

CHAPTER-VI :DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION

6.1 Project Management in Terminal Ballistics Research Laboratory Chandigarh

Out of 28 projects selected for audit, 24 projects including two staff and 22 R&D projects were completed by TBRL. We however observed that against the two staff projects, parameters as per qualitative requirements of Army were not completely achieved. Out of the remaining 22 completed R&D projects, success against the prescribed objectives, in qualitative and quantitative terms was achieved only in 10 projects. These projects were however still to be translated into deliverables. In the remaining 12 completed projects, the objectives were only partly achieved.

6.1.1 Introduction

Terminal Ballistics Research Laboratory (TBRL) is a Defence Research and Development Organisation (DRDO) laboratory (Lab) located in Chandigarh. The Lab is functioning under the technical control of the Director General Missiles and Strategic System (MSS) since September 2013 and is headed by a Director. The Lab conducts basic and applied research in the fields of high explosives processing, detonics and shock waves dynamics blast and damage immunity, lethality & fragmentation, defeat of armour and performance of warheads and other armament systems apart from performance evaluation of armour defeating projectiles and immunity profiles. The research project programme of the Lab has been classified into four main categories:

- i. **Staff project/Mission Mode project (SL/MM):** Staff projects are high priority projects based on well-defined user-requirements in terms of Qualitative Requirement (QR). The objectives, deliverables and time frame in respect of these projects are clearly spelt out in the sanction. These projects are expected to culminate in the induction of the systems in the Services within a specified time frame.
- ii. **Technology Demonstration project (TD):** TD projects are planned in the areas where user's requirement is known but the technology is not yet matured for taking up a Staff project with well-defined cost and time frame. TD projects form basis of taking up user oriented future projects and are expected to be converted into deliverables in three to five years.
- iii. **Research and Development project (R&D):** R&D projects are general competence build up projects in a given area of research or to solve specific problems arising out of or having a bearing on Staff projects.
- iv. **Infrastructure (IF):** IF projects are taken up to create typically advanced test and qualification facilities

6.1.2 Scope of Audit

The Research & Development (R&D) projects of the Lab involve long gestation period to develop critical technologies and products as such the projects undertaken during the period of 15 years from 1998 to 2013 were covered in the scope of Audit. A total of 36 projects were undertaken by TBRL during the period January 1998 to December 2013. Since no Staff projects had been taken up by the Lab during this period, we included two Staff projects undertaken prior to 1998 which were subsequently developed through R&D and TD projects, in the scope of Audit.

Out of the 38 projects, (category wise breakup given in the **Table-24** below), 24 projects were completed and 14 were in progress. Audit examination was carried out in respect of 28 projects, the probable date of completion (PDC) of which was up to March 2014. The selection included 24 completed and four in progress projects. The **Table-24** below summarizes the selection of projects by Audit:

Table-24

Total No. of projects		Staff	R&D	TD	IF	Total
	Undertaken	2	23	9	4	38
	In progress	0	3	8	3	14
Selection	In progress			3	1	4
	Completed	2	20	1	1	24
	Total	2	20	4	2	28

6.1.3 Audit Findings

6.1.3.1 Non achievement of Objectives

All types of DRDO projects are taken up for execution by the Lab after being sanctioned by the competent financial authority within their delegated financial powers. The sanction *inter-alia* mentions and enumerates the objectives of the project. Hence these objectives become a benchmark to assess the success of the project.

Audit examined the overall success rate of the projects undertaken by the Lab during the period covered in the scope of audit. Success of completed projects was assessed against the objectives defined for each project. Audit examination revealed that all the objectives as enumerated in the sanction had been fully achieved only in 10 out of the 24 completed projects. In case of the remaining 14 projects the objectives were partially achieved *i.e.* with limited qualitative success. Thus, the success rate in achieving the objectives of the projects was only 42 percent.

Type-wise success of the projects further show that in case of the two staff projects, the objectives were not fully achieved in either of the projects. The projects were closed only after part achievement of objectives. Similarly, in case of R&D projects, the achievement of objectives was only in case of nine out of twenty projects *i.e.* 45 percent.

The details are summarized in **Table-25** below:

Table-25

Type of project	No. of projects (No)	Objective fully achieved (No)	Objective partially achieved (No)	%age of fully successful projects
Staff projects/MM	2	0	2	00
R&D	R&D-12	4	8	33
	Study/trials/evaluation-8	5	3	63
TD	1	1	-	100
IF	1	-	1	00
Total	24	10 (42%)	14 (58%)	

(A) *Staff projects*

We observed that despite clear Qualitative Requirement (QR) of the user and well defined objectives for the project, the Staff projects undertaken by the Lab were closed by the Director of the Lab after declaring them successful though the QR and objective of the project were found not to have been fully achieved during the trials/manufacturing stage. Therefore, infact both the selected staff projects were short closed for want of desirable quality, after part productionisation and further use of the ammunition banned. The failure in successful achievement of objectives in these projects is summarized as follows:

(i) *Development of multimode grenade*

The work for development of multimode grenade to replace the existing grenade by a lighter version having enhanced capabilities, was assigned to TBRL in 1989 at a sanctioned cost of ₹98 lakh with the objective of achieving a delay time of fuze for multimode grenade between 3.5 and 4.5 seconds. The first user trial was conducted in December 1997 although the PDC of the project was over in June 1997. On the basis of successful user trials, a project for Transfer of Technology (ToT) to Ordnance Factory Board (OFB) was sanctioned by DRDO at cost of ₹19 lakh for production of grenade in May 1998. The project on ToT was completed in May 2000 with the recommendation that a new project be taken up for extended user's trials. Accordingly, Ministry of Defence (MoD) sanctioned (June 2000) another project for manufacturing of 2000 grenades after extended user trials at a cost of ₹24.8 lakh. The project was closed by TBRL in June 2003 after declaring it successful. As per the closure report the users had achieved 95 per cent reliability in their trials. There was, however no specific mention about the time delay in the closure report.

In March 2010, MoD placed supply order on OFB to arrange supply of 10 lakh grenades at a total cost of ₹193.80 crore. But after receipt of only 35,000 grenades costing ₹6.78 crore, Army intimated TBRL (November 2011) that the detonating time delay of the grenade was ranging between 2.5 and 5.0

seconds against required/specified delay of 3.5 to 4.5 seconds. As the delaytime was an operational requirement and could not be relaxed, Army imposed ban on use of grenades in November 2011 and progress on the production of grenades is at a standstill as of September 2014. Since TBRL was Authority Holding Sealed Particulars (AHSP) for production upto first 10 lakh grenades, it was the responsibility of the Lab to ensure that the user's requirement was fully met, till production of such quantity. However, due to non-achieving of the desired delay of 3.5 seconds to 4.5 seconds, TBRL failed to develop the lighter version of the grenade with enhanced capability even after lapse of nearly 25 years and incurring an expenditure of ₹8.20 crore.

