle Field Surveillance Radar (2D BFSR-SR)
- Weapon Locating Radar (3D WLR)
- Multi Mission Radar (MMSR)
- FOPEN Radar
- Through wall detection Radar
- Ground Penetration Radar

#### **Air Force**

- Multifunction Phased Array Radar and 3D Surveillance Radar for Akash Missile Weapon System (Rajendra and 3D CAR respectively)
- Active Phased Array Radar for AEW&C
- Low level 2D Air Defence Radar (Indra-2)
- 3D Low Level Light Weight Radar (Aslesha)
- 3D Medium Range Surveillance Radar for Air Defence (Rohini derivative of 3D CAR)
- 4D Active Array Medium Power radar for AD role
- Airborne Electronically Scanned Array Radar for Tejas Mark II
- Ground Controlled interception
- SAR for UAVs

#### **Navy**

- Maritime Patrol Radar for fixed and Rotary Wing Aircraft (superseded by more advanced system)
- Maritime Patrol Radar with RS and ISAR (XV-2004)
- 3D Medium Range Surveillance Radar for ASW Corvettes
- Multifunction Phased Array Radar for Air Defence Ship
- Maritime Patrol Airborne Radar for UAV
- Coastal Surveillance Radar (CSR)

### **NAVAL RESEARCH AND DEVELOPMENT**

#### **Sonars**

DRDO, BEL and the Indian Navy have developed and productionised a range of sonars and related systems for the Indian Navy's frontline combat ships.

#### **These include:**

- **APSOH** (Advanced Panoramic SONar Hull mounted),
- **HUMVAD** (Hull Mounted Variable Depth sonar),
- **HUMSA** (Follow on to the APSOH series; the acronym HUMSA stands for Hull Mounted Sonar Array),
- **Nagin** (Towed Array Sonar),
- **Panchendriya** (Submarine sonar and fire control system).

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Other sonars such as the airborne sonar Mihir are in trials, whilst work is proceeding apace on a new generation of sonars. Sonars may be considered one of DRDO's most successful achievements as the Indian Navy's most powerful ships rely on DRDO made sonars. The standard fit for a front line naval ship would include the HUMSANG hull mounted sonar and the Nagin towed array sonar. The Mihir is a dunking sonar meant for use by the Naval ALH, working in conjunction with its Tadpole sonobuoy. The Panchendriya is in production for the Kilo class submarine upgrades.

### **Torpedoes**

DRDO is currently engaged in developing multiple torpedo designs. These include a lightweight torpedo that has been accepted by the Navy and cleared for production.

### **Under development**

- Advanced Light Torpedo Shyena is an advanced experimental torpedo developed by the Naval Scientific and Technological Laboratory (NSTL), a DRDO wing. Development was started in 1990.
- NSTL Advanced Lightweight Torpedo[66]
- NSTL Varunastra Heavy Weight Torpedo: The heavy weight wire-guided torpedo called Varunastra and Thakshak thermal torpedo are suitable for use against both ships and submarines. The electrically powered Varunastra is stated to be in production.

The DRDO also developed and productionised a microprocessor controlled triple tube torpedo launcher for the Indian Navy as well as a towed torpedo decoy.

### **Other projects**

These have included indigenisation of various components (for instance, adsorbent material for submarines, radar components, naval ship signature reduction efforts and materials technology). DRDO has played a significant role in the development of warship grade steel in India and its productionisation. DRDO has also assisted private industry in developing EW trainers, ship simulators for training and health monitoring systems for onboard equipment. Other equipment for the Navy includes underwater telephone sets, and VLF communication equipment, for the Navy's submarines. DRDO's IRDE has also developed optronic fire control systems for the Navy's and the Coast Guard's ships.

### **Information command and control systems**

DRDO's labs have been part of projects to develop sophisticated command and control systems for the Navy, such as the EMCCA (Equipment Modular for Command and Control Application) which ties together various sensors and data systems. The EMCCA system gives commanders on the ship a consolidated tactical picture and adds to the ship's maritime combat power.

DRDO labs are also engaged in supporting the Navy's ambitious naval enterprise wide networking system, a programme to link all naval assets together via datalinks, for sharing tactical information.

### **Mines and targets**

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Three kinds of mines, processor based mine, moored mine and processor based exercise mine are in production for the Navy. Targets developed for the Navy include a static target called the Versatile Acoustic target and a mobile target called the programmable deep mobile target (PDMT).

