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भारत सरकार

GOVERNMENT OF INDIA

कार्मिक, लोक शिकायत तथा पेंशन मंत्रालय

MINISTRY OF PERSONNEL, PUBLIC GRIEVANCES & PENSIONS

पेंशन एवं पेंशनभोगी कल्याण विभाग

DEPARTMENT OF PENSION & PENSIONERS' WELFARE

**ANUBHAV**  
**2020**



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**AMIT MAZUMDAR ,  
DRTC ,TECHNICAL OFFICER C**

Name of the Project: Development of Micro-controller based electronics system for extension of operability length of control cable of the remote control unit to Leica Tracking Camera upto 2

Introduction: The Camera Model R6.2 Leica is versatile mechanical SLR still camera and fitted with remote camera operation consisting of three parts: (1) Leica model R6.2 camera,

(2) Camera control unit-the unit controls the camera as per the signals from remote control unit and

(3) RC Leica R remote controller-the operator can remotely program this unit to control the shutter from a distance of 100 meters.

The PCB is fully populated circuit function as a master unit consists of (1) separate PCB for keyboard unit, (2) separate PCB for multiplexed display unit and (3) power supply with charger unit directly integrated to in. rnk PCB.

Limitation of the present controller is even with 4 nos (25 meter each) extension cable supplied with the system the distance covered is only 100 meters and the camera would malfunction if more than four cables are attached. For convenience it was decided to operate the camera at least from a distance of 1 km or above, since it Wi-Fi be deployed to cover real time mission. The problem was communicated to the manufacturer but they could not suggest any solution with the existing module. It was decided to design a new remote control module to extend the operability range upto 2 km without disturbing the camera electronics.

Developed design: First, the circuit diagram of the present Leica R remote controlled was done for ease of analyzing the signal flow. A microcontroller based unit fitted to the camera and capable of doing all the function available with the Leica R was designed. The unit consists of RS-485 communication port. The microcontroller based remote control unit was designed which programmed the slave unit through RS-485 serial port from a distance location. The function keys and the display unit were incorporated inside the master unit to program and keep track of operation completed by the slave unit. The two wire full duplex RS-485 serial communication bus is chosen to extend the operation length and also to control more than one slave unit with one master unit. The operation of the developed system deployed to the remotely operated camera has two optional function: (1) Normal mode exposures are directly taken by pressing the exposure switch (as shown in attached diagram of Leica remote block in Appendix-B).

Every time the master controller is switched on the unit directly goes into the normal mode.

(2)Timer -exposure is controlled automatically and interval &tween the exposure is programmed before the start of particular operation Five program switches in front of master controller unit are multiplexed to function in different manner in normal and timer mode operation.

Since no service manuals and circuit diagrams were available with the Leica R6.2 camera the whole reverse engineering was conducted at ITR, Balasore to complete the project and make it functional within the stipulated time period. At present the system is fully operational in different launch pads of ITR Balasore for real time mission coverage.

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**CH PATIL ,  
DRTC ,TECHNICAL OFFICER C**

I have been assigned various tasks ranging from Fuze component manufacturing to configuration design, 3D modelling and testing.

I was posted to fuze facility in the beginning of my career at ARDE. The fuze facility was created to precision components and testing of sub assembly of Fuzes. It was a great experience to work in Fuze manufacturing facility as it has laid down the foundation of my work not only about manufacturing aspects from raw material selection for components to finishing of components.

After getting good exposure on Fuze manufacturing aspects. I was sent to basic armament course. There I have learnt what the user wants from us.

After learning Basic armament course, I started to work on Design and Development of different fuzes. I am happy that I have learnt a lot about fuzes as I was involved from configuration design to testing of many fuzes.

I was assigned to work on configuration of design of various fuzes. Some Of them are . Electronic Time Fuzes for 122mm, Pinaka, Anti-submarine Rocket, Aircraft Bomb and 155mm Gun Ammunition; Proximity for Pinaki Rocket, Aircraft Bomb and Mortar Fuses.

I also got opportunity to work on stiller gun fuses. I have prepared 3D models drawings for fuse of 105 & 155mm Gun Ammunitions. These Fuzes are different as they are point Detonating and Dela fuses I also got opportunities to work on influence fuze for Adrushya Mine Mark II.

Recently I got an opportunity to develop a fuze which can help to save lives of our soldiers who work at high altitude areas. The avalanches happened in some parts of India takes lives of our beloved soldiers every year. The artificially triggered avalanche initiation at the early stage is desired to avoid them. I actively participated in preparing models, hardware and on testing of prototypes on this Fuze.

I have also carried out Inspection and Tests of components, sub assemblies, assemblies of Fuzes. I prepared Fuzes for various Static & Dynamic trials. Attended the trials at different ranges at Balasors, Ahmednagar, Pokhran, Itarsi, and Mohou.

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**DR.(MR.) GADGIL S B ,  
DRDS ,SCIENTIST H**

During the course of approximately 37 years of service, I have contributed to the design, development and deployment of electro-optical and imaging infrared (IIR) seekers, RF seekers and flight instrumentation systems, in various grades starting from Scientist-B to Scientist-H, and guided teams of scientists and engineers in various capacities as Divisional Head, Technology Director and Associate Director at RCI, Hyderabad. Following is a brief description of my major technical contribution.

1. Laser Seeker: Contributed to the development of a semi active laser seeker for anti tank application as part of a development project. A seeker prototype was demonstrated in field.
2. TV Tracker System: Contributed to the development of a TV Tracking System for the purpose of guiding a short range surface to air missile. Engineering model was developed and demonstrated during missile flights.
3. IIR seeker: Contributed to the development and evaluation of IIR seeker in a phased manner leading to the successful development of flight worthy seekers. These seekers could be established through missile flight trials. IIR seeker technology is being currently employed for various guided missile missions very effectively.
4. IIR Seeker Test & Evaluation Facility: Conceived and commissioned an IIR Seeker Test and Evaluation facility at RCI as a part a Technology Demonstration (TD) project. The facility is equipped with necessary infrastructure, equipment, tools and systems for testing / evaluation of all seeker subsystems and evaluation of the integrated seeker. This facility is being extensively used currently for seeker development for various guided missions.
5. Indigenisation Of IR Domes: Initiated and successfully completed development of IR domes for IIR seekers in partnership with ARCI, Hyderabad. IR Dome working in both the LWIR and the MWIR regions were developed. Zinc sulphide IR domes based on this technology are currently being produced at BEL, Bangalore.

6. RF Seekers: As Associate Director, RCI supervised and guided teams of engineers for the development of variety RF seekers working in Ku, X and W band of operation. Ku band seekers have been successfully demonstrated during missile flights.

7. Flight Instrumentation: Guided a team of engineers for development and timely delivery of flight instrumentation packages consisting of sensors, SCPs, PCM encoders, transmitters, tele command systems, transponder systems and antenna systems for all the projects and programs of the missile complex as Technology Director, Flight Instrumentation at RCI.

8. Secure Data Links: Initiated and successfully completed development of Secure Data Links for various projects and program in partnership with BEL, Bangalore and SAMEER, Kolkata. Data link systems are currently being evaluated in various guided missile flights.

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**MR. GOKHALE N M ,  
DRDS ,SCIENTIST G**

During past 32 years I have been working for progressing project activities in the field of structural and functional ceramics and in the recent past, for the last 3 years I have provided progress of R & D activities on Protective Technologies for Indian Navy and ATVP. In addition to the scientific activities I have also provided managerial support all over the years towards various administrative activities of the establishment.

**As Scientist in Ceramics Division and HOD Ceramics wef Nov 2007 to Jan 2016**

In this capacity I have developed 3-3 piezocomposites, Zirconia powders and ceramics, Zirconia Toughened Alumina (ZTA) powders and ceramics, Magnesium Aluminate Spinel Ceramics, Solid Oxide Fuel Cell(SOFC) and 1-3 piezocomposites. The ZTA ceramic - polymer composite armor panel with weight less than 2 kg with multi hit with standing capability against 5.56 mm, AK47 d7.62 bullets was developed and successfully tested. ZTA ceramic vehicle armor panels were useful in successfully stopping 7.62 mm AP, 12.7 mm AP and 14.5 mm AP ammunitions (with Areal Density 43 kg/m<sup>2</sup>, Areal Density 65 kg/m<sup>2</sup> and with Areal Density 100 kg/m<sup>2</sup> respectively).