Ministry in their reply (August 2015) to the draft report accepted the limitation and stated that it was not possible to get 100 *per cent* of grenades functioning between 3.5 second and 4.5 second and therefore a case for waiver of 0.5 second has been sent to Competent Authority for approval. It was further stated that TBRL was making efforts to resolve the issue of delay time by involving private industry.

Notwithstanding the reply, the fact remains that TBRL failed to achieve the delay time as stipulated in GSQR and therefore could not meet the requirement of the Army.

(ii) *Development of Bund Blasting Device*

Project on "Design & Development of Bund Blasting Device (BBD)" was undertaken in February 1991 by TBRL, based on GSQR No.573, with PDC of June 1991 revised to December 1994.

The User trials of the BBD developed by TBRL were carried out in 1994 but dimensions of cut achieved (9x5.5x2m) after blasting the bund was less than that desired as per GSQR (8x4x2.5m). In addition, weight of BBD was 22.5 kg against the GSQR requirement of 15 to 20 kg. Despite the limited achievements, the project was closed with recommendation by the User trial team to introduce the device into service until an improved version was developed and tested. Against total requirement of Army of 2880 numbers, a supply order for 1440 numbers was placed on TBRL by the Ministry, in December 2004. The supplies were delivered by TBRL by 2007-08. As performance of device could not be improved in the present version, TBRL was asked by Integrated Headquarters of Ministry of Defence (Army) in November 2009 to try to achieve required parameter through improved version of MK-II.

Accordingly, a project for "Performance Enhancement of BBD" was undertaken by TBRL in June 2010, at a cost of ₹48 lakh, with PDC of 18 months (*i.e.* upto December 2011) which was revised to 30 June 2013. The project was closed successfully by TBRL in June 2013 at a cost of ₹20.37 lakh though evaluation trials are yet to be carried out by Director General Quality Assurance (July 2015).

TBRL could not develop the device of required specifications even after 24 years despite the objective of providing BBD within six months.

Ministry in their reply (August 2015) accepted that against the dimension cut of 2.5m as per the GSQR, only 2m cut was achieved during the trials. Despite this limitation, BBD Mk-I was accepted by users with minor deviation. It was further stated that while BBD Mk-II designed under second project met most of the physical/operational characteristics yet the final user trials are awaited.

The acceptance of BBD Mk-I by the users was however not absolute as only part quantity was procured to meet the urgent requirement, pending development and testing of improved version.

(B) Utilisation of technology developed through R&D/TD projects

Out of the 22 completed R&D/TD projects selected in audit, eight projects were on Study/Trial evaluation, whereas one project each was on TD and IF. We observed in eight out of 12 R&D projects that technologies have not been developed as per the specific objective laid down in sanction of the projects. These projects could not therefore be converted into TD/MM projects. In addition, technologies developed through one completed TD project could also not be used as feeder technology for future or imminent Mission Mode projects due to non-achievement of the objectives. While the failure in achieving the objectives in two R&D projects have been discussed in Para No.3.1.1.1 earlier, the cases on the remaining six projects are summarized as follows:

(i) Development of multi P-charge and futuristic shaped charge warhead

A project was sanctioned by DRDO, in June 1998 at a cost of ₹4.62 crore with PDC of 4 ½ year for “Development of multi P-charge⁵⁷ and futuristic shaped charge warheads” to upgrade the Explosively Formed Penetrator (EFP) based warhead performance to 0.8-1.0D.

Penetration of the warhead was to be tested in Rolled Homogeneous Armour (RHA) to demonstrate the indigenously developed medium caliber HEAT based warhead and to demonstrate the feasibility of multi P-charge and multi stage shaped charge warhead. TBRL completed the technical work of project in May 2000. We observed from the records that the maximum penetration of 700mm only was achieved in forged steel target. In RHA, the penetration was 0.6D (50mm) with 85mm diameter warhead and 0.5D with 50mm diameter warhead. Thus, the desired penetration of 0.8 – 1.0D penetration in RHA was not achieved as was the objective of the project. The project was closed with limited achievement after incurring ₹4.62 crore.

In the closure report finalized by TBRL, it was stated that the State of the Art technology in various schemes had been established by way of achieving the near set goals and therefore it was recommended to take up the development scheme based on shaped charge based warhead separately for different

⁵⁷ P-charge- Projectile charge.

applications. This was despite the fact that no specific requirement had been raised by the users for production of the same.

DRDO Headquarters accordingly sanctioned three different R&D projects for establishment of shaped charge based warheads for futuristic high energy shaped warheads, as discussed below.

Ministry in their reply to the draft audit report stated (August 2015) that the project was undertaken with an aim to improve their understanding of shaped charge related technologies and also to improve performance of EFP. The reply was however silent about testing the penetration in mild steel instead of RHA, which formed the main objective of the project.

- **Establishment of shaped charge based Anti-ship and Anti-submarine warheads and Anti-armour technology**

This project, with the aim to defeat the protection offered to Main Battle Tanks (MBTs), ships, submarine, aerial targets, was taken up by TBRL in October 2003 at a cost of ₹4.95 crore with PDC of 54 months (*i.e.* March 2008). Project was closed in April 2008 at a cost of ₹4.70 crore after development of prototype design of the shaped charge and multi P-charge based warhead without stating the achievement against desired penetration level of the same. The project was made a feeder project for development of technology for design of futuristic high energy shaped charge warheads. In the absence of any mention about the specific level of penetration, the success rate of the project could not be ascertained in audit.

Ministry replied (August 2015) that technology was developed and demonstrated through experimental trials enabling to design shaped charge warheads. However the reply is silent about the specific achievement made in the project and its success in terms of the objectives of the project.

