

CHAPTER II: AIR FORCE

2.1 Operation and maintenance of 'AA'

The Ministry of Defence concluded a contract (March 2004) for procurement of three 'AA' and its sub-systems at a cost of 1108 MUSD (₹5,042 crore).

There was sub-optimal utilisation of operational capabilities of 'AA' in terms of flying task achieved mainly due to un-serviceability of 'AA'. Besides, scope for increasing operational efficiency of 'AA' aircraft was restricted due to absence of training to aircrew on air to air refuelling (AAR) and non-acquisition of additional land for extension of runway length at AF Station 'S-3'.

There was delay in installation of Ground Exploitation Station (GES) at intended location ('S-1') due to lack of due diligence in planning of work services. There was shortage of aircrew which may impact the operations of the 'AA' aircraft during hostilities. No long-term arrangement existed for repair and maintenance of 'AA' which was being managed with interim maintenance services contract. Supply of defective Automatic Test Equipment for Communication System, the non-supply of 'I' level facility for Identification of Friend or Foe (IFF) system and short provisioning of stores / rotables had adversely affected the serviceability of 'AA'. Certain infrastructure facilities were not synchronised with the induction of 'AA' as there was delay in completion of work services for modified hangars, independent storage facility and separate training-cum-accommodation centre at AF Station 'S-3', which affected smooth functioning of 'AA'.

2.1.1 Introduction

'AA' provides air and surface surveillance within a given airspace. It provides early warning on attacks by enemy aircraft within its surveillance volume. The 'AA' is capable of operating as an Airborne Autonomous

Command & Control Centre for conducting offensive and defensive air operations.

Ministry of Defence (the Ministry) procured (March 2004) three 'AA' and its sub-systems at a cost of 1,108 MUSD¹ (₹5,042 crore)². 'AA' is divided into two segments *i.e.* Airborne Segment and Ground Segment. Airborne Segment, called 'AA' aircraft, is a Mission System Avionics (MSA³) mounted on modified 'A' aircraft⁴ (platform). The MSA helps in gathering signal intelligence of adversaries and in determining location of the emitters. Collected data is analyzed on board and transmitted to ground stations. The system on ground called Ground Exploitation Station (GES) receives and processes data collected by MSA.

All the three 'AA' aircraft were inducted in Indian Air Force (IAF) between May 2009 and March 2011 and six GES were installed between September 2009 and February 2012 at six units of IAF. The Ministry established (June 2007) 'Sq-7' Squadron (operating unit) at AF Station, 'S-3' to operate 'AA'. 'Sq-7' Squadron at 'S-3', under functional control of Air Headquarters (HQ) and administrative control of 'W-2' Wing, through HQ Central Air Command (CAC) is responsible for execution of operational task as assigned, maintenance of the 'AA' aircraft, operational training and management of all associated activities.

Audit was conducted to see whether 'AA' was optimally utilised since 'AA' is a high value national asset which could be a deciding factor in conflict situation. Audit consisted of test check of records relating to 'AA' maintained at the Air HQ and operating units covering period from 2011-12 to 2013-14.

¹ Million US Dollar

² 1 USD= ₹45.50

³ MSA, developed by vendor (M/s 'V-1'), comprises of Primary Radar, Secondary Surveillance Radar, Electronic Support Measure, Communication Support Measure, Mission Communication System, Data Link, Hybrid Navigation System, Mission Computer System and Operator Work Stations.

⁴ Modified aircraft is newly manufactured 'A' aircraft with re-engining and structural modifications for installation of MSA, as per tripartite agreement between the Governments of India (IAF), Israel and Russian Federation.

Records beyond these years were also scrutinized wherever considered necessary.

Statement of Case (SoC) issued (November 2014) to Air HQ was replied in January 2015. The draft audit report was also issued to the Ministry in January 2015. This report has suitably incorporated replies from Air HQ. Based on further examination, revised draft was issued to the Ministry (July 2015); the Ministry's reply to initial draft report or revised draft report was awaited (September 2015).

Audit findings are discussed in following paragraphs.

2.1.2 Operations

2.1.2.1 Shortfall in Flying Task

As per Policy Page⁵ of 'Sq-7' Squadron issued by the Ministry (June 2007), the operating unit was to operate 1500 flying hours per annum with all three 'AA' aircraft. Air HQ informed (May 2015) that monthly flying task for 'AA' operating unit is assigned based on training and other special requirements projected monthly by various Commands HQ, which is then deliberated and prioritised at Directorate of Airborne Sensors and Networking (ASAN).