Yttria Stabilized Zirconia (YSZ) powders, Ni-YSZ Cermet and Strontium doped Lanthanum Manganite developed under my guidance are being used as electrolyte and electrodes for Solid Oxide Fuel Cell(SOFC) being developed under DRDO project NMR 246.

Magnesium Aluminate Spinel Ceramics having optical transparency >85% and Hardness 12-13 GPa was successfully developed under my guidance. This transparent ceramics has application as Transparent Vehicle Armour in defence vehicles. The composite panel consisting of spinel ceramics as front layer backed by glass and polycarbonate lining successfully stopped 7.62 mm AP ammunition.

I have guided the process of identification of vendors for ToT and ensured ToT for bulk suction of 1-3 Piezocomposites for application in transducers for underwater detection of ships submarines.

**As HOD Protective Technology wef Jan 2016 to 31 May 2019**

I have carried out duties of Head Protective Division from Jan 2016 till date of superannuation i.e. 31 May 2019. In this capacity I have guided a team of Scientists, DRTC Officers & Staff for progressing various DRDO and ATPV project activities, provide technical support to Indian Navy for Corrosion Protection using paints/coatings, ICCP System and Sacrificial Anodes. have also guided the Division for conducting User (Indian Navy) trials for the following products

1. Self Cleaning Coating
2. Underwater Coating
3. Hydrophobic Potting Compound for cofferdam electrodes
4. Deck Overlay Coating

I have also guided Protective Technology Division for Transfer of Technology (ToT) of the following products to private industries.

- ▶
- ▶ Heavy Duty Non Skid Coatings- F-rest Tod to new Vendors
- ▶ Solvent Free Anti Corrosive Coating- Fresh ToT to new Vendors
- ▶ Intumescent Fire Retardant Coating-Renewal of ToT
- ▶ Coating for application in submerged conditions- Fresh ToT, LAToT pending
- ▶ Peelable Coating- Fresh ToT, LAToT pending
- ▶ Zinc Sacrificial Anode- Fresh ToT
- Aluminium Alloy Sacrificial Anode - Fresh ToT

(b) As a Team Member

1. Development of nanocrystalline Zirconia Powders and Sintered Ceramics.
2. Development of Armour Ceramics and Composite Armour.
3. Development of Piezocomposite Transducer Elements for Diversified. Naval Applications.
4. Development of Piezoelectric materials.

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**MR. HARI SINGH ,  
DRTC ,TECHNICAL OFFICER C**

I am associated with Avalanche Forecasting Group (AFG) from the very beginning I joined SASE and hence I have a valuable experience of 35 years in the field of weather and avalanche forecasting. Weather and Avalanche forecasting is a challenging job. Accurate weather and avalanche prediction can save the loss of human life and property of the people deployed/residing in the snow bound region of Himalaya.

During my early service i.e. for the first ten years, I was detailed to carry out snow and avalanche studies in the Siachen Glacier where I made valuable contribution in terms of establishing of forward snow-met observatories in highly inhospitable condition and predicting avalanches. I was actively involved in the Gald atudiee and have collected very valuable data during my deployment in the forward areas/observatories, which has been used for the development of various weather and avalanche models. I was the first person to carry out the route alignment of Gynngla and Korrisa glacier and identified avalanches and crevaaeaa in Gyongla, Layogma and Urdolep Glaciers. By virtue of being in the Glacier many times, I have carried out intense study of Natural Hazards of Glacier and have made valuable contribution in this direction. I have also imparted training to troops in avalanche safety and rescue method9 and have conducted various training workshops for the benefit of troops at the forward locations of Siachen Glacier.

From the mid nineties I was deployed in various forward observatories of Kashmir Valley and made valuable contribution in the field of snow and avalanches by conducting ground and aerial reconnaissance of various axis of Kashmir valley and by Issuing accurate weather and avalanche forecasting to troops deployed in the snow bound regions of Kashmir.

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**MR. J K RANJIT ,  
DRDO(A&A) ,MEDICAL ATTENDANT**

Job- I worked as Medical Assistant from 25-7-2002 to till date I have got full job satisfaction.

I have rendered selfless service to the Employees of ITR Day & Night as and when called by authority even on holidays. Carried serious Patients to Cuttack, Bhubaneswar very often with full attentiveness and sincerity. During mission time, I cover the medical help round the clock.

Problem:- During dressing and stitching to Patient at ITR Health care centre we face problems due to want of Shadeless Light. I have brought this fact before the Director as well as Grap Head Medical officer. But this is not done till date. I request the authority to look into this Sincerely and provide the light system Urgently. Purchase of Medicines from open market.

At Present all the medicines required for ITR Health care centre are Purchased from market through tendership which is costly. If the medicines are Purchased through Central Goverment supply JANA AUSADHI. That will cost very less amount which will give financial benefit to our organisation.

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**Nishit Kumar Jain**  
**Scientist 'F'**  
**ISSA/ORDO, Metcalfe House**

A study was undertaken for the analysis of Nuclear deterrence using Game Theoretic approach. What sort of threats (if any) is credible and will deter a first strike. What threatened level of punishment is optimal in deterring aggression? Under what conditions threatened level of retaliation should be less than proportional, proportional and more than proportional. In case attack has occurred can both sides entertain only a move to final disastrous outcome or is there possibility both sides can revert to the initial cooperative outcome before deterrence fails. Is it rational to retaliate with the threatened level if the deterrence fails? A two person, non constant sum "Threat game" which is based on chicken game and allows quantitative choices and the possibility of retaliation is analyzed. Strategy of limited retaliation is analyzed for finding out - How much to retaliate if the adversary has attacked and killed some population so that deterrence is restored. A tool to determine number of nuclear missiles required to initiate attack/deter adversary in nuclear war scenarios. Developed Mathematical models for the Analysis of Nuclear War Scenarios between two countries. This paper presents an analysis of nuclear.

War scenarios between two countries. The scenarios considered in this paper are based on the assumption that opponent's nuclear missiles locations are not known to both the countries. Further, the effects of availability of Anti-Missiles (i.e. surface to Air Missiles) on both sides have also been analyzed. For the analysis models have been developed using differential equations. A future military planning for national Security — A Game Theoretic Approach. This paper identifies an "Exploitation" phase of war and discusses two end results of this phase. It is shown how war can be avoided and a hospitable environment can be built up. Two paths emerging out from exploitation phase are discussed in detail. One path emerges from acceptance of exploitation and other emerges from resisting the exploitation. Prisoner's dilemma game is introduced with a view to provide awareness and strength of Prisoner's Dilemma Technique for evolving co-operation and avoids the chance of war between two nations. It is shown how a strategy Tit-for-Tat establishes itself in this world of egoist. It is hoped that the planning of exploitation phase will have a bearing for future military requirement for the battle in preparing our nation to meet the challenge of national security.

A study was carried out for evaluation of trade among Regional Security Alliance(RSA) with a view to explore the feasibility of increasing trade among proposed RSA countries. It is seen that RSA countries are importing commodities from European and other countries, which are available within RSA countries, and exporting commodities to European and other countries for which demand exists within RSA. Thus, members of RSA countries are trading significant part of their commodities to Rest of World (world less RSA) for which sufficient market among RSA is available. It is required that members of RSA countries should be brought close to each other so that co-operation is evolved among them and they feel concerned about the welfare of the members of the alliance.

Was involved in Reliability analysis of Missiles and MINT Arjun. Designing Test Programs for Reliability Demonstration of Weapon Systems. Estimation of Environmental Factor for reliability Assessment in different Environment.

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**JOSEPH GEORGE ,  
DRTC ,TECH OFFICER C**

I joined ARDE on 18 Jan 1983. I started working in weapon group. During my service tenure of 36 years and 5 months, I have been assigned various tasks, ranging from preparation of drawing of components, assemblies & layout. I have been involved in procurement process, liaison with vendors and MMD. Assisted in assembling of various guns and was a team member of various firing trials. I have been assigned to work on different guns, Pinaka Mk-II rocket and a challenging job as Manager of CSD canteen for five years. I would like to share my experience through which I have grown in ARDE, Pune.