- **Development of technology for the design of futuristic high energy shaped charge warhead**

In February 2009, a TD project was taken up by TBRL at a cost of ₹13.70 crore with PDC of 60 months. Under the project, technology for design of high energy shaped charge warhead to defeat deep buried Command and Control bunkers, double hull submarines and design of high energy multi-P charge based warheads for defeat of naval ship and aerial targets were to be developed. One of the objective was to penetrate 4.5 meter in multi layer target like Triple Reinforced Cement Concrete (TRCC)/Compact earth, as clarified by the Lab in August 2008 (before sanction of project). Despite the limited success of the project, Chairman Executive Review Committee of XIth plan projects however recommended closure of project (January 2014), after achieving penetration of 3m in Plain Cement Concrete (PCC) target as against penetration of 4.5m in TRCC. This was a significant lapse on the part of Executive Committee. In reply to audit query as to how the test was qualified as successful when the penetration was only 3m in PCC against 4.5m TRCC, it was stated that a separate project has been taken up under 12th Plan to achieve higher penetration *i.e.* up to 4.5m in RCC. Thus, even though the

objectives were not fully achieved, the project was declared as successful by Executive Committee.

Audit observed that to achieve the penetration level of 4.5 m TRCC, another TD project (TD-13/TBR-655) was taken up by TBRL in December 2013 for “Development of technology for design of shaped charge based multi stage warhead system to defeat hardened deep buried targets”. The PDC of the project is December 2018.

Ministry in their reply (August 2015) stated that multi EFP technology was developed to the extent that war heads were designed as per required specification which were used successfully in number of flight tests of interceptor missiles under programme AD of RCI Hyderabad. The reply therefore substantiates the audit finding that the technology developed was used as feeder technology and to achieve the specified penetration levels, a separate project was taken up.

Thus, even after undertaking two R&D projects and one TD project and after a lapse of 16 years, technology developed could not be converted into Staff/MM project due to non-achieving of desired objectives. Fourth project for shaped charge application is still in progress as TD project.

(ii) Design and development of Bunker Buster

The objectives of the project were to develop specific weapon technology for design and development of bunker buster capable of penetrating and destroying hardened bunkers/deep buried structures. Ministry sanctioned a project in March 2004 for ‘Design and Development of Bunker Buster’ at a cost of ₹4.90 crore with PDC of 48 months subsequently revised to 60 months from date of sanction.

Though the project was closed in March 2009 at a cost of ₹1.42 crore, yet the issue regarding translation of developed technology into production was not done even after four years (April 2009 to November 2013) of completion of the project. TBRL ascribed the reasons (November 2014) for delay to pending financial closure of the project. It was also stated that it was a feeder project whereby the technology developed is being used in current running 12th Plan project (TBR-655) sanctioned in December 2013 with PDC of December 2018. Hence the technology developed in the previous project was not used for more than five years in the subsequent project which caused an overall delay in use of technology developed for conversion into product.

Ministry in their reply (August 2015) stated that the technology developed was subject to detailed feasibility studies, decision aid for technology evaluation (DATE) analysis and formulation of project proposals prior to undertaking a feeder technology demonstration project. The fact however remains that since the subject project had been taken up as a feeder project, the activities like feasibility study, DATE analysis etc should have been carried out before successful completion of this project.

(iii) Development of slapper detonators

To develop the technology for development of slapper detonator, MoD sanctioned a project at a cost of ₹4.29 crore with PDC of 42 months from date of issue of sanction in November 2002.

The objective of the project was to develop slapper detonators device for sophisticated weapon system to make the system at par with devices used by advanced countries. After development of technology the same was to be transferred to production factories for integration with future weapon system. The project was closed on 30 November 2006 as successfully completed. On Audit query regarding utilization of the technology developed for incorporation in weapon system, TBRL replied (December 2014) that the detonator developed under the project achieved higher voltage than desired voltage level. Thus to bring down the voltage level, a TD project (TBR-1249) was taken up with PDC of November 2015. Thus TBRL did not make proper study of voltage matching of detonator with warhead before taking up the project. The objectives framed for the project were therefore inaccurate.

Hence, after development of technology, the same could not be transferred to production factories due to non-achievement of the desired voltage level for integrating the same with weapon system even after eight years of completion of the project.

(iv) Development of Technology for initiating devices

The objective of the project was to develop laser ordnance initiator for single point initiation and multi point initiation and subsequent transfer of technology to the production agencies for integration with the weapon system, after successful development. To achieve the objective, the project for 'Development of Technology for initiating devices' was sanctioned in November 2002 at a cost of ₹4.76 crore with PDC of 4 years from date of sanction, which was subsequently revised to 5 years. Single point initiation by laser technology was achieved in the project but multi point initiation could not be achieved as the laser system which was to be imported could not be received in time even in extended period of the project upto November 2007. However, the project was closed by Director TBRL as successful in November 2007, based on initiation of multi target by splitting the beam and by simultaneously firing number of laser diodes.

On audit query regarding transfer of Laser Ordnance Initiator system to production agencies for integration with weapon system as envisaged in the objective of the project, TBRL replied (December 2014) that the project was R&D and Laser Ordnance Initiation System (LOIS) developed under this is a Lab model and for development of field setup, subsequent TD project (TBR-1249) has been taken up in November 2008 with PDC of May 2014 which was extended to November 2015.

Thus the objective of development of laser initiator technology and its transfer to the production agencies for integration with the weapon system could not be achieved in the project. Notwithstanding the same, the project was closed as successful.

In reply, Ministry stated that this is a future generation technology towards development of precision, safe and miniature detonator mainly for secret strategic application. Notwithstanding the reply, the fact remains that technology developed has no application as on date.

(v) *Design & development of multipurpose fuze long delay*

Director, TBRL, Chandigarh sanctioned R&D project “Design & development of multipurpose fuze with long delay” in January 1998 with PDC of 18 months (June 1999). This project was in continuation of earlier staff project on ‘Design and Development of General Purpose Anti-personal Grenade’ sanctioned in August 1989, which was closed in June 1997 after successfully achieving acceptable qualitative level. The objective of the R&D project was to modify the time delay of the existing fuze developed under staff project from 5 seconds delay to 7 seconds delay required for rifle grenades. During four trials held between 1997 and 1999, the fuzes used in rifle grenade failed to meet the parameters. Hence it was decided by users to foreclose the project in October 2000. Thus, the project for development of fuze for rifle grenade did not achieve the desired objectives.

Ministry in their reply (August 2015) stated that the desired delay for which TBRL was responsible was successfully achieved. The fact however remains that the success was actually achieved only in Hand grenade. In case of Rifle grenade the parameters could not be met, which caused the Army to close the Project on Multi mode grenade (Rifle) in October 2000.

6.1.4 Time overrun in R&D/TD/IF Projects

For planning of new projects, feasibility study, availability of resources, probable date of completion (PDC) and execution plan form the main criteria. To review the overall progress of the projects, all projects have an integrated review and monitoring mechanism approved by the Competent Authority at the time of sanctioning the project.