Against the established task stipulated in Policy Page, year-wise details of flying task planned and flying task achieved in terms of flying hours are as given below:-

⁵ Policy page issued by Government of India, Ministry of Defence defines the role and task to be performed by a Unit and manpower sanctioned for its functioning.

Table 2.1: Flying Task Planned and Achieved

Year	Task Planned	Actual flying	Shortfalls in Percentage, against	
			Flying Task Planned	Annual task of 1500 flying hours
	(Hours)	(Hours)	(%)	(%)
2011-12	895	855	4	43
2012-13	1088	926	15	38
2013-14	844	766	9	49
Total	2827	2547	10	43

Thus, on an average there was 43 *per cent* shortfall against the established task of 1500 flying hours per annum. Even the reduced task planned was not achieved in any of the years.

Regarding fixing of lower flying task plan against the established task fixed for the Squadron, Air HQ stated (January 2015) that task planned for ‘AA’ aircraft was based on its 75 *per cent* availability whereas its actual availability had only been approximately 66 *per cent*, which had resulted in lower task planned. Further, Air HQ attributed (January 2015) the shortfall in flying task to low availability of aircraft due to un-serviceability of any one or more sub-systems of ‘AA’ just prior to mission launch, non-availability of participant force⁶ and the environmental factors such as bad weather, bird activity, *etc.*

Air HQ replies may be seen in view of the following:

- 1500 hours⁷ fixed by the Ministry were not qualified with any constraints and were not subject to any condition. Lower availability of ‘AA’ aircraft

⁶ ‘AA’ aircraft do not always fly in isolation like other fleets of IAF. Missions are carried out with participants of fighter aircraft from other Squadrons.

⁷ The basis of fixation of 1500 flying hours per annum specified in the Policy Page was requested from Air HQ (March 2015), but the details of working out the figure of 1500 flying hours per annum was not made available to Audit. In absence of this, Audit is constrained to consider that task of fixation of flying hours was without conditions.

in initial years itself is also a reason of concern, specially for a costly national asset with limited life.

- Further, the task planned for 2011-12 and 2013-14 was less than even 66 *per cent* (990 hours⁸) of assigned task of 1500 flying hours as contended by Air HQ.
- Non-achievement of flying task due to non-availability of participating forces indicated inadequate co-ordination between 'Sq-7' Squadron and the participating units of IAF.

Fact thus remains that the task planned and achieved was far below the task of 1500 flying hours per annum assigned to 'Sq-7' Squadron in its Policy Page, which resulted into sub-optimal utilisation of 'AA' in its initial years itself and consequently, IAF has been unable to fully exploit the intended benefits from the valuable national asset. As both 'AA' technology and aircraft have limited and defined life, shortfall in assigned task especially in its initial years is a cause of concern.

2.1.2.2 Non-exploitation of Air to Air Refueling (AAR) capability in 'AA' aircraft

As per Tripartite Agreement (October 2003) between the Governments of India, Israel and Russian Federation, newly manufactured 'A' aircraft was to be structurally modified with PS-90A engines by Russian agencies and equipped with Israel made Mission System Avionics (MSA). As per the scope of work, M/s 'V-1', the prime vendor had the responsibility of training of the Indian Aircrew, MSA operators and maintenance personnel as required.

The contract (March 2004) for 'AA' provided structural modifications for 'AA' aircraft which included modifications relating to Air to Air Refuelling (AAR) *viz.* wing air refuelling installations, air refuelling boom and in-flight refuelling probe capability. Total cost of all structural modifications for three

⁸ 1500x66/100

‘AA’ aircraft (including AAR capability) and integrated logistic support (ILS) was 143.75 MUSD (₹654.06 crore).

Through audit of records at Air HQ it emerged (June 2014) that AAR could significantly enhance the time on task⁹ and is essential due to limitation on maximum permissible take-off weight during summer months leading to reduced fuel capacity of the aircraft at higher ambient temperatures. Further, whenever extended stay of ‘AA’ aircraft is required in an Area of Responsibility (AOR) far away from a base or deployment of ‘AA’ aircraft is demanded in a different AOR, the AAR allows effective operation of ‘AA’ aircraft by eliminating delay associated with landing for refuelling. In addition, aerial refuelling conserves airframe hours and engine life cycles (consumed at each take-off) and reduces ratio of sorties to flying hours thereby reduces exposure to hazards associated with take-off and landing phases. AAR therefore enhances operational efficiency of ‘AA’ aircraft.