I was posted to weapon group in the beginning of my career at ARDE. The group at that time was working on project "SHARPSHOOTER". I have also worked on 30/80 external powered gun, and 30/80 gas operated gun. The study of AK 6-30 Russian gun was taken by this group. I have prepared different design layout and manufacturing drawings for gun system and was involved in prototype manufacturing, inspection assembly and firing trials of the gun. It was a great experience to work with weapon group as it had laid down the foundation of my work. I learnt a lot about different types of working principles of guns. I was also able to team mechanism like loading, ramming, firing, extraction and ejection of the round at great speed of 4200 rounds per minute.

Initially worked with T Square & set square on board. Then on drafting machine, later on computer using AutoCAD and solid modeling software. Learning and working on 2D drawing and 3D modelling on computer was a great experience. I was fortunate to visit other establishments to study various guns available there. This knowledge was incorporated in developing new systems in ARDE.

I have also led a team to dismantle BER (Beyond Economical Repair) ammunition at ARDE range which was risky job. These ammunition were kept in store after its life expired and was a threat to range. With the support of other team members & guidance from my superiors I have carried out this operation successfully.

Rocket propulsion After some years gun group was abolished and was merged with rocket propulsion group. For the propulsion group I have worked on 214 mm Pinaka Mk-I rocket and ER pinaka Mk-II, I also got an opportunity to work at GMC of

Associated Director. Technique of liaison and coordination with other groups and senior officers was learnt by me. It was a great experience to know how to work with senior officers.

### **CSD Canteen**

I worked as Manager of ARDE CSD canteen for five years (2013 to 2018) It was a very challenging job which people would normally avoid to take. I enjoyed the responsibility very much. During this period I have worked sincerely, honestly and motivated other CSD employees to work hard . Due to this I could successfully serve ARDE employees, retired persons, DSC Personnel and others smoothly.

### **Tech CORD**

Since last one year I am working as OIC of VMC under Technical Coordination Division.

My reponsibilities were to arrange Visits, Meetings, and Conferences I have been able to do it smoothly and successfully. I kept venues ready for events at anytime and operational for twelve months. Coordinate and motivating other VMC staff to serve better was an uphill task and I have achieved it successfully.

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**DR.(MR.) KHATRI KN ,  
DRDS ,SCIENTIST G**

### Professional Work Details

As a scientist with Defence R & D Organization since 1986, I had been involved to a large extent in developing armament stores, e.g., gun launched shells, minelets, warheads for rockets, LP gun, etc. Apart from getting involved in the work pertaining to armament domain at my work place, I continued pursuing academic interests as well.

Important engineering works for which personally responsible .

#### Research Assignments

I had been the project in-charge / leader for a number of projects at Analytical Studies Group (ASG) Delhi/ Armament R & D Establishment (ARDE), Pune/ System Analysis & Modeling Centre, DRDO HQr, Delhi namely,

- (i) Project on Development of Solid Fuel Ramjet for Artillery Shell.
- (ii) Project on Development of Scatterable Remotely Delivered Mines Warhead for 122 Grad Rocket.
- (iii) Project on the feasibility study of Development of the Rocket assisted Cargo Sub- munition Warhead containing Bomblets.

#### Techno-managerial Assignments

- (A) Directorate of Armaments/DRDO Hair.
- (B) System Analysis & Modeling Centre (SAM-C)/ DRDO Hair.

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**DR.(MR.) MC PANDEY ,  
DRDS ,SCIENTIST F**

I joined DRL-DRDO at Tezpur in April 1985 and worked there up to July 1996. During this period I was engaged as a project leader of many projects and studied the use of different solar gadgets like solar street lighting system, solar lantern, solar battery charger, solar bunker lighting system etc. in Services locations of remote area in NE region. Developed different solar operating equipment utilizing photovoltaic module instead of regular workshop machinery for small works. Use of solar energy irrigation purpose was demonstrated in Service locations for their day to day water requirement as well as irrigating kitchen gardens. Desorption study of dehydrated mushroom has been carried out at different temperature and relative humidity. Kinetic study of dehydrated black lahi was also carried out. Equilibrium moisture content different food and feed material was also found out. Day to day meteorological parameters like temperature, rainfall, relative humidity, wind velocity/direction, soil moisture/temperature were recorded at Tezpur (Assam), Salari and Tawang (A.P). All India Radio, Tawang was regularly board casting the data obtained at Tawang. Created awareness of Non-conventional energy sources gadgets/systems in the troops of 3-corps & 4-corps and in civil populace of NE Region through practical demonstration/exhibition. The gas produced from Biogas plant was utilized for cooking the food of the Unit situated at foot hills as a alternate source. In 1985 DRL opened dett at Salari at an altitude of 1600 meter and Tawang detachment was opened in Dec 1986. Both lands were developed for agro-horticultural experiments and terraces, temporary sheds, temporary water canals were developed. Met observatory and different solar gadgets were installed in both places.

In August 1996, I was transferred to FRL, Leh (DIHAR-DRDO) where I was engaged in project and administrative duties. I was project leader of Greening of Partapur Garrison. Specific techniques in cold desert were adopted for arboriculture and horticulture in Bde HQ. Studies were conducted for yield of leafy vegetables during winter season in protected cultivation and demonstrated in units. Lakhs of nurseries of vegetables and flowers were provided to farmers and army units for kitchen gardening and beautification. 10 Units were adopted yearly basis for greening. Besides providing all inputs like tools, polyhouses, seeds/nurseries/saplings/cuttings, manures and technical know-how, unit reps were also provided training in FRL det (DIHAR Leh) as well as in their unit locations when ever required.

Organized 'cucurbit exhibition' at FRL det Paitapu during the period to create awareness about the importance of cucurbit cultivation in Nubra valley. 'Success story was with the development 11' FRL det Partapur by enhancing activities many folds. This land was developed and plantation of thousands plants of like willow, popular, wild rose, sea buckthorn, apple and apricot were done. An additional 15 acres land was taken over during April, 2000 from State Govt. adjacent to Det for further expansion of Det activities. Development work of the det like installation of new pipe line with pump, two gen sets, three bore well and construction of officer mess, approach road, polyhouses and trenches was carried out for agro-animal experiments etc. Tremendous effort at Field Research Laboratory, Leh witnessed the use of local agricultural resources for the research and development of various food products and also created awareness about greening and afforestation among Siachin troops with emphasis on therapeutic forest plants, fruit & vegetable plants besides floriculture to conserve and improve the echo system in the region.

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**DR.(MR.) MUKHEDKAR RJ ,  
DRDS ,SCIENTIST F**

Since Dec 1981, I have been working in ARDE, Pune.

1. During my initial tenure, I was working in Computer Center. I was responsible to develop.

- a. Software programme in Fortran for scientific applications and COBOL for business applications like Payroll system on 2 generation Honeywell-400 computers.
- b. Software in BASIC and LISP languages on desktop computers for scientific applications.
- c. Scientific applications using Fortran77 and C on Norsk Data-100 with SINTRAN-III OS and OMEGA 58000 with Unix OS environment.
- d. Scientific applications with graphics environment KALCOMP of N&100 using FORTAN77 and C languages.
- e. Scientific simulation applications with graphics environment using C on desktop computers.
- f. Fire Control Computer software for Pinaka weapon system using C/C++ with GUI environment and Communication module to establish communication between Pinaka BCP/FCC and Launchers.

2. During Ballistic division tenure, I was responsible to develop:

- a. 105mm and 130mm trajectory models to generate RT.
- b. 130mm RT from Russian atmospheric standard to ICAO atmospheric standard.
- c. False Range RT parameters for 130mm ehell with VT fuze for required HOB.
- d. ANN (AI) model for 155mm KRASNOPOL RT.
- e. RT nonetanderd paramaterx for 155MM NASCHEM.

f. Genenc GUI based trajectory model using C++ with graphics environment.

g. WLR algorithm to estimate enemy's launch location from where shell is fired. It is used to counter enemy's launch location.

h. FDR algorithm to estimate fall of shot position of fired shell, It is used to estimate target hit probability,

3. During Pinaka division tenure, I have been responsible to develop:

a. The model to integrate Pinaka weapon in lo SHAKTI ACCCS environment of Indian Army.

b. The model to minimize its complexity of trajectory parameter prediction as well as OP corrections so to engage target within short bme and to avoid counter attack.

c. Generic interface to integrate in-service and futuristic Artillery weapon system in to SHAKTI environment.

d. TCM-DLL for 214mm Pinaka, 105mm, 130mm, 155mm Dhanush and 155mm ATAGS to integrate in to SHAKTI environment.