We observed that while each project has a defined PDC, yet out of 24 completed projects, 14 projects (58 *per cent*) were delayed. The delay ranged between 8 months and 54 months. Age wise analysis of the delayed projects is summarised in the **Table-26** below:

Table-26

Total No. of projects	No of projects delayed	Period of delay				
		Upto one year	One to two years	Two to three years	Three to four years	Four to five years
24	14	6	5	1	1	1

In reply the Ministry stated that projects are considered closed once the PDC/extended PDC is over. However it takes some time before it is administratively closed. The Ministry contested the above mentioned period of delay, stating that while the projects were physically completed, the administrative closure was delayed. This contention of the Ministry is not

tenable, as a project is considered closed only after closure of all activities linked with it.

Ministry however attributed the delay to non-materialization of supply orders of “dual use items” for which technology is denied to the Lab.

6.1.5 Future utilization of technology developed

The Closure Reports of the projects undertaken do not mention the future utilization of technology developed/results achieved. This issue was raised in Audit to examine the use of technology developed. In response to audit query, Director TBRL confirmed (December 2014) that the same is not mentioned in the closure report, and stated that as some of the projects are of strategic nature, and are for advancement of systems already developed, the usability of techniques developed are furnished to user/Director General (Headquarters). Given the low success rate in achievement of objectives, as discussed earlier in the report, proposed utilization of the technology developed/results achieved should be mentioned in Closure Report for transparency.

Conclusion

- Staff projects are undertaken on the basis of well defined QR projected by the user. The objective of these projects is to culminate in the induction of the systems in the Services within a specified time frame. However TBRL did not undertake any staff project in the last 15 years. Two staff projects undertaken prior to 1998, which was subsequently developed through R&D and TD projects in 2000 and 2010, were still awaiting successful productionisation. The reason for non-productionisation and eventual induction of technology in the Service was the failure of TBRL in achieving the prescribed quality parameters.
- R&D and TD projects are expected to eventually find application in Staff projects. Such projects have the potential of creating a certain extent of intellectual property that is patentable. However, most of the R&D/TD projects, undertaken by TBRL during the last 15 years could not be converted into staff projects due to non-achievement of objectives. 11 out of 20 R&D projects, though closed after declaring them successful, had actually not achieved the prescribed objectives and were eventually used as feeder projects for subsequent projects.
- All projects have an integrated review and monitoring mechanism approved by the Competent Authority at the time of sanctioning the project for reviewing the overall progress of the projects. However, inspite of monitoring at various levels through Executive Committee, Project Monitoring Committee, 58 *per cent* projects got delayed mainly due to non-materialisation of supply orders which suggest improper planning and monitoring.

Matter was referred to Ministry (June 2015). Ministry’s reply received (August 2015) has been suitably incorporated.

6.2 Information Technology Audit of SAP Enterprise Resource Planning System at Research Centre Imarat, Hyderabad

The ERP system implemented at a cost of ₹15 crore in August 2011 after a delay of three years, was utilised partially due to incomplete mapping of business rules, inadequate usage of modules leading to manual intervention in generation of MIS report and decision making. The inventory data in the ERP system is incomplete as it was ported partially only from the legacy database. Further, the data in the ERP database have wrong codification. The Project System module was used only for procurement related activities integrated with Material Management module and not utilised for scheduling and monitoring of projects.

6.2.1 Introduction

Research Centre Imarat (RCI) Hyderabad, a laboratory of Defence Research and Development Organisation (DRDO) was established to design and develop state of the art technologies which will produce reliable indigenous weapon systems. It is pursuing research on navigation, control and guidance system, imaging infrared and radio frequency seekers, batteries and flight instrumentation technology areas. In March 2005, RCI initiated proposal for implementation of SAP ERP⁵⁸ system with the objectives of effectively managing the mega Research and Development (R&D) projects having a lot of uncertainties and challenges, reduce the project risk in terms of technical performance, schedule and cost, integrate the existing scientific software and utility software to protect the previous IT investment, integrate all the divisions of RCI, other research and educational institutions and various DRDO labs, integrate all the data for decision making and automate project monitoring and have on-line generation of various reports, including management information report. In September 2007, RCI engaged M/s Tata Consultancy Service (TCS) as prime contractor and M/s Computer Maintenance Corporation (CMC) as sub-contractor for setting up of a data centre and implementation of SAP ERP system on turnkey basis at a total cost of ₹14.91 crore. RCI has implemented 23 modules under ERP system in August 2011, after a delay of three years, from the envisaged schedule. The SAP ERP is made available to the users through web based portal and SAP GUI provided in the PCs/Thin Clients.

The audit reviewed business process re-engineering, hardware and software procurement, customisation and implementation of SAP ERP system during January to April 2015 and the data for the calendar year 2011 to 2014 was analysed. The Project System (PS) and Material Management (MM) module were selected. The PS module deals with preparation of project proposal, sanction, project scheduling to procurement and inventory management while MM module deals with planning, organising and controlling the flow of materials from their initial purchase through internal operations to the service point.

⁵⁸ SAP ERP is enterprise resource planning software developed by German Company SAP and incorporates all the key functions of an organisation.

6.2.2 Audit findings

6.2.2.1 Control Weaknesses

Adequate and appropriate IT controls ensure that adequate measures have been designed and are operated to minimise the exposure to various risks. IT control objectives relate to the confidentiality, integrity, and availability of data and the overall management of the IT function of the business enterprise.

(A) Physical Control

In order to prevent easy access to sensitive data maintained in RCI Data centre, provision was made in the contract for installation of access control devices like access control system, finger print reader, surveillance system (CCTV), magnetic door contact and controller. The responsibility of Data centre was entrusted to private parties including maintenance of access control system. However, we observed that the door was kept open for easy access to the data centre.

On seeking clarification regarding access control at the data centre, DRDO stated (August 2015) that the entry in the data centre room was not required for all the software maintenance/installation/administration staff, which could be done from outside the data centre at Command centre. The entry of maintenance team into data centre was controlled by the data centre in-charge and the movement of people was recorded by CCTV.

The reply is not acceptable in audit, since, there is free movement of personnel in the data centre and the system being followed by RCI is reactive rather than proactive. Further, log files of access control device were not maintained to monitor unauthorised access. Considering the confidentiality of data in the system relating to Research activities under taken by RCI in the field of Missiles and Defence sector equipment, weakness in the physical access control exposes the systems and data to unauthorised access.