#### **In development**

- A Submarine Escape set, used by crew to escape from abandoned submarines. The set consists of breathing apparatus and Hydro-suit.
- New generation Sonars and EW equipment.
- Heavyweight torpedoes, underwater remotely operated vehicles, improved signature reduction technology for naval applications.

## **MISSILE SYSTEMS**

### **Integrated Guided Missile Development Programme (IGMDP)**

#### **Main article: Integrated Guided Missile Development Programme**

The IGMDP was launched by the Indian Government to develop the ability to develop and design a missile locally, and manufacture a range of missile systems for the three defence services. The programme has seen significant success in its two most important constituents – the Agni missiles and the Prithvi missiles, while two other programmes, the Akash SAM and the anti-tank Nag Missile have seen significant orders. The Trishul missile, a programme to develop a tri-service short-range SAM faced persistent problems throughout its development, and was shut down in 2007.

#### **Prithvi ballistic missiles**

The Prithvi (Earth) missiles are a range of SRBMs produced for the Indian Air Force and Army; a variant for the Navy has been deployed on Sukanya class patrol vessel. Another submarine-launched variant known as the K-15 is under development. The Prithvi is an extremely accurate liquid fuelled missile with a range of up to 350 km. While relatively inexpensive and accurate, with a good payload, its logistics footprint is high, on account of it being liquid fuelled.

#### **Agni ballistic missiles**

Main article: Agni (missile)

The Agni (Fire) ballistic missiles are a range of MRBMs, IRBMs, ICBMs meant for long-range deterrence. The Agni-III is the newest version which is getting inducted into the armed forces and has range of up to 3,500 km (2,175 mi). The Agni-I and Agni-II have been productionised, although exact numbers remain classified.

First trials of the Agni-III saw problems and the missile test did not meet its objectives. The second test was successful. Further tests of the Agni-III are planned to validate the missile and its subsystems, which include new propellant and guidance systems, a new reentry vehicle and other improvements.

The Agni-V missile is an Intercontinental ballistic missile meant for long-range deterrence. The Agni-V is the newest version and has the longest range of up to 5000–6000 km. Agni-V would also carry Multiple independently

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targetable reentry vehicle payloads and will have countermeasures against Anti-ballistic missile systems. It was successfully test fired on 19 April 2012.[72] The missile will utilise a canister and will be launched from it. Sixty percent of the missile will be similar to the Agni-III missile. Advanced technologies like ring laser gyroscope and accelerometer will be used in the new missile.[73] DRDO plans to develop reusable missiles which will be a combination of ballistic and cruise missile technology. During an interview in August 24, 2014, The DRDO chief disclosed the plans of DRDO designing a Long Range ballistic Anti-Ship missile.

### **Akash SAM**

The Akash (Sky or ether) is a medium-range surface-to-air missile system consisting of the command guidance ramjet powered Akash along with the dedicated service specific launchers, battery control radar (the Rajendra Block III), a central acquisition radar, battery and group control centres. The Akash project has yielded spinoffs like the Central Acquisition radar and weapon locating radar.

The Akash system cleared its user trials with the Indian Air Force in 2007. The user trials had the Akash intercept flying targets at ITR, Chandipur. The Akash missile successfully hit its targets in all of the tests. The Indian Air force has since been satisfied with the performance of the missile and ordered two squadrons of the Akash, with a squadron having eight launchers.

The Indian Air Force placed an order for an additional six squadrons of the Akash SAM in 2010, with an order of 750 missiles (125 per squadron). This order makes a total of a 1000 Akash SAMs on order for the Indian Air Force for eight squadrons. In June 2010, the Defence Acquisition Council placed an order of the Akash missile system, valued at ₹12,500 crore (US\$1.7 billion). Bharat Dynamics Limited will be the system integrator and nodal production agency for the Akash Army variant.

### **Trishul SAM**

Main article: Trishul (missile)

The Trishul (Trident) is a short range surface-to-air missile developed by India. It was developed by Defence Research and Development Organisation as a part of the Integrated Guided Missile Development Program. It can also be used as an anti-sea skimmer from a ship against low flying attacking missiles. Trishul has a range of 9 km (5.6 mi) It is powered by a dual thrust propulsion stage using high-energy solid propellant. Trishul weighs 130 kg (290 lb) and is capable of carrying a 15 kg (33 lb) warhead.