- "Estimation of Control force parameters using Laser Guided Bomb (LGB) release envelope data", National conference on Computational Engineering, Modelling, Simulation and Optimization, 2010 DIAT Pune.

- "Mechanism to optimize trajectory prediction and correction time in Network Centric Warfare" 6th National Seminar and Exhibition on Aerospace & related mechanism INSARM Dac 2012, pp 420-425.

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**MR. NAGARAJ N V ,  
DRTC ,TECHNICAL OFFICER D**

I had an opportunity to work in two different Laboratories. Aeronautical Development Establishment (ADE), Bangalore from 27th Dec 1978 to 16th Aug 2005 (System Cluster) and Defence Food research Laboratory, (DFRL), Mysore (LS Cluster), from 17th Aug 2005 to till my retirement.

**My contribution at ADE, Bangalore is as follows.**

1. Developed Mission software module in 'C' language for Lakshya Ground Control station (GCS) which has been delivered to all the three services. The basic software provides graphical representation of aircraft, artificial horizon and flight parameters which is used by controller to maneuver the aircraft from the ground. The software displays the trajectory path of the aircraft.
2. Up-graded the mission and utility software which will test the subsystem of GCS individually.
3. Total pairing of wiring chart, cable details for the up-graded GCS to interface with other subsystem.
4. Worked out Integration and testing of computer with controller's console and operator's console.
5. Developed Mission software and diagnostic software for Lakshya GCS, was modified to suit Lakshya 1D standard and used in trials successfully.
6. Configured new computer system based on COTS technology for Lakshya GCS. This has the latest hardware technology using PCI system.
7. Teaching Faculty for training Electro Mechanic apprentice engaged by Establishment.
8. Actively involved in more than 40 Lakshya trials including 3 successful sorties in ISRAEL.
9. Simulation software incorporated with the mission software.
10. Received overseas demonstration award for our team for the successful conduct of the first ever overseas trials at ISRAEL of LAKSHYA (UAV).

**Work contributions at DFRL, Mysore from August 2005 are as follows.**

As a senior Technical Officer, the application of electronic media for library holdings and management was made. I was looking after and monitoring for the entire laboratory Internet and Intranet with low down time. As a DRONA system Administrator I was Liasning regular live webcast from Hqrs. As nodal officer for personnel information system and the following major contribution significant towards the system updates.

1. Knowledge repository- Liasoning with DESIDOC for Gyansrota a DRDO intuitional repository.
2. Centralized Internet Access Gateway (CIAG) - CIAG was provided by DRDO(DCS) through single gateway, Implementation, maintenance in the laboratory.
3. Information Security Officer (ISO) - Initiation of security policy and implementation as required.
4. National Knowledge Network (NKN) - Liaison for network provided by NKN.
5. Web - coordinator - updating the web details regularly on the public domain.

**The following important my contribution as a Head of the division :-**

1. I was entrusted the responsibility of developing bio-sensor as well as low cost food processing lab equipment in collaboration with technical groups.
2. Digitization of field test kits by colorimetric method using microcontroller was evaluated.
3. Development of low-cost Palettes stove.
4. Evaluation of induction Heater and induction Compatible cooker (60 Lts).

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**MR. NAMDEO RAMBHAU NANGARE ,  
DRTC ,TECHNICAL OFFICER B**

I was appointed as Tradesman 'E' in Gun Group. Gun group was among prestigious and strength wise large group.

In Gun group I worked on following projects-

'Design and development of Thermal Insulating JacLet for 105 Tank barrel' was the first project wherein I was member of development team. I have integrated thermal jacket with the barrel and assisted in trials at KK Ranges, Ahmednagar. This was early stage of my service like but still remembering because of dedication and affection of officers, staff as a team.

Further, I was associated with the project for '50mm mortar development'. During the work, my experience & knowledge base about gun and ammunition assembly and working was widen.

Later, as a project team member, was associated with the project for 'Development of Air Defence Gun system' which was working on 'Gatling Gun principle'. As a filter, mechanisms and technology was new to me. Here after, I was motivated to work spontaneously and my journey started giving an immense pleasure of work. I could understand complexity of working principle and operation of Air Defence Gun. I really thank my seniors for giving me guidance and opportunity to work on such a project of national interest.

Understanding the Gatling mechanism and principle, team was assigned a staff project 'Sharpshooter'. It was project for development of Air Defence Gun. Team accepted the challenge and worked hand-in-hand leading to successful development of 'Sharpshooter'.

I was also associated in the development of gun mounting structure for BMP II. I was associated with the firing trials at KK Ranges, Ahmednagar. Further, I was sent on TD for 4 weeks to Kargil LOC to position the system where it showed a meritorious performance during operation "Vijay". I felt very proud for my contribution towards the development work useful in war front.

I have also carried out assembly, Inspection, testing and firing of 84 mm Recoil-less canon launcher. I was associated with the troop trials carried out at hot temperature at Pokhran, cold temperature at Tangse (6 JAK RIF) and user trials at Balasore.

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**MR. PRADEEP KUMAR ,  
DRTC ,TECHNICAL OFFICER T,**

I have fabricated more than 1000 sleds for various projects of national importance. The process includes cutting of Mild Steel angles and flats as per drawings, machining of slippers, drilling and fettling and welding work. The RTRS workshop demands multi-disciplinary skills. I have also operated milling machines and shapers for machining of shoes, blocks, load cell adopters, shackles, payload mounting fixtures, knives, magnet assemblies, fabrication of metallic containers for electronic actuation systems and telemetry packages.

Recently, RTRS has started making new modular Aerodynamic Aluminum alloy sleds. I have contributed in assembly of aerodynamic sleds and its components, provisioning of rocket motor mounting arrangement, provisioning of air break release mechanisms, mounting of various sensors on aero sled.

RTRS test facility has been augmented for length and number of tracks for accommodating heavy payloads at higher speed. The track length has been increased from 1.2 km to 4 km and five parallel rail tracks have been laid. I have contributed in mounting of coils on all the tracks. The work involved drilling and tapping at every 10m span.

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**MS. REKHA RANI SINHA ,  
DRDS ,SCIENTIST G**

### **Major Achievements / Contributions**

**1. Defence Electronics & Research Laboratory (DLRL) Hyderabad:** During my tenure in DLRL my major contributions were in the following projects:

**i) Project BOX**

BOX is a V/UHF ground based COMINT system for the Indian Army. It has the capability of detecting, monitoring & jamming the communication signals. I designed & developed the "System Controller" embedded software package for this project. The system controller was integrated and tested successfully with the receiver & jamming subsystems of BOX. Field trials were successful

**ii) Protect SAMYUKTA**

SAMYUKTA is a ground based integrated EW system for the Indian Army. It is used for intercepting, direction finding, location fixing & providing counter measures in all bands. (Comm & Non Comm)

I have successfully designed & developed the following software packages:

- a) Control Post display of Control Center (Non Comm)
- b) ESM display prototype
- c) ECM display prototype

**2. Centre for Airborne Systems (CABS), Bangalore**

During my tenure in CABS my major contributions were in the "AEW&C Programme" The indigenous Airborne Early Warning and Control (AEW&C) System, built on a regional-jet class of aircraft has the capability for Surveillance, Communication and Electronic Support Measures, effectively making the AEW&C a true force-multiplier

As **Group Director A DPD(DHDS)**, I have led a team towards successful design, development, testing, certification, integration and flight trials of Data Handling & Display System (DHDS) for indigenously developed 'Eye in the Sky' AEW&C System (NETRA).