(B) Logical and Authorisation control

Password policy

The system protection parameters from unauthorised access, their functions, the SAP standard settings and the recommended settings vis-à-vis actual settings at RCI were examined in audit. We observed that the period for expiry of the password and changing the password was not set in the system. Further, analysis of the profile parameters pertaining to password changes revealed that the users changing the password was minimal as out of 630 users, only 48 users have changed their password within 90 days, which is advisable for IT Security.

In reply to audit query, DRDO stated (August 2015) that ERP system of RCI is the first integrated automation system implemented in the organisation and bit complex to be used for naïve users. DRDO further stated that in order to make the use of ERP system simple for RCI employees, flexible password

policies has been defined which can be made slowly strict over a period of time. It was also stated that action will be taken up to implement frequent password changing policy. The reply confirms that even though four years have lapsed since Go-Live of the system the password policy has not been strengthened. This indicates that the present logical and authorisation control in the system are weak which compromises the IT Security of RCI.

Segregation of duties

Separation of duties occurs when one person provides a check on the activities of another and prevents one person from carrying out an activity from start to finish without the involvement of another person. Inadequate segregation of duties increases the risk of errors being made and remains undetected, chances of fraud and adoption of inappropriate unethical working practice. This can be achieved through the existence of and compliance with job descriptions. Notwithstanding the above,

- i. A developer was granted full access to PS Module, who could modify an existing programme in production, configure the production environment to limit monitoring, conceal irregular development practices and can modify data in tables and run programme using inappropriately modified data. Thus, entrusting all powers of PS module to a developer is contradictory to best practices of IT security.

On pointing out in audit, DRDO stated (August 2015) that these officials are not a User of the Module but all the problem resolutions specific to this module is addressed by these experts and they do not have any authorisation of financial/non-financial approval role.

- ii. As Integrated Financial Advisor (IFA) was not exploiting the facility extended to them, all the documents requiring IFA approval that were obtained on paper, were fed into the system by Director of Contracts and Material Management, RCI on behalf of IFA using his Username and Password. This leads to compromising best IT Security practices and would compromise the vital control over expenditure.

In reply DRDO stated (August 2015) that one official is doing approvals on behalf of IFA, once manual signature is done on the file. It was further added that once IFA starts using the ERP system, the referred step will not be required.

The reply is not tenable in audit as the above system indicates inadequate segregation of duties as officials are performing multiple roles leading to risk of data manipulation, irregular sanction of procurements.

(C) Internal Audit

The organisation of PCDA/CDA (R&D) is responsible for carrying out the Internal Audit of the accounts maintained by the DRDO. The internal audit's objective is to ensure that the accounting system and the mechanism are efficient and the accounting reports are accurate and to disclose all the

material facts. Further, this involved conducting a systematic examination of the records, systems and procedures and operation of an organisation as a service to the Executive. The internal audit of financial accounts of the R&D projects undertaken by these Laboratories/Establishments/Units is also conducted by CDA (R&D). In the process, the LAO does the linking, pairing, casting and checking closing/opening book balances.

We observed that module for discharging functions of internal audit was not incorporated in the ERP system, which would not only result in accounts remaining unaudited through ERP system but also in maintenance of manual records for the purpose of internal audit.

On being pointed out, DRDO stated (August 2015) that proactive involvement of CDA (R&D) was essential. It was further stated by DRDO that CDA can access the documents using ERP from their location if they want, on real time basis without waiting till month end and can take corrective measures. In addition, manual copy was generated through ERP for the last couple of years. However, CDA (R&D) in their reply stated that there is no 'Audit Module' incorporated in the system and they were not associated in implementation of the modules.

As such reply of DRDO is not tenable in audit, since audit module has not been incorporated in the ERP system as confirmed by CDA (R&D) despite lapse of four years from Go-live of the system.

6.2.2.2 Business Continuity and Disaster Recovery plan

The objective of Business continuity, disaster recovery plan and associated controls is to ensure that the organisation can still accomplish its mission and it would not lose the capability to process, retrieve and protect information maintained in the event of an interruption or disaster leading to temporary or permanent loss of computer facilities. We observed that RCI did not establish backup servers outside the data centre building or out of the same seismic zone, thus exposing to the risk of loss of data/continuity of business due to natural calamities.

In reply, DRDO stated (August 2015) that they would consider suitable place for safe storage of back up data. As regards disaster recovery and business continuity plan DRDO stated that the same would be implemented on receipt of financial sanction. The absence of well-defined and tested Business continuity and disaster recovery plan may pose threats to the very existence of the organisation in the event of disaster.

6.2.3 Material Management Module

Basic functionalities of MM module under SAP implementation at RCI, were maintaining Material Master and Vendor Master, Material procurement (demand, tender processing, TPC, supply orders, preparation of vouchers *etc.*), inventory management and material valuation.

6.2.3.1 Business Rules not mapped into the system

Business rules are abstractions of the policies and practices of a business organisation which define and control the structure, operation, and strategy of an organisation. The mapping of rules automates the action to be taken under specific conditions.

We observed that some of the Business Rules have not been correctly mapped in the Material Management module as detailed in the following paragraphs:

(A) Non-mapping of fields

Audit requisitioned details pertaining to 64 fields relating to procurement of stores, subsequent to implementation of SAP ERP in RCI. The data requisitioned was to assess the process flow, compliance to the procurement rules, time taken to obtain the sanction till placement of supply order and its materialisation. However, RCI in their reply stated that the data relating to 21 fields could not be generated through ERP system, which included, the availability of funds, date by which stores were required, financial sanction, issue of EDEC/CDEC, TDS, amount of liquidated damages for delayed delivery, date of issue of stores to users, final payment voucher No and date, among others.

On seeking clarification in audit, DRDO stated (August 2015) that some of the transactions are carried outside the system viz., CDEC/EDEC, TDS, amount of LD and efforts would be continued in implementation regarding the process that needed to be mapped. It was also stated that as and when ERP is implemented across DRDO and CDA module will be effectively in use, all these transactions will be available in system.

The reply is not acceptable in audit since this indicated that the procurement process is still not fully automated despite implementation of SAP ERP system in August 2011, thereby defeating the very intention of digitising the entire procurement process.

(B) Tender Process and Authorisation control -Demand initiation

DRDO Purchase Management Manual 2006 stipulated authority/level for initiation of Demands for procurement of stores against projects, build-up, maintenance and general use. Extraction of the records revealed that 3392 demands valuing ₹15.11 crore were initiated by officials of the rank below Scientist 'C', who were not authorised to initiate Demands. On being pointed out in audit, DRDO stated (August 2015) that the additional authorisation was given to few employees based on the Technology Director's request who duly approved the demand in those cases and the system would be corrected as per rules. The reply is not tenable in audit as the present system of demand initiation is not as per rules.

