CHAPTER-VI: DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION

6.1 Avoidable procurement of a mobile Nitrogen Gas Generator Plant

Despite no demand from Army for Nitrogen gas generator plant (Gas Plant), Combat Vehicles Research & Development Establishment (CVRDE), placed an order for development of a mobile Gas Plant, at a cost of ₹97.33 lakh. Development of Gas Plant by CVRDE was unwarranted as the plant had already been developed by the same firm for DRDO in July 2010 and supplied to Defence Research and Development Laboratory in January 2011.

Combat Vehicles Research & Development Establishment, Avadi, (CVRDE) projected (May 2010) a requirement for procurement of mobile Nitrogen gas generator plant (Gas Plant) to produce Nitrogen gas for use in the Army's main battle tanks (MBT-Arjun) during operations/trials in the field area. The requirement was justified on the ground that during strategic operation/war scenario, the gas cylinders may be required to be positioned deep in the forward area/war zone and the requirement cannot be met by procuring gas in cylinders from open market.

CVRDE placed an order in November 2011 on M/s GEM Pressure Systems (Firm) for supply of vehicle mounted mobile Gas Plant at a cost of ₹97.33 lakh. The Gas Plant was taken on charge in August 2012 and the firm was paid an amount of ₹97.33 lakh by March 2014.

We, however, noticed that even after lapse of three years, the Gas Plant was held (September 2015) in CVRDE and thus, not being used for the intended purpose in the field areas/operations.

When enquired (June 2015) in audit about the justification for development of the Gas Plant as it was lying unused since its procurement and does not find any use with the Army. DRDO HQ stated (October 2015) that being a research and development organization, CVRDE is required to visualize and develop state of the art system that will be advantageous in use of Armoured Fighting Vehicles.

The reply is not tenable as the procurement of the Gas Plant was not a developmental activity. The plant had already been developed by the same firm for DRDO in July 2010 and two such plants were supplied to Defence Research and Development Laboratory in January 2011.The Gas Plant was also demonstrated to the CVRDE Scientist who visited the Firm's premises in July 2011 i.e. before placing of the supply order by CVRDE in November

2011. The Scientist noticed that the integration, installation and assembly of components were well positioned. Thus, it could be seen that the Gas Plant was already developed for DRDO to meet the strategic requirement of the users, if any, and no further research and development work was involved except that it was to be mounted on a vehicle.

We also enquired about the possible induction of the Gas Plant into service as a strategic maintenance vehicle for Armoured regiments. The Director General Mechanised Forces (DGMF), as user, stated (December 2013) that their directorate was not pursuing any plan for acquisition of Gas Plant. It was added that the procurement of Gas Plant was an internal decision of CVRDE and Army had not given its concurrence or requisition for procurement of the Gas Plant. DGMF also stated that Nitrogen gas cylinders are authorised to Armoured Regiments for maintenance of MBT Arjun and the requirement, therefore, is for refilling of the cylinders that is carried out through Ordnance channel.

Thus, the placing of development order by CVRDE for an already developed Nitrogen Gas Generator Plant was unwarranted. The expenditure of ₹97.33 lakh was therefore avoidable as the plant did not find any use since its procurement in 2012.

6.2 Infructuous procurement of material

Despite being aware that C-103 material would not resist the high temperature generated in the scramjet engine, Defence Research and Development Laboratory procured 1329 Kg of C-103 material valuing ₹4.83 crore, which was unwarranted and eventually proved wasteful.

For 'Design and Development of Hypersonic Technology Demonstrator Vehicle' (HSTDV) by Defence Research and Development Laboratory (DRDL), a Technology Demonstration Project was sanctioned by Defence Research and Development Organisation (DRDO) in March 2001. DRDL undertook a feasibility study in September 2003, which *inter alia* included a study on design and development of scramjet engine. The study, *inter alia*, found that the temperature encountered in the scramjet engine combustor was of the range equivalent to 2227-2527^{o}C. DRDL therefore identified two high temperature resistant materials *viz* Nimonic C-263 and Niobium C-103, for possible use in the development of the engine.

On further study, DRDL found that C-263 was the suitable material which could sustain for 20 seconds flight duration. As far as C-103 material was concerned, the maximum temperature resistance capability was found to be 1200^{o}C, which could be enhanced only up to 1370^{o}C through coating technique.

As part of the HSTDV project, Ministry of Defence sanctioned (September 2005) a project for 'Development of Scramjet Engine and Engine Integrated Airframe' at an estimated cost of ₹48.65 crore, to be taken up by DRDL. The aim of the project was *inter alia* to design, fabricate and carryout testing of scramjet engine.

Scramjet engine is subjected to very high temperature DRDL identified (May 2006) C-103 material as High Temperature Resistant Material (HTRM) for inner layer of the engine and C-263 for the outer layer. Requirement of C-103 material, which has a shelf life of 10 years, was accordingly projected for development of five scramjet engines. However, keeping in view the anticipated design changes and high cost involved, the Special Purchase Committee (SPC) held in May 2006 recommended procurement of C-103 material for development of only three scramjet engines. DRDL accordingly procured (July 2007) a quantity of 1329 Kg of HTRM worth ₹4.83 crore which was received between October 2007 and October 2008. A quantity of 3660 Kg of C-263 material was also procured between December 2007 and February 2008 at a cost of ₹1.76 crore, for use in the project.

We observed in March 2012 that the feasibility study carried out in 2003 had specifically brought out that C-103 material can resist temperature only up to 1370^0C whereas the temperature generated in the scramjet engine combustor would range up to 2527^0C. Despite this known limitations, DRDL procured 1329 Kg of C-103 material. During the process of development, DRDL used only 107 Kg of the C-103 material and found that it could not withstand the high temperature beyond five seconds and therefore, the balance material was not further used.

We enquired (March 2012) about the justification for procurement of the material. DRDO HQ stated (January 2016) that due to severe oxidation problem/change in engine combustor design, C-103 material could not be used and C-263 material alone has been used for the scramjet engine development. It also added that though usage of C-103 material has limitation as the temperature experienced is more than 2300^oC, yet considering the ground test data it was expected that the same has potential for longer duration tests of the order of 100 seconds and 200 seconds with suitable anti-oxidation coating techniques.

The reply is not tenable as during the feasibility study itself, DRDL was aware that C-103 material had limitations to resist high temperature encountered in the scramjet engine combustor. Yet, it procured the C-103 material, which eventually proved wasteful. Besides, the Project proposal envisaged flight tests of short duration of 20 seconds, for which the material has failed, hence the possible usage of C-103 material for a longer duration flight tests of 100 seconds and 200 seconds is unlikely.

Thus, the procurement of C-103 material valuing₹4.83 crore for development of the scramjet project was unwarranted and proved wasteful.