The DHDS provides the interface to the operators to interact with the AEW&C system. It consists of 5 Operator Workstation (OWS). Each OWS displays the integrated tactical air situation picture to the operators. The OWS functionality deals with the Human Machine Interface (HMI) required for the proper operation of the AEW&C systems. It involves displays of tactical data and tools to insert Operator's inputs to the Air Situation Picture,

displays of overall system serviceability, etc. The OWS can be configured as Air Situation Picture / Command & Control (ASP/C2) i.e. C2 mode, ESM, CSM, Instructor, Trainee & Playback consoles.

Each OWS receives Track / Plot / Emitter data from Radar/IFF, ESM & CSM systems via the Mission System Controller and provides a composite Air Situation Picture (ASP) to the operator, on top of a Background Map. It is a real time graphical display with a dynamic, powerful and ergonomically designed HMI enabling the operators to gain a better situational awareness of the region under Surveillance. The OWS software has been developed in-house & is DO-178B Level C certified.

The OWS software executes on an airborne qualified OWS Console which is rugged and lightweight designed as per MIL-STD- 1472F Specifications. The OWS console is a qualified indigenous unit and is in line with the MAKE IN INDIA initiative of Government of India. The OWS have performed satisfactorily in 500+ mission sorties and multiple AEW&C campaigns.

Two AEW&C aircrafts have been handed over to the USER (IAF) after successful completion of flight trials.

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**MR. S B BORKAR ,  
DRDS ,SCIENTIST F**

I have joined ARDE on 12 Sept 1986. Since then I worked in PMU, Pinaka-Launcher & APP Divisions. At present, Division Head of Air Pilot Plant Division, I am leading the team, responsible for development & productionization of various power cartridges required by Indian Air Force & Navy. I have planned, coordinated & executed all activities for completion of the development, production & Life extension trials of various power cartridges as required by the Users from time to time. The power cartridges are of paramount importance for safe escape of the Pilot from fighter aircraft in the emergency.

I have taken keen interest & sincere efforts to complete development & productionization of the cartridges as per the urgent requirement projected time to time by the users. Production of these cartridges successfully completed in time & supplied to the Users thereby meeting immediate requirements, to avoid grounding of large fleet of Fighter aircraft.

With these considerable foreign exchange has been saved, achieved self-reliance and self- sufficiency which resulted in Mission Make in India.

**Contributions**

My summarised contributions are as follows -

**1. Projects**

Following projects have been completed successfully being inducted in the Indian Air Force / Navy.

1. Development of Cartridge PDO-1 Electric Ignites for Sukhoi 30 & MiG 29 Aircraft
2. Development of Cartridge Harness Power Retraction Unit (HPRU) & Cartridge Delay Breech Unit (C DBU) for Hawk MK-132 Aircraft.
3. Development of Cartridge half Inch
4. Indigenous Cartridge F - 71 A for Vajra Aircraft
5. Development of Mini Disruptor for IED's

**2. Manufacturing & productionization at OF's:**

Following Power cartridges are supplied to Air Force & Navy -

1. Cartridge Seat Ejection set for Vajra t12 Cartridges)
2. Cartridge Seat Ejection set for Sea Harrier (11 Cartridges)
3. Cartridge Seat Ejection set for Jaguar (8 Cartridges)
4. Cartridge Canopy Jettisoning set for Jaguar (3 Cartridges)

5. Cartridge Air Intake Shutter PP-9, Fuze Signal Rocket
6. Cartridge Signal Flare 26 mm, Cartridge Seat Ejection Guillotine
7. Cartridge Re-cocking Defa, Cartridge Frangible Pillar
8. Cartridge Cable Cutter HS-12, Cartridge EP K-28-6
9. Electrically Operated Firing Extinguisher No.6 Mk-1
10. Cartridge Cable Cutter No. 4 Mk-1
11. Cartridge PDO—1 Electric Initiator for Sukhoi-30 & MiG-29 Aircraft

Prepared TOT documents of above cartridges & productionization at Ordnance Factories (OF's) is under final stages.

### **3. Life extension trials :**

Finalised trial schedules & carried out life extension trials time to time requirements projected by Indian Air Force & Navy for the following life expired cartridges -

Imported : Cartridge PV-1, PK-16, PK-21 M-2. PW -1 1 MK-1 , PK-3 M-1

Initiator F-71, PP-9, Sequencing Cartridge, IR-50 Squib, & CCU TVU 3D-1,  
0.5 & 0, PC -7, Half inch, Air Pyro & PDO-I

Indigenous : Cartridge EOFE No. 3 Mk-3, Cable Cutter HS -12. Squib Cutter 20 mm PV-35,  
PV-50, R- 4 pyro-cutter & CSF 26 mm

Based on satisfactory results of the firing trials, life of all cartridges was extended time to time on urgent basis. It has increased the availability of fighter aircraft of Indian Air Force & Navy for operational flying. Thus, Aircraft On Ground (AOG) situations was avoided. This was appreciated by the User.

My efforts have been culminated into large savings in considerable Foreign exchange. The production of these cartridges is a mark of self reliance in critical stores to keep aircraft in operational readiness. I was actively involved in all the trials required for acceptance of the products. I have initiated Transfer of Technology action of these cartridges to Ordnance Factories & now in the final stages of completion. I was also actively involved for the activities pertaining to improvement in the Power cartridges.

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**S NAGA MALLESWARA RAO ,  
DRDS ,SCIENTIST G**

I was assigned with the responsibility of implementing Management Information System (MIS), which was developed for all naval R&D labs and Directorate of Naval R&D(DNRD), DRDo Hqr's. After performing the acceptance tests, the MIS software was commissioned. The MIS takes projects expenditure data and enables the DNRD/Lab., to monitor the transactions & project financial status.

As a member of the Project Design & development of Computer Aided War (CAW) gaming system to assist naval commanders in formulating and assessing strategic plans. It involves displaying the entire costal region map and representing the forces as per the game plan. After successful user evaluation, the system has been accepted and installed at School of Maritime Warfare &Tactics, southern Naval Command, Cochin.

As a member of the infrastructure building project I was associated in the establishment of computer center, by the installation of VAX-11/780, VAX-11/730 computer systems, AD-10 system, graphic terminals and other peripherals.

The VAX-11/780 computer system was installed and it has the features of multi user/multi testing features with VAX/VMS operating system. The VAX-11/730 computer system was installed at SR centre and both are interconnected with DECnet software. These systems were used for the computational requirements of various projects. AD-10 was used to perform the H/w in the loop simulation tests.

**Project PANCHENDRIYA**

As a part of Panchendriya NSTL has developed TWCS consists of two sub systems called Fire Control Computer (FCC) and Weapon Data Converter (WDC). TWCS is a Multi processor Multi talking Real time Embedded System using MC 68020 Processors. As a member of the software development team, generated the Software requirements specification. The user interface of the TWCS has been designed through a set of display pages and I have developed the Display Pages.

As a member of the team performed the software testing. After installation of the TWCS on INS KARANJ submarine, performed Pre-HATS and subsequently the HATS were successful. Also as a member of the team evaluated the system in the SATs on the onboard submarine INS KARANJ and finally the project was successfully closed and accepted by Navy.

### **Establishment of LAN**

It was proposed to establish Campus LAN to utilize the Computing resources available in various work centers of the lab.

I have studied, designed the campus LAN layout and established Campus LAN using Ethernet 100/10 Mbps technology by connecting important Work centers using Fiber optic & UTP cables and Installed Network switches, Hubs and other network devices. Initially with about 140 PC's of various work centers were connected to the network with WINDOWS-NT Server system. The Campus LAN was commissioned in the year 1999 and all the user nodes were Configured & Customized. Based on this infrastructure services like Resource sharing, internal mailing services were implemented, which has resulted sending various Notes, Circulars, publishing Daily Order parts etc were made easy. Latter the LAN was further extended to all work centers of the Lab., in a phased manner.

RDO's Rapid Online Network Access System was established at HQ's & all Lab's. NSTL's Sub-Router Centre was installed through leased lines and implemented the DRONA Services in the Laboratory through LAN. Initially the web and mail services were provided to authorized users in the Lab.

### **Internet facility**

I have established Internet facility at NSTL through BSNL dial-up facility and implemented initially at computer centre in a room with 4 nodes. Latter Broadband Internet service was established and extended the Internet service to all major work centers of the lab. Also hosted the Email services on the NIC mail server for the lab till 2008 to interact with external agencies.