(C) Booking of Capital expenditure under Revenue

As per para 5.6 of Store Management Guidelines for DRDO, non consumable items costing more than ₹10 lakh and having a life of seven years are to be

categorised as Capital items. However, in 381 cases valuing ₹34.75 crore where the cost of the item was less than ₹10 lakh, were demanded under Capital Head. Four of the supply orders for annual maintenance for ₹31.48 lakh were also demanded under Capital Head. Further, no field was catered in the system to capture the life of the store to verify the correctness of the nature of booking.

On being pointed out in audit, DRDO stated (August 2015) that the cases where the cost was less than ₹10 lakh has been booked under capital because they had shelf life more than seven years.

The reply is not tenable in audit as the Stores Management Guidelines stipulates condition of cost and seven years of life for Capital expenditure.

(D) Acceptance of tenders without approval of Stores Procurement Committee (SPC)

Para 4.4 of DRDO purchase manual stipulated that demands in excess of ₹ one lakh were to be processed with the approval of SPC. Audit however, observed that in 137 cases valuing ₹12.38 crore, where the estimated cost of the item was more than ₹ one lakh, the demands were processed without the approval of SPC. DRDO replied (August 2015) that presently all the cases above ₹ one lakh were routed through SPC.

The reply is not tenable in audit, as DRDO is silent about mapping of rules in the system.

(E) Non recording of collection of tender fees from non-registered vendors

As per para 7.4.5 of DRDO Purchase Management manual, tender fees was to be realised from non-registered vendors. It was observed that in 232 cases wherein the amount of tender fee involved was ₹1.08 lakh, the field to record receipt of tender fee was kept blank. On raising the issue in audit, it was stated that the tender fees was received from all non- registered vendors through Demand Drafts and manually recorded in the register. Further it was stated that DRDO was planning collection of tender fee through payment gateway on e-procurement platform.

The reply is not tenable in audit, as the details regarding actual collection of tender fee was not entered in the designated field even after receipt of the amount. The rules regarding collection of tender fees were not captured in MM Module. This indicates that rules for issue of tenders have not been mapped in the system which may lead to issue of tender free of cost.

6.2.3.2 Validation Control

Information technology system may have in-built controls to automatically check that the input data is accurate and valid. In the SAP R/3 System, all input values are validated by a program or against tables or master files except some types of validations which are not standardised but such programme could be created to validate transactions specific to the organisation. The

validation function enables to check values and ranges of values as they are being entered in the system thus ensuring that only valid data is entered and processed.

(A) *Material Master*

In SAP system when a new material is procured, a master record is created. There should be a unique Material Code Number for the material thereby avoiding duplication. It is used as a central source for retrieving the material specific data. The Material Master Record for a material would be created only once across all the Directorates (Plants).

This information was to be stored in individual Material Master Records in two categories one in 'descriptive nature' with information content such as name, size, or dimension. Another category of the data to perform a price control function. As such, every material would have a single master record created, which means all the information pertaining to material e.g. Purchasing, Inventory, Accounting, Quality etc., would be maintained in a single record, thereby redundancy was avoided.

In this context, during the test check of the Material Master functions, the following points were noticed in audit:-

- The Material master contained 64226 items out of which 6311 items have 19336 material codes. Even, the material code number was not unique as the same material code number was repeated two to 43 times.
- The Unit of measurement was not correctly captured for items like filter oil and coolant. The unit of measurement for Machinery was "Box" instead of "Number". For items that were to be measured as "litre" were counted as "number".

Misrepresentation of items would result in incorrect reporting of the Quantity of Stock held in the stores, leading to likelihood of ordering the item despite holding the same in stock or otherwise.

On being pointed out in audit, DRDO replied (August 2015) that necessary action would be taken to rectify the above mentioned errors.

(B) *Material coding*

Under Material Master, RCI adopted codification logic based on the North Atlantic Treaty Organisation (NATO) codification standards, wherein, the code consisted of 18 digits, including two hyphens. The first two digits represented 'Industry Sector', second two digits represented 'Material type', third two digits represented 'Main category' of material and the fourth two digits indicated 'Sub Category' of the items. The last eight digits represented unique material code number for a specific item. Analysis of the material master records revealed that the material coding had deviated from the standards set, thereby undermining the correctness and completeness.

- The first two digits that represent “Industry” should range from 01 to 12. However, the coding was assigned beyond this range.
- Text characters were used instead of digits.
- Under material type, consumables were classified under the code for “Non-consumables” and vice-versa. There were mis-classification under main category and sub-category items viz., under ‘Weapons’, items such as Wet Canteen, LPG spares and ‘Computer printer Cartridges’ and Computer Printers were classified under ‘Cartridges’ of ‘Ammunition & Explosives’.

On being pointed out in audit, DRDO replied (August 2015) that necessary action would be taken to rectify the above mentioned errors.

Search by using wrongly coded material master would result in mis-reporting that may lead to under/over provisioning of stores. As RCI is dealing with explosive stores also, there is likely hood of the same landing in unsecured storage location.

(C) Payment more than the order value

Out of 4578 cases, in 144 cases valuing ₹35.03 crore, the system reflected that the actual payment made was amounting to ₹38.96 crore, which is ₹3.93 crore more than the supply order value. This indicated that there was no link between the supply order value and the total payment made to the vendors. Moreover, there was no indication regarding revision of the sanctioned amount in the data given. On being queried in audit, DRDO stated (August 2015) that in the mentioned 144 cases payment made was more than the supply order value due to exchange rate variation, tax structure revision, etc. It was also stated that ERP will not allow excess payment without proper additional financial sanction and same is enrolled and processed through ERP.

The reply is not tenable in audit as DRDO in reply regarding ‘non-mapping of fields’ had stated that transactions like CDEC/EDEC, Financial sanction etc. are carried out outside the system. This indicates that the controls in the system to restrict the payment within the supply order value does not exist and consequent poor validation check.

(D) Down payment more than the order value

As reflected in the system, in 16 cases worth ₹6.53 crore ‘the down payment’ made was ₹7.74 crore, which is ₹1.22 crore more than the supply order value. This indicated that there was no link between the order value and the actual payment. On being pointed out in audit, DRDO stated (August 2015) that the same was due to errors occurred during transition from manual system to ERP and there was no over payment. Legacy supply orders were created in the system for making the balance payment but entire amount was booked against the supply order. It was further stated that actual payment is always linked with the order value and this in turn is linked to the financial sanction. The reply of DRDO is not tenable in audit as the system could not restrict the

down payment within the supply order value. Thus, there is a deficiency in control to restrict the down payments with reference to the supply order value, financial sanction, etc.