The Trishul missile project was commissioned in 1983 as a part of Integrated Guided Missile Development Program. The project was to be completed by 1992 and the missile would be fitted to Brahmaputra-class frigates as an anti-sea skimmer. In 1985, Trishul made its first unguided flight from Satish Dhawan Space Centre, Sriharikota. The missile made its first full range guided flight in 1989. In 1992, the missile was successfully tested against a target and reached Mach 2 speed.[81] In 1997, the associated radar systems for detecting the incoming sea-skimmer were operational. The launch system was developed by Bharat Dynamics Limited in 1998.[81] In 2003, Government of India announced that the missile will be a technology demonstrator and de-linked it from other projects. The missile was successfully test fired in 2005. The development cost of the programme was ₹2.826 billion (US\$39 million) and the Defence minister announced the official closure of the programme in 2008.

### **Nag anti-tank missile**

Main article: Nag (missile)

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The Nag Anti-tank missile (Cobra) is a guided missile system intended for the Indian Air Force and the Indian Army. The Army will deploy the Nag on ground-based launchers and from helicopters, whereas the Air Force will rely on helicopter based units. The Nag has an Imaging Infrared (IIR) seeker and has a top and direct attack capability, with a tandem warhead. The Army's land missile carrier and launcher, known as the Namica, carries several ready to use Nag missiles within and four Nag missiles in an extendable launcher above the turret. The Namica has its own FLIR based sighting and fire control unit.

The Air Force and Army will also use their Advanced Light helicopters (ALH) (HAL Dhruv) and the HAL Light Combat Helicopter (LHC) as Nag carriers. The ALHs will be equipped with IRDE (DRDO) developed HELITIS (Heliborne Imaging and Targeting systems) with a combination of a FLIR and laser range finder in a stabilised turret for target acquisition and designation. The thermal imager is likely to be imported, but the gimballed turret, stabilisation, laser range finder and associated electronics have been designed in India and will be manufactured locally. The Nag ATGM is regarded as a highly capable missile, even though its development has been protracted, mainly due to the technological challenges of developing a state of the art IIR sensor equipped top attack missile. The Nag is still cheaper than most imported missiles in its category and is earmarked for the Army and Air Force.

The Nag anti-tank guided missile was cleared for production in July 2009 and there are uncorroborated reports since that it may be purchased by Tanzania, Botswana and Morocco. The Nag will complement the existing Russian 9M113 Konkurs Anti-tank guided missile and European missile MILAN in Indian usage, both of which are manufactured under licence by Bharat Dynamics Limited.

### **Brahmos missile**

#### **Main article: BrahMos**

Launched as a joint venture between India's DRDO and the Russian NPO, the BrahMos programme aims at creating a range of missile systems derived from the Yakhont missile system. Named the "BrahMos" after the Brahmaputra and the Moskva rivers, the project has been highly successful.

The Indian Navy has ordered the BrahMos Naval version, both slant-launched and vertically launched, for its ships; the Indian Army has ordered two regiments worth of land-launched missiles for long-range strike; and an air-launched version is in development for the Indian Air Force's Su-30 MKIs and the Navy's Tu-142 long-range aircraft.

The DRDO has been responsible for the navigational systems on the BrahMos, aspects of its propulsion, airframe and seeker, plus its Fire Control Systems, Mobile Command posts and Transporter Erector Launcher.

#### **Main article: BrahMos-II**

The hypersonic Brahmos 2 is to be developed as a follow on to the original Brahmos. The missile would fly at speeds of 5-7 Mach.

#### **BrahMos I Block-III**

An upgraded version of the 290 km range BrahMos supersonic cruise missile was successfully test fired by India on 2 December 2010 from Integrated Test Range (ITR) at Chandipur off the Orissa coast.

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"Block III version of BrahMos with advanced guidance and upgraded software, incorporating high manoeuvres at multiple points and steep dive from high altitude was flight tested successfully from Launch Complex III of ITR," its Director S P Dash said after the test fire from a mobile launcher at 1100 hours. The 8.4-metre missile which can fly at 2.8 times the speed of sound is capable of carrying conventional warheads of up to 300 kg for a range of 290 km.