### **LAN Upgradation with Gigabit Campus LAN:**

A detailed study was carried out, identified requirements, designed the network architecture and drafted specifications with the 10G backbone fiber connectivity. Installed & commissioned the Server systems, Storage device, on-line Backup device, Software & other accessories on the network in 2009.

This has resulted in providing gigabit network / backbone access for processing network intensive applications. Nearly about 600 users connected to the network at 1Gbps and the devices are being monitored using Network Management software. The following services were established in the lab.

### **Mail Services: Installed Microsoft Excha**

**nge server and maintaining 600 User Mailboxes with customized 120 user groups for the internal mailing service.**

**Storage:** Installed Storage Area Network (SAN) for online requirement with 10TB capacity and also established Network attached storage (NAS) of 24TB to facilitate users to store the critical trail data.

**System Update Server:** Established Windows System Update Server (SUS) to patch all the computers connected in LAN for critical Updates, Security patches, hot fixes and Service Packs.

Installed Anti Virus service and configured all PCs for the automatic updating of virus definitions on daily basis.

### **DRONA Upgradation**

The DRONA facility was upgraded with the installation of 34Mbps leased lines. The firewall was upgraded and users provided with Level-1 access to all the employees & Level-2 access to all Scientists/other authorized personnel. The Video conferencing facility was established which facilitates to interact with ORDO Hqr's and other lab's. As a result of this various Project reviews, Technical discussions and Tender Procurement Committee (TPC) meetings are being conducted. Also important technical talks at HQs are being web casted to the Scientists.

### **Internet Upgradation**

The Internet service was upgraded from broadband to leased line and also the internal connectivity is upgraded with optical fiber cables (OFC). Internet service provided by DRDO Hqrs was installed and the facility is provided to 120 Pc's and the access given to all Employees of the Lab. A web monitoring and reporting tool was deployed to monitor the traffic.

**National Knowledge Network (NKN) :** The NKN network has been established in the Lab. The users are able to access National Knowledge backbone to interact with National institutions, other R&D organizations and to conduct various web conferences.

### **Intranet web application -Digital NSTL**

An initiative was taken to enable all services digitally to all the employees. A survey of all manual processes was taken up, the gap analysis was done. Guided my team and Developed Intranet website, Interfaced with other existing Database Applications to retrieve selective personal information. The application has been hosted on the Intranet and it is in use in the Lab., with accessibility to all services through LAN like, Access control, Movement order, Leave processing, Visitor management, File tracking, Access control information, Employee data, Cash purchase processing etc. The other departmental services like Stores procurement, Library information etc., were made accessible from the Intranet.



**Other Technical Contributions:**

**As a member of the Cyber security team** associated in the formulation of the Lab., cyber security guidelines & Instructions, conducted user awareness talks on the vulnerabilities, safe usage & browsing of the Internet services. Also monitoring the usage of the services by the users and implemented the various measures proposed by the Cyber security committee like port binding of network ports, formatting HDDs of the Internet PC's, blocking of USB ports etc.

**As member of the Cyber Management committee**, studied the existing IT applications and recommended the necessary IT infrastructure facilities required to facilitate to implement the IT application services for all employees. Based on the recommendations, initiated the action and established IT infrastructure facilities.

As Co-chairman of IV&V team organized the review meetings for the various projects. The necessary s/w IV&V guidelines documents and templates were provided on LAN NAS server sharable to all IV&V members. It was also proposed to carry out the firmware IV&V for the embedded systems. The IV&V firmware tool is also acquired and about 4 scientists were trained.

Provided technical expert services to DG (NS&M) office for the DRONA & Internet services establishment at various phases of planning, Technical evaluation, installation & commissioning.

Up keeping of the IT hardware: As a head of the Division, I have monitored the maintenance support of all computer systems, peripherals, campus LAN and Internet systems in the lab. Formulated the scope of work and established Annual Maintenance Contracts (AMC's) through external the agencies.

I have planned, conducted **CEP courses on Computer Networking & LAN Management** and

**Implementation of Cyber Security Aspects** as course Director.

**Organizational / Institutional Activities:**

1. As Secretary of NSTL Educational Society and Chairman of Ramanath Secondary School Management committee, I have administered the school for 5 years.
2. Provided technical expert services to Andhra University for the Campus LAN establishment at various phases of Technical evaluation, installation & commissioning.
3. Extended expert services to Indian Maritime University, Visakhapatnam to UP8rZIde IT-infrastructure.

**MR. S V JOSHI ,  
DRDS ,SCIENTIST F**

**DURING THE PERIOD UNDER REPORT MY ASSIGNMENTS INCLUDED TITE FOLLOWING:**

**1. Inspection of engine components:**

I have been assigned the task of executing precision dimensional measurement on engine components utilizing following machines.

- i. 3 co-ordinates measuring machine model Beia-Dz-H-Man
- ii. Form tester model MFK2
- iii. Roughness and contour measuring machine model surfcom 700 B

The job involves planning of inspection methods and schedules, procurement of measuring instruments tools & gauges etc., giving guidance to staff ensure timely execution of the inspection work, which included systematic recording of dimensions of gas turbine engine components as per the drawing during various stages of manufacture of components of the following projects.

- (i) GTX-37-I4U full development
  - (ii) GTX- 37-14UB
  - (iii) V.C.C
  - (iv) Miscellaneous- projects
- Co-ordination with other groups regarding problems confronted during inspection & finally documentation of inspection reports.
  - Planning for other enhancement of facilities including software, keeping the requirements of GTX-35-VS project in view,

**(II) Planning for the enhancement of facilities keeping the requirement of GTX-35-VS project in:**

Assessment of computerised 3 coordinates measuring machines by visiting R&D laboratories & public sector units like, CVRDE Madras, BEML R&D division KGF, CMTI, HAL Engine division, NAL Bangalore etc., preparation of detailed technical specification for the procurement of co-ordinates measuring machine considering the important features such as high measuring accuracy exceptional speed of measurement ,extremely simple operation , great versatility & reliability of results in an improved productivity due to shorter down times and better utilisation of the work piece tolerance & also to play a major role in meeting the projects schedule. Quotation for the said machine invited studied & finalised the requirement.

**(III) Computerised co-ordinate measuring machines & micro processor controlled machines:**

I have made templates of the machines to be accommodated by cutting out pieces of plastic sheets to a scale of 1m=1cm. These templates of different types of machines placed on a flow diagram space which is on scale were moved to suitable positions for every best possible layout, the feasibility & the flow is studied, by marking the obstructions. This process continued till the best layout is obtained, i.e. the most economical from the point of view of the distance & convenience of loading the heavy gas turbine engines components on precision measuring machines.

**(IV) Establishment of CMM facility:**

Involved in drawing of specifications comparison of various models and procurement of 4-axis CNC precision 3 co-ordinates measuring machine and personal co-ordinates measuring machine for the requirement of **KAVERI project**. Prepared building plan and coordinated with work services in various stages of construction for the 3CMM facility.

**(V) Inspection and quality control of aero — engine components using coordinate measuring:**

Evolved a method of measurement for the accountable characteristics of critical & intricate aero — engine components, procurement quality planning of appropriate tools & gauges required for the uninterrupted service of quality measurements keeping project schedule in mind.

Adaptation for the measurement of profile in difficult to reach areas of engine casings, participated in producibility review for the measurement quality aspect.

**(VI) Trade inspection:**

I have carried out the inspection of components, sub assemblies etc at the supplies premises. This work often required repeated visits to the firms and coordinated efforts in demanding module group for its timely completion. The schedule of activities was similar to that outlined under item 1. The most important aspect of this task is to render technical adviser and support to the vendor and develop the vendors.

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**MR. SANTEPPA K ,  
DRDS ,SCIENTIST H**

I joined Vikrata Sarabhai Space Centre (VSSC) on 30 April 1982. As a team member, I contributed to the design and development of microprocessor based real time onboard computers and checkout systems for ASLV and PSLV. A letter of appreciation was received from the Director for the development of technology for the checkout systems during this period.