6.2.3.3 Transactions still being carried outside the system

(A) Accounting of Security Deposit

Para 7.11 of Purchase Management manual stipulated that qualified vendors shall deposit 'Security' equivalent to an amount not exceeding 10 per cent of the value of supply order before release of the order. The Deposit shall be made in favour of Controller of Defence Accounts (R&D) [CDA (R&D)] and will not be held in the Public Fund Account of the Lab/Establishment.

We observed that, the amount received as Earnest Money Deposit / Security Deposit / Performance Guarantee in the form of Demand Draft was handed over to Finance Section by Directorate of Contracts and Material Management (DCMM), RCI. The Demand Drafts were then deposited in the Public Fund Cash Book of RCI which was then converted into Fixed Deposit (FD) in the name of RCI. The Fixed Deposit Receipts (FDR) was kept in the safe custody of Accounts Officer. Upon maturity, the FDR was encashed and the amount so realised was credited into Public Fund Cash Book. The amount due to the contractor was then refunded and the interest received was credited to the Government through Military Receivable Order. As of February 2015, a sum of ₹84.68 lakh was held with RCI under various FDRs, the oldest being of the year 2005. There was no field in the ERP to indicate the trail of the amount of Security Deposits received from the vendors in the MM Module as the same is transacted offline. On being pointed out in audit DRDO stated that the matter has been referred to CDA for clarification.

The above practice being followed was incorrect and susceptible to misappropriation as the same was kept outside Public Fund Cash Book during the tenure of FD and the same is not reflected in assets and liability statement. In addition, the interest earned from these FDs could be mis-utilised as security deposit is not intended to generate income to the Government. Hence, the Security Deposit needed to be deposited with CDA and necessary fields may be incorporated in the ERP for its audit trail.

(B) Non-computerisation of Vouchers

With the introduction of ERP it was expected to generate various types of vouchers in respect of stores viz. Receipt Voucher, Issue Voucher, External Issue Vouchers, etc through system. However, we observed that vouchers were being raised manually instead of through ERP. On being pointed out, DRDO stated (August 2015) that after completion of the stock verification, execution of the various types of vouchers would be maintained in ERP. This indicated that the MM Module is partially complete even after four years of Go-Live.

6.2.3.4 Non utilisation of the system for Decision making

IT systems are used as a tool for effective and faster decision making by providing complete and reliable data to the management for the decision making. We observed in the following instances that ERP system is still not being effectively employed for decision making process.

(A) Vendor Registration

RCI issued 10084 limited tenders to various vendors. Analysis of the Supply order process revealed that the 47.50 per cent of the vendors did not respond, 55 vendors who received the tenders never responded and action was not taken to de-register/black list such vendors as stipulated under para 3.4 of the DRDO Purchase Management.

On flagging the above issues in audit, DRDO replied (August 2015) that ERP system automatically generates warning letter to the vendors who did not respond to the limited tenders. As regards vendors who never responded, DRDO stated that a report will be handed over to vendor registration committee for necessary action as per provision of Purchase Management Manual 2006.

The reply is not tenable in audit as Para 3.4(b) of the manual stipulated that if the firm fails or neglects to respond to three consecutive invitations to tender within the range of products for which it is registered, the vendor shall be removed from approved list of suppliers. The vendor registration committee did not utilise this data proactively in blacklisting/blocking such unresponsive vendors.

6.2.3.5 Inaccurate and Unreliable data

Data reliability is a state that exists when data is sufficiently complete, relevant and valid. Master data is a crucial element of a business such as products, raw materials, vendors etc. The presence of unreliable data impact the ability to make timely decision and to manage operational performance.

(A) Vendor Master

Vendor Master is one of the basic requirements of MM module. Vendors are the business partners who will be supporting with the supply of material or services. All the vendors would be maintained in the system with unique code numbers. Business transactions were to be posted to various accounts and managed using the data in the Vendor Master.

Vendors were required to submit mandatory information to the lab during registration viz., Application Date, Vendor Name, Registration type, Address, Telephone No., Fax Number, e-mail id, Vendor upper limit, etc. We observed that :

- The database does not reflect the correct number of vendors. Vendor master contained 2680 vendor names, which included 270 duplicate vendor Name records.

- In respect of 105 vendors, the Material category was not available in Material Master and in respect of 13 vendors the material for which the vendor had registered was missing. In respect of 94 vendors, mandatory field, address, was blank and in respect of 95 vendors, addresses were repeated. This may lead to non-issue of tenders to these vendors and issue of tenders to wrong vendors.
- Against 768 vendors the upper monetary limit for supply of material was 'zero'. This would result in issue of orders to incompetent vendors.
- Bank Account Number was not available for 1900 vendors and eight vendors were with duplicate Bank account numbers. This would defeat the ECS mode of payments adopted by DRDO. Duplicate bank account number may result in payment to wrong vendor.

On pointing out the above, DRDO stated (August 2015) that the above discrepancies were due to wrong categorisation of vendors due to wrong selection from the dropdown lists, data entry mistake, non-availability of information on vendors, etc. It was also stated that corrective action wherever necessary will be initiated and the ERP vendor database is being replaced / updated through e-procurement platform which would ensure validity of vendor database. The reply is not acceptable in audit, since the Supply orders were placed against these vendors, without complying with the stipulated conditions. Moreover, DRDO did not capture the complete information of vendors as required for business transactions in ERP. The input control could not prevent entry of duplicate Bank Account Numbers and fictitious numbers. Therefore, the data in the present form was not reliable and the automation envisaged by implementing the ERP was deficient.

(B) Incomplete porting of Inventory Legacy data

Prior to implementation of SAP ERP, inventory was maintained in MILMAN software and the same was to be brought forward. However, we observed that from the legacy data, 13887 items with positive balance in the stock were not brought forward to the SAP ERP system. Total value of stores remaining unaccounted in ERP was to the tune of ₹848.74 crore.

On being pointed out in audit, DRDO stated (August 2015) that the Stock taking board was formed by the Director RCI to validate the inventory. Based on their recommendations legacy inventory data would be uploaded to ERP. This proves that the database in the ERP system was incomplete and unreliable.