It can effectively engage ground targets from an altitude as low as 10 metres for surgical strikes at terror training camps across the border without causing collateral damage. BrahMos is capable of being launched from multiple platforms like submarine, ship, aircraft and land based Mobile Autonomous Launchers (MAL). The Block III BrahMos has the capability of scaling mountain terrain and can play a vital role in precision strike in the northern territories. The advanced cruise missile can fly close to the rough geographies and kill the target. A five-year development timeframe is anticipated.

### **Shaurya**

#### **Main article: Shaurya (missile)**

The Shaurya missile (Valor) is a canister-launched hypersonic surface-to-surface tactical missile developed by the Indian Defence Research and Development Organisation (DRDO) for use by the Indian Armed Forces. Similar to the BrahMos, Shaurya is stored in composite canisters, which makes it much easier to store for long periods without maintenance as well as to handle and transport. It also houses the gas generator to eject the missile from the canister before its solid propellant motors take over to hurl it at the intended target.

Shaurya missiles can remain hidden or camouflaged in underground silos from enemy surveillance or satellites till they are fired from the special storage-cum-launch canisters. The Shaurya system will require some more tests before it becomes fully operational in two-three years. Moreover, defence scientists say the high-speed, two-stage Shaurya has high maneuverability which also makes it less vulnerable to existing anti-missile defence systems.

It can be easily transported by road. The missile, encased in a canister, is mounted on a single vehicle, which has only a driver's cabin, and the vehicle itself is the launch platform. This "single vehicle solution" reduces its signature – it cannot be easily detected by satellites – and makes its deployment easy. The gas generator, located at the bottom of the canister produces high pressure gas, which expands and ejects the missile from the tube.

The centrepiece of a host of new technologies incorporated in Shaurya is its ring laser gyroscope (RLG) and accelerometer. The indigenous ring laser gyroscope, a sophisticated navigation and guidance system developed by the Research Centre Imarat (RCI) based in Hyderabad is a highly classified technology.

In test flights the RLG functioned exceptionally well. The RLG monitors the missile's position in space when it is flying. The missile's on-board computer will use this information and compare it with the desired position. Based on the difference between the missile's actual and desired positions, the computer will decide the optimum path and the actuators will command the missile to fly in its desired/targeted position. The third test of the RLG was successful on 24 September 2011, reaching a speed of 7.5 mach. It is now ready for production.

### **Sagarika**

#### **Main article: Sagarika (missile)**

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The K-15 Sagarika is a nuclear-capable submarine-launched ballistic missile belonging to the K Missile family with a range of 750 kilometres (466 mi). Sagarika can carry a payload of up to 500 kilograms (1,102 lb). Sagarika was developed at the DRDO's missile complex in Hyderabad.

This missile will form part of the triad in India's nuclear deterrence, and will provide retaliatory nuclear strike capability. The development of this missile (under the title Project K-15) started in 1991. The Indian government first confirmed Sagarika's development seven years later (1998), when the then Defence Minister, George Fernandes, announced it during a press conference.

The development of the underwater missile launcher, known as Project 420 (P420), was completed in 2001 and handed over to the Indian Navy for trials. The missile was successfully test fired six times, and tested to its full range up to three times. The test of missile from a submerged pontoon was conducted in February 2008.

Sagarika is being integrated with India's nuclear-powered Arihant class submarines that began sea trials on 26 July 2009.

**Sudarshan**

**Main article: Sudarshan laser-guided bomb**

India's first laser-guided bomb, Sudarshan is the latest weapon system developed indigenously to occupy the niche of a precision delivery mechanism. It can be fitted to a 1000-pound gravity bomb and can guide it to the target using lasers with a CEP (Circular Error Probability) of 10 metres.

**DRDO Glide Bombs**

**Main article: DRDO Glide Bombs**

Garuthmaa & Garuda are DRDO's 1000 kg Glide Bombs. These are India's first indigenously designed Glide Bomb with a range of 30 km (Garudaa) to 100 km (Garuthmaa).

**Prahaar Missile**

**Main article: Prahaar (missile)**

Prahaar is a solid-fueled surface-to-surface guided short-range tactical ballistic missile developed by DRDO of India. It would be equipped with omni-directional warheads and could be used for hitting both tactical and strategic targets. It has a range of about 150 km. It was test-fired successfully on 21 July 2011 from the Integrated Test Range (ITR) at Chandipur.