I moved from VSSC to ANURAG. DRDO on 10<sup>th</sup> October 1991. I had been Head of "VLSI group" in ANURAG since inception. I significantly contributed in building VLSI design capability. Infrastructure and nurturing the human resources. The team has delivered 70 chips including, Applications Specific ICs (ASICs), Microprocessors, DSP Processors, Analog ICs and systems based on these chips.

As the team leader, I guided a team for the design and development of a 32-bit RISC Microprocessor for real-time embedded applications during 1994-97 we received DRDO Technology award for this development in 1997 Around this time. I completed M.Sc (Engineering) in Computer Science & Automation from Indian Institute of Science (IISc), in 1995 I received National Science Day Commendation Certificate for significant contributions in the field of VLSI Architectures from Scientific Adviser to Raksha Mantri (SA to RM) in 2001.

I received DRDO Scientist of "the Year" award in 2002 for significant contributions in designing VLSI ICs for strategic applications from Prime Minister.

During 2000-2004, I guided a team in the design and development of a totally indigenous parallel computer including Microprocessor, servers, communication network and porting of Linux operating system and compiler tools. A trusted desktop computer was later realized using this technology.

During the period 2004-2011, several complex System-on-Chip ICs were realized for the ongoing projects of various DRDO labs.

I was appointed as Chairman of "Working Group on Microelectronics" to implement Microelectronics Development Program of MeitY in 2015 Some of the responsibilities include identifying thrust areas and developing R&D plan, identifying R&D projects programmes and institutions to carry out the projects, evaluating and recommending specific R&D project proposals for funding by MeitY. India needs to possess indigenously designed and developed.

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**MR. SUSHIL KUMAR ,  
DRDS ,SCIENTIST G**

I joined DRDO on 25<sup>th</sup> June, 1984 at DRDL, Hyderabad/ under the Directorship of Dr.APJ Abdul Kalam, Being a mechanical engineer, I was assigned the duty of developing the Mechanical assembly of both NAG and AKASH missile Seeker Head. For Akash missile Seeker head a SAM-6 missile was available for reverse engineering, however, for NAG missile no existing hardware was available.

Subsequently I moved to SSPL, Delhi in the year 1988 due to some personal reasons. Whereas in DRDL I was working for NAG seeker head, at SSPL, Delhi I started working for the sub-system to be integrated in the same seeker head. Thus I started working for the development of a Dewar assembly in which the FPA detector was to be packaged. Initially the **100X100 element IR GPA detector** was being developed at SSPL for which I started to develop a glass-metal dewar. After few iterations of the Dewar design, the required Dewar was developed with an initial help from BEL, Bangalore. A lot of Dewars were integrated and consequently vacuum sealed after a continuous degassing for about 15 days. A good amount of success was achieved in this packaging work under high vacuum.

Thereafter, a new project was started to develop a 60-element linear array IR detector for which again there was a requirement of packaging it in a suitable glass-metal dewar. Whereas the previous detector dewar was to be cooled with a JT cooler, this time the cooling requirement was through a Stirling cooler as its requirement was for the thermal sight of the Main battle tank. The necessary Dewar development was carried out using a G-M(glass to metal) sealed glass tube through which the cold finger of the Stirling cooler need to be inserted for cryo-cooling of the detector. Since there was no ROIC used in this detector and a total of 72 connections were to be taken out, a specially designed 76 pin glass to metal sealed Feed through was developed to take out the necessary connections. The glass ID tube was gold-coated and then 76 vertical tracks were cut on its surface by laser cutting to enable the 76 connections (60 elements+12 commons+2 temperature sensors) to be taken out through a matching 76-pin feed through. This feedthrough was later patented, which is still a live patent of SSPL, as on date. A number of Dewars were integrated with and without the IR detector and consequently vacuum sealed with a good amount of success. Thus this was another commendable work done at SSPL.

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**T B KHILARE ,  
DRDS ,SCIENTIST F**

**A. My experience with Disposal of UXO at far extreme location from Srinagar**

There was a request from Army's Northern Command HQ to ARDE to detail Ammunition expert for in-situ study and to suggest methodology of disposal of large Unexploded Ordnances (UXOs) lying in the one of the Ordnance Depot located some 100 km away from Srinagar. I was detailed to study the situation and help Army to suggest some methodology for disposal of UXOs. We visited the Ordnance Depot twice in the year 2009. Our journey took more than two hours from Srinagar. The next day we visited the Depot site where the large no. of UXOs were lying scattered. The devastated site was beyond our imagination and came to know that why Army has taken ARDE's help in spite of having all resources and expertise with them.

Unexploded Ordnances (UXOs) are explosive weapons ( shells, bombs, grenades, land mines, cluster munitions etc) that did not explode when they were employed and still pose a risk of detonation. The UXOs were scattered all over vast depot area and beyond border of depot covering nearby villages. The generally the term "UXO" is used where leftover UXOs are originated from war. However these UXOs were originated due to major fire accident occurred at depot years prior to our visit i.e. 2007. During the scrutiny of vast area, I was given Bomb Suit to wear so that in case of untoward incident or detonation of UXOs, the risk of injury would be minimum.. During the scrutiny of site of UXOs, we were constantly video-graphed. After the accident, the scattered UXOs were collected and accumulated on plinths. There were 16 Nos of such plinths and depot area was made relatively safe to walk. At the lime of collection. the UXOs were not classified in any manner viz. Fuzed and plugged or safe and dangerous to handle. Such a classification / segregation would have been of great assistance during the planning and execution of disposal operations. Thus most of the plinths on which UXOs are placed /dumped, consist of a mix of hazardous, doubtful and safe ammunition, making the task of segregation ,quantification and disposal impossible. Moreover rapid growth of grass and weeds makes the task difficult.

After the accident the depot had categorized the UXOs into two categories as " safe to handle' and 'Dangerous to handle'. In spite of taking utmost care by the Army's expert team, during the clearance operations, a number of accidents have occurred during the disposal of UXOs. By hearing such incidences, we had to take utmost care and suggest methodologies for safe disposal. No documented procedure is available anywhere in the world for safe disposal of UXOs at such large scale. There are no guidelines/manuals/

world for safe disposal of UXOs at such large scale. There are no guidelines/manuals/publications available on the handling of UXOs. Since the quantity of UXOs lying in open space was huge, assorted and risk of the casualties were involved, the disposal task was more difficult and complex in nature, therefore generalized safe disposal method was not applicable. Some of the fuzes were having copper components, the chances of formation of Copper Azide- which is more sensitive than Lead Azide could not be ruled out. In such situation, the manual handling of these store would have caused the accidents. It was purely oved 30 years of my experience of handling of all types of ammunitions in ARDE which helped in suggesting some new extraordinary methodologies for safe disposal of UXOs. Some UXOs which are safe , we demonstrated to Army , how we do it.

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**DR.(MS.) TUTEJA URMILA ,  
DRDS ,SCIENTIST G**

I had been involved in the R & D projects on Detection and Prevention of bacterial pathogens of Bio-Warfare, Bio- Terrorism & Public Health Importance since my joining in DRDE, Gwalior. Participated actively during on-site and off-site investigations of highly infectious disease outbreaks of Plague, Anthrax, Leptospirosis and Cholera in the country and helped the health authorities during the course for the timely containment of these outbreaks. Guided PhD students. Undertook administrative responsibilities as Head of Microbiology and Admin Divisions. Following are the significant achievements of my scientific carrier at DRDE, Gwalior.

Reliable reagents and assays were standardized and developed for rapid identification of both defence and public health important agents in the clinical and environmental settings in order to improve the public health surveillance and epidemiology. Assays were developed for selected BW agents for simultaneous detection and characterization of *Bacillus anthracis*, *Yersinia pestis*, *Bmcello melitensis* and *Burkholderia pseudomallei* with high specificity and sensitivity. Various molecular typing methods were standardized for confirming the identity of organism at strain level. These methods helped in generating the molecular signature database of *F. pestis* and *B. anthracis* prevalent in our country and were found useful in tracking the F\* Pestis involved in 1994 Surat plague outbreaks. These methods would aid in maintaining a data base for plague and anthrax surveillance and would also help in developing strategies for molecular epidemiology and disease control.