(C) Inventory Holding

In SAP, inventory held under a Directorate was shown as Plant and the place where the material was physically held was shown as storage location. Further, no item with multiple material code number was expected to be held. However, in respect of 1985 items valuing ₹471.15 crore, there was duplication in description of the item, within the same Plant and within the same storage location. Holding the same item under different Inventory code concealed the actual quantity held by the Division.

In respect of 51 items, storage locations, which needed to be confined within a plant was spilling over to other Plants and in respect of 773 items, Inventory Holder names was shown as 'DO NOT USE'.

On raising the above issues in audit, DRDO stated (August 2015) that stock taking board is under progress and after completion of the stock taking the finalised list will be verified and updated into the system. As regards spill over of storage location DRDO stated that due to reorganisation some of the storage location became part of the different plant. This indicates the present database is inaccurate and not reliable. Further stores available with RCI would not be available for use until the reorganisation of storage locations is completed as well as system deficiencies is rectified.

(D) Period of holding of Retention money

Para 7.23 of DRDO purchase manual stipulated for retention of 10 per cent of the supply order amount towards risk coverage during warranty period. The period of holding of retention money ranged from 0 days to 1787 days. This indicated that no standard procedure was followed. Further, the conditions regarding warranty in the supply order was not captured on the data base so as to reflect the correct period of guarantee required for the product.

On being pointed out in audit, DRDO stated(August 2015) that the system was having provision to enrol these details. It was further stated that the retention money might have been paid manually through CDA (R&D) and the same is not reflected in the system and effective use of CDA (R&D) module will ensure online payment related updates in ERP system.

This indicates that there is no linkage between DRDO and CDA (R&D) regarding release of retention money thereby resulting in DRDO maintaining incomplete database. This may result in early release of retention money and the same would not be monitored through the system till CDA (R&D) utilises the system.

(E) Incomplete details of Bank Guarantee

The data maintained by RCI on Performance Bank Guarantee (PBG) was scrutinised and it was observed that vital information viz., date of completion/installation of the item / machinery, inspection document No, date, date of acceptance of the item, BG No and date, amount of PBG retained, validity of PBG and extended validity of PBG were not captured. On being queried in audit, DRDO stated (August 2015) that the System was having the provision to record the details of Bank Guarantee which was enrolled at the time of preparation of Supply Order. All the details observed in audit are available in manual form of records and the same will be recorded into ERP system.

The absence of such data indicates weakness in the controls in securing the interest of the DRDO in case of contractor violating the warranty conditions mentioned in the contract.

6.2.4 Project Systems (PS) Module

The SAP PS module optimises the business processes from project planning through project progress analysis. The Project System Module manages the mega R&D projects with a lot of uncertainties and challenges effectively, reduces the project risk in terms of technical performance, schedule and cost, and integrates the existing scientific software, data and utility software to protect the previous IT investment for decision making. It also automates project monitoring and have on-line generation of various reports, including management information report.

6.2.4.1 Sub-optimal use of Project System module

DRDO project proposals includes Critical Path Method (CPM), Decision Aid for Technology Evaluation (DATE), Performance Evaluation Review Techniques (PERT) chart, Earned Value Analysis, Milestone Trend analysis and cost-benefit analysis. Funds for the project are allotted year-wise and Head wise and expenditure is monitored. Assets created are accounted under the Projects which are transferred to build-up after closure of the Project. On completion of the project a closure Report is also being prepared, indicating the results of the Project, financial position among others. The entire activity was to be mapped into PS Module. Accordingly the Business Blue Print (BBP) was framed to suit the above requirements of RCI.

RCI was executing 23 projects, including sub-projects, Memorandum of Understandings (MoU) valuing ₹1066.63 crore, which were at various stages of implementation. Audit scrutiny of the PS Module pertaining to ongoing projects revealed the following:

Out of 23 projects, details of six projects were available on the ERP system and the data in respect of remaining 17 projects were not maintained or partially maintained in the ERP system. Details of seven projects closed after the year 2012 were not available on ERP system, though as per BBP it was required to be maintained; Work Breakdown Structure (WBS) was available in respect of only one project; one of the Project offices had stated that technical documents were not loaded in the ERP due to its sensitive nature; Project procurement aspects was available in all the projects sanctioned after 2012. Further, test check of nine projects revealed that the percentage of PS module utilisation ranged from 12.5 to 81 *per cent*, as such, the Module was not fully utilised by the Project offices. In addition to this, functions such as, network activities, project structure, re-appropriation of funds, were stated to be 'in the process' of implementation.

On pointing out the above aspects in audit, DRDO stated (August 2015) that there is no shortfall in implementation of project management functionalities but the technical structure is not being used by many project groups. It was also stated that adoption of creating the technical structure and regular update of status in the system depending on the progress is required from the user side. Once it is done, ERP will certainly bring visibility, control and effectiveness leading to in time delivery of project. Further it was stated that the Project officers may not be aware/fully knowledgeable about the technical

aspects of PS Module. As regards classified projects it was stated that project offices would not be able to upload documents on the system pertaining to such projects due to its confidential nature.

Thus, the PS module is yet to be fully utilised by the Lab for effective management of projects. As such, the objectives envisaged before implementation of SAP ERP system could not be achieved even after four years of 'Go-live' of the PS Module.

6.2.4.2 Mis-match in Project Expenditure

Consequent on implementation of the Project System module in SAP ERP system, the mis-match in budget – expenditure figures generated at various levels of the organisation was to be minimal. We observed from the project expenditure figures generated at two levels of RCI *i.e.*, Monthly Expenditure Return (MER) of Planning and Production Group (PPG) and FICO Module were not in synchronisation with each other. The mis-match ranged from 1.83 *per cent* to 374.46 *per cent*. On being pointed out in audit, DRDO stated (August 2015) that the difference in expenditure figures was due to off-line payments made by the CDA and could be achieved only when CDA becomes fully online.

The reply indicates that the module was not being fully exploited even after four years of 'Go-Live'.

Conclusion

The ERP system that was installed in August 2011 after a delay of three years suffered from inadequate physical and logical access controls, input controls and validation checks. Further, incomplete mapping of all the business requirements and inadequate usage of the modules led to underutilisation of the ERP SAP solution. The inventory data ported in the system was incomplete, unreliable and inaccurate. These inadequacies resulted in incompatibility of the system to meet all business requirements, created risk of defective/delayed MIS reporting and decision-making leading to manual intervention. The underutilisation of the system implemented at a cost of ₹15 crore has compromised the basic objectives of leveraging information for improving operational efficiency, productivity and achieving higher user service and satisfaction.