**LABORATORY NAME**

<b>Laboratory Name</b>	<b>Location</b>	<b>Area of Research</b>
Advanced Numerical Research and Analysis Group (ANURAG)	Hyderabad	Computational System
Advanced Systems Laboratory (ASL)	Hyderabad	Missiles and Strategic Systems
Aerial Delivery Research and Development Establishment (ADRDE)	Agra	Parachutes and Aerial Systems
Aeronautical Development Establishment (ADE)	Bangalore	Aeronautics
Armaments Research and Development Establishment (ARDE)	Pune	Armaments
Centre for Airborne Systems (CABS)	Bangalore	Air-Borne Systems
Centre for Artificial Intelligence and Robotics (CAIR)	Bangalore	Artificial Intelligence and Robotics

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Centre for Fire, Explosives and Environment Safety (CFEES)	Delhi	Explosives
Centre for High Energy Systems and Sciences (CHESS)	Hyderabad	High Energy Weapons
Combat Vehicles Research and Development Establishment (CVRDE)	Chennai	Combat Vehicles
Defence Avionics Research Establishment (DARE)	Bangalore	Avionics
Defence Bio-engineering and Electro-medical Laboratory (DEBEL)	Bangalore	Bio-engineering
Defence Electronics Applications Laboratory (DEAL)	Dehradun	Electronics and Communication Systems
Defence Electronics Research Laboratory (DLRL)	Hyderabad	Electronic Warfare
Defence Food Research Laboratory (DFRL)	Mysore	Food Research
Defence Institute of Bio-Energy Research (DIBER)	Haldwani	Bio-Energy
Defence Institute of High Altitude Research (DIHAR)	Leh	High Altitude Agro-animal Research
Defence Institute of Physiology and Allied Sciences (DIPAS)	Delhi	Physiology
Defence Institute of Psychological Research (DIPR)	Delhi	Psychological Research
Defence Laboratory (DL)	Jodhpur	Camouflaging and Isotopes
Defence Materials and Stores Research and Development Establishment (DMSRDE)	Kanpur	Textiles, Polymers and Composites
Defence Metallurgical Research Laboratory (DMRL)	Hyderabad	Metallurgy
Defence Research and Development Establishment (DRDE)	Gwalior	Chemical and Biological Warfare
Defence Research and Development Laboratory (DRDL)	Hyderabad	Missile and Strategic Systems
Defence Research Laboratory (DRL)	Tezpur	Health and Hygiene
Defence Terrain Research Laboratory (DTRL)	Delhi	Terrain Research
Electronics and Radar Development Establishment (LRDE)	Bangalore	Radars
Gas Turbine Research Establishment (GTRE)	Bangalore	Gas Turbine
High Energy Materials Research Laboratory (HEMRL)	Pune	High Energy Materials
Institute of Nuclear Medicines and Allied Sciences (INMAS)	Delhi	Nuclear Medicine
Instruments Research and Development Establishment (IRDE)	Dehradun	Electronics and Optical Systems
Integrated Test Range (ITR)	Balasure	Missile Testing
Joint Cipher Bureau (JCB)	Delhi	Cipher Systems
Laser Science and Technology Centre (LASTEC)	Delhi	Laser Technology
Microwave Tube Research and Development Centre (MTRDC)	Bangalore	Microwave Devices
Naval Materials Research Laboratory (NMRL)	Ambarnath	Naval Materials
Naval Physical and Oceanographic Laboratory (NPOL)	Kochi	Sonar Systems
Naval Science and Technological Laboratory (NSTL)	Visakhapatnam	Underwater Weapons
Proof and Experimental Establishment (PXE)	Balasure	Armament Testing
Research and Development Establishment (Engrs) (RandDE[E])	Pune	Engineering Systems and Weapon Platforms
Research Centre Imarat (RCI)	Hyderabad	Missile and Strategic Systems
Scientific Analysis Group (SAG)	Delhi	Cryptology
Snow and Avalanche Study Establishment (SASE)	Chandigarh	Snow and Avalanche
Solid State Physics Laboratory (SSPL)	Delhi	Solid- State/ Semiconductor

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		Materials
Terminal Ballistics Research Laboratory (TBRL)	Chandigarh	Ballistics
Vehicles Research and Development Establishment (VRDE)	Ahmednagar	Wheeled Vehicles

**CMT REPORT (Corruption, Money Laundering & Terrorism]**

The Public Notice information has been collected from various sources including but not limited to: **The Courts, India Prisons Service, Interpol, etc.**

**1] INFORMATION ON DESIGNATED PARTY**

No records exist designating subject or any of its beneficial owners, controlling shareholders or senior officers as terrorist or terrorist organization or whom notice had been received that all financial transactions involving their assets have been blocked or convicted, found guilty or against whom a judgement or order had been entered in a proceedings for violating money-laundering, anti-corruption or bribery or international economic or anti-terrorism sanction laws or whose assets were seized, blocked, frozen or ordered forfeited for violation of money laundering or international anti-terrorism laws.