Immuno dominant antigens were characterized from an Indian *Y. pestis* clinical isolate of pneumonia for the development of subunit vaccine against plague. A new formulation of plague vaccine was devised with M. Tuberculosis HSP70 (domain II) that provided 100% protection in murine plague model. The HSP70 augmented the immune response of vaccine candidates with significant elevation of cytokines like; IL-2, IFN- $\gamma$  and TNF- $\alpha$  and CD4+/CD8+ T cells secreting IFN- $\gamma$ . The findings suggested the role of HSP70 (II) as an immune modulator in preparing new generation vaccines. Efforts were also made towards the development of a sub-unit vaccine against anthrax. Various gene/peptide sequences of three toxin components (PA, EF & LF) of Indian *B. anthracis* were prepared based on the prediction criteria of specificity, surface accessibility and B-cell epitopes. A simple and full proof challenge model was established for characterizing the protective efficacies of vaccine candidates. Chimeric proteins and peptide cocktails were identified that exhibited potent protection against lethal toxin challenge in terms of in-vitro toxin



administered mice. This specific monoclonal antibody may prove to be of therapeutic value for rescuing the antitrax infected individuals.

Attended BTWC Ad Hoc Group meetings at Geneva. Served as technical expert for WHO SEARO for evaluation of Diagnostic Kits on Anthrax and Leptospirosis. Conducted workshops on laboratory diagnosis of anthrax and leptospirosis for armed forces as well as for various Medical/Public health/Veterinary Institutes of Kerala, Orissa, Maharashtra and Karnataka. Provided diagnostic help on anthrax detection as WHO SEARO expert in Sri Lanka. Participated in Scientific Exchange Programme between NIH, Thailand and DRDE, India.

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**MR. VASANT SAPATRAO GHADGE ,  
DRDS ,SCIENTIST G**

I Joined ARDE as 'Junior Scientific Assistant- II and posted to Center Group (presently the MBT Arjun Group) of ARDE

I have been working on Weapon System of various Tank Guns and Artillery Guns. During my service tenure, I have worked on no. of prestigious projects of DRDO namely, 130mm Armament System HBT Arjun & 155mmx52 Cal. Advanced Towed Artillery Gun System (ATAGS), Projects of National Importance.

I have worked on Project MBT Arjun, since almost its inception stage to its induction stage in Indian Army and subsequently it's Production. This project has acquired national status and importance. India came into limelight as one of the few countries in the world producing MBT of their own. I was actively associated with many project activities Design, Development, Product improvement, Production, Transfer of Technology(ToT), Transfer of Authority of Holding Sealed Particulars(AHSP), Documentation & Training of 120mm Armament System of MBT Arjun Project As a Group/Associate Director of MBT.

I designed & developed light weight Brass Stub for Modular Charge System (MCS) of 130mm Field Gun and 105mm/ 37Cal IN-G in a very short period of span. Production process has been well established indigenously at Ordnance Factory. Amdernath.

I was fully involved in design & development of 120mm Long Range Morlar,81mm Mortar, 120/125mm Ammn. (FSAPDS, Practice, Blank), Steel Packages for Arjun Ammn., various Thermal Insulating Jackets (TIJ's) & comparable trial including MI TU, Fixed firing land for 105mm IFG, 120mm Tk Gun, misc. activities related to T-72 Auto-Frettage Barrels / T-60 Tank Gun, 105mm IFG, 130mm SP Gun (Arjun Catapult) etc completed successfully/ satisfactorily.

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**DR.(MR.) VEPA KAMESWARA RAO ,  
DRDS ,SCIENTIST G**

1. I joined NCML, Bombay as Scientist 'B' in the year 1987.
2. I was given the task of working in the area of Crevice Corrosion & Development of "Molybdenum bearing stainless steels". I invented a device to measure the crevice corrosion and applied several electrochemical techniques for studying the corrosion properties of "Moly stainless steels". Here, I got exposure in the field of metallurgy.
3. I was able to develop the Nerve agent detector. The TOT has been given to a firm. This is being used by SPG for VIP security, especially on Independence day and Republic day. Perhaps, this is the first successful endeavor to develop an indigenous equipment (Chemical warfare agent detector) by DRDE, Gwalior. I worked along with mechanical engineers and electronics engineers for developing this item.
4. The topic of detecting the biological warfare agents arose around the year 2000. The then Director wanted any one of the scientists, to initiate the work in the area of Biosensors. I came forward. I was able to develop screen printed electrodes and establish the method of detecting pathogens with high sensitivity. A prototype was made. A patent was also obtained. This work also involved interaction with electronics engineers & computer scientists. Having done Masters in Computer Applications and ability to write programs, my interaction with them was smooth. Five Ph.Ds were awarded under my guidance. Besides, several students of academic institutions did their project work with me. Due to my efforts, a new division called Biosensors Development Division started, of which I became the HOD,
5. Another big opportunity to serve the nation came in the form of requirement of "Development of Air cleaning filters for ATPV". I got an opportunity to visit the submarines. It was a wonderful experience. The submariners told me that, the air cleaning system is very important for them. I worked along with a small team. Initially, we thought, that we have to develop the adsorbent materials and prove their efficiency, using Russian materials as bench mark. However, after successful completion, the onus of preparing Bulk materials also fallen on us. This task was new to our laboratory. Since no vendor was initially interested, we had to make all the adsorbents in-house. Three types of adsorbents and 14 types of filters were developed. ToTs were given to several firms (5 firms). This work involved Development, Bulk Production, Developing testing methods and Documentation. Perhaps, such an opportunity knocks the door of a few scientists in Life.

The success of this work is not only due to the efforts of our group, but also because of the dedication of naval officers concerned with this work. I am proud that I am involved in this work in leading a team and worked initially on the bench to prove that we can make air cleaning system for submarines. A savings to the tune of more than 100 crores for our nation and much more in future is the result of this work.

6. Another work assigned to me was the development of a DS2 solution.

a) I was able to develop this solution and was also able to establish a simple and cost-saving technique for quality assurance. In few years, more than a lakh liters have been manufactured by TOT holders and supplied to the Armed forces. Even though quality assurance was taught to the testing agency, the samples used to be sent to our laboratory for testing. We did the work religiously.

b) The shelf life of this item is 5 years. After having mutilated large quantities. the military asked for the method of" disposal of this item. The initial solutions offered by DRDE were not acceptable to the Army. Finally, I found a simple method for their recovery, to the surprise of all. We applied for a patent. The technology document was forwarded to CDEEF, Nagpur so that it can be used.

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**MR. VITHAL PANDITRAO SOLE ,  
DRTC ,TECHNICAL OFFICER B**

I joined VRDE (Vehicles Research & Development Establishment, Ahmednagar M.S.) on 10<sup>th</sup> Jan. 1987 as a Draughtsman Grade - III. After crossing the threshold of VRDE, I saw here many indigenous and foreign made military vehicles on the ground. Being the work of research, development & testing of wheeled and light tracked military vehicles is going on here, in this establishment.

I was posted in the TV (Traded Vehicle ) Division, where the project HTMRV (Hell Track Multi Roll Vehicle) and BMP Variants were on full swing. I was appointed on the project HTMRV. While working on this project, I had drawn so many layouts and drawings of parts.

I had drawn detailed drawings of Under Carriage assembly, Axle Arm Housing Assembly, modifications in Steering Column & Accelerator Linkages and General Assembly etc.

The cabin of this vehicle was tiltable and while maintenance every time the steering Column and Accelerator Linkage was to be made delinked. To eliminate this exercise, I made modifications in these systems introducing "Telescopic System" which became very successful.

We developed total five Prototypes of this "HTMRV" at VRDE. This was the very good and challenging project suggested by former Army Chief, General 'K.Sundarji' but unfortunately it could not be inducted in Army due to reasons beyond our control.

Other Projects of our division were rapidly progressing on BMP-II K tank. It was Armored Amphibious Dozer (AAD), Armored Engineer Reconnaissance Vehicle (AERV). Armored Nuclear Biological & Chemical Reconnaissance Vehicle (NBC-RV) and Fuel, Oil & Lubricant (FOL) Carrier on BMP-II K. I got an opportunity to work on Project Armored Engineer Reconnaissance Vehicle (AERV).

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सत्यमेव जयते

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