**2] Court Declaration :**

No records exist to suggest that subject is or was the subject of any formal or informal allegations, prosecutions or other official proceeding for making any prohibited payments or other improper payments to government officials for engaging in prohibited transactions or with designated parties.

**3] Asset Declaration :**

No records exist to suggest that the property or assets of the subject are derived from criminal conduct or a prohibited transaction.

**4] Record on Financial Crime :**

Charges or conviction registered against subject: **None**

**5] Records on Violation of Anti-Corruption Laws :**

Charges or investigation registered against subject: **None**

**6] Records on Int'l Anti-Money Laundering Laws/Standards :**

Charges or investigation registered against subject: **None**

**7] Criminal Records**

No available information exist that suggest that subject or any of its principals have been formally charged or convicted by a competent governmental authority for any financial crime or under any formal investigation by a competent government authority for any violation of anti-corruption laws or international anti-money laundering laws or standard.

**8] Affiliation with Government :**

No record exists to suggest that any director or indirect owners, controlling shareholders, director, officer or employee of the company is a government official or a family member or close business associate of a Government official.

**9] Compensation Package :**

Our market survey revealed that the amount of compensation sought by the subject is fair and reasonable and comparable to compensation paid to others for similar services.

**10] Press Report :**

No press reports / filings exists on the subject.

**CORPORATE GOVERNANCE**

MIRA INFORM as part of its Due Diligence do provide comments on Corporate Governance to identify management and governance. These factors often have been predictive and in some cases have created vulnerabilities to credit deterioration.

Our Governance Assessment focuses principally on the interactions between a company's management, its Board of Directors, Shareholders and other financial stakeholders.

**CONTRAVENTION**

Subject is not known to have contravened any existing local laws, regulations or policies that prohibit, restrict or otherwise affect the terms and conditions that could be included in the agreement with the subject.

**FOREIGN EXCHANGE RATES**

Currency	Unit	INR
US Dollar	1	INR 72.80
UK Pound	1	INR 94.88
Euro	1	INR 84.37

**INFORMATION DETAILS**

<b>Information Gathered by :</b>	TEJ
<b>Analysis Done by :</b>	VIVR
<b>Report Prepared by :</b>	SUJ

**SCORE FACTORS**

DEMERIT POINTS		
--BANK CHARGES	YES/NO	NO
--LITIGATION	YES/NO	NO
--OTHER ADVERSE INFORMATION	YES/NO	NO
MERIT POINTS		
--SOLE DISTRIBUTORSHIP	YES/NO	NO
--EXPORT ACTIVITIES	YES/NO	NO
--AFFILIATION	YES/NO	NO
--LISTED	YES/NO	NO
--OTHER MERIT FACTORS	YES/NO	YES

**RATING EXPLANATIONS**

Credit Rating	Explanation	Rating Comments
A++	Minimum Risk	Business dealings permissible with minimum risk of default
A+	Low Risk	Business dealings permissible with low risk of default
A	Acceptable Risk	Business dealings permissible with moderate risk of default
B	Medium Risk	Business dealings permissible on a regular monitoring basis
C	Medium High Risk	Business dealings permissible preferably on secured basis
D	High Risk	Business dealing not recommended or on secured terms only
NB	New Business	No recommendation can be done due to business in infancy stage
NT	No Trace	No recommendation can be done as the business is not traceable

NB is stated where there is insufficient information to facilitate rating. However, it is not to be considered as unfavourable.

This score serves as a reference to assess SC's credit risk and to set the amount of credit to be extended. It is calculated from a composite of weighted scores obtained from each of the major sections of this report. The assessed factors are as follows:

- Financial condition covering various ratios
- Company background and operations size
- Promoters / Management background
- Payment record
- Litigation against the subject
- Industry scenario / competitor analysis
- Supplier / Customer / Banker review (wherever available)

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