Audit, however, observed (June 2014) that AAR capability, provided through modifications in ‘A’ aircraft, could not be exploited operationally so far as no AAR training was provided to aircrew of ‘AA’ aircraft by the OEM¹⁰ for this purpose.

Air HQ stated (October 2014) that AAR training was not part of ‘AA’ contract. However, on persuasion by IAF, M/s ‘V-1’ agreed to impart training after prolonged discussions and the training was likely to be conducted in November 2014. As regards the status of AAR training, Air HQ intimated (May 2015) that the approval of Ministry had been obtained for training of two pilots and two flight engineers in Russia and the training was being conducted by the OEM in May/June 2015.

The reply confirms that even though ‘AA’ aircraft was modified to have capability of AAR, the Ministry did not ensure provision of AAR training with other commensurate training as provided in the contract (March 2004). In fact, the conclusion of contract without a provision of AAR training essential

⁹ Time on task is the period during which ‘AA’ aircraft is in the air to perform its mission.

¹⁰ Original Equipment Manufacturer

for exploiting the vital AAR capability was a serious oversight lapse resulting in non-realisation of full potential of 'AA' aircraft so far (July 2015) since its induction in May 2009 thereby restricting efficacy of defensive and offensive operations of IAF. Air HQ response on the Audit query (July 2015) on the status of AAR training to aircrew of 'AA' by the OEM, was also awaited (September 2015).

2.1.2.3 Restriction in operation of 'AA' aircraft due to shortage in runway length

The contract for acquisition of 'AA' was concluded in March 2004 with the scheduled induction of first 'AA' at 'Sq-7' Squadron (Operating unit) in November 2007. The Operating unit initiated a Statement of Case 'SoC' (July 2005) for extension of runway at Air Force Station (AFS) 'S-3' as the All-Up Weight (AUW) of 'AA' aircraft was 195 tonnes, which required a runway length of over 15000 feet *vis-à-vis* the existing 9000 feet, for its unhindered operation.

The SoC (July 2005) incorporated a requirement for acquisition of 253.67 acres of private land, also indicating that the action for the same had been initiated in May 2004 to enable extension of runway over 15000 feet. The SoC (July 2005) also proposed to start extension, with available Defence land first, for extension of runway to a length of 10500 feet as a viable option and as an immediate interim measure for operation of 'AA' at AF Station, 'S-3'.

Audit noticed (July 2014) from the SoC (July 2005) that AF Station 'S-3' is also a base for 'B' fleet, which provides air to air refuelling (AAR) to fighter fleets and has maximum AUW of 210 tonnes. For the AUW of 210 tonnes, the SoC (July 2005) stated that the minimum length of runway required at various temperatures as 11480 feet (15°C), 11874 feet (20°C), 12464 feet (25°C), 13120 feet (30°C), 13940 feet (35°C), and 15022 feet (40°C). Further, as per the SoC (July 2005), the AUW of 'B'/'AA' aircraft on a runway length of 10500 feet was assessed at 199 tonnes, 194 tonnes and 183 tonnes at 20°C,

30°C and 40°C respectively, as the payload capacity of the aircraft reduces with the increase in temperature given the length of runway and that the mean airfield temperature at 'S-3' airfield is 36°C during April-September and 22°C from October-March.

Audit observed¹¹ that temperature at Air Force Station 'S-3' was more than 30°C for 236 days and more than 40°C for 48 days, in a year. Therefore, the maximum AWW of 'AA' aircraft was getting adversely affected for major part of year because of restricted runway length.

Audit further noticed (July 2014) that the work services for extension of runway to 10500 feet, was sanctioned in September 2006 under Para 11¹² of Defence Works Procedure (DWP) -1986 and completed in March 2009 at a cost of ₹20.38 crore just before induction (May 2009) of first 'AA' aircraft. Audit also noticed (October 2014) that the length of runway remained at 10500 feet and it was not extended to the desired runway of over 15000 feet.

Audit pointed out (November 2014) the issue of delay in acquisition of additional land and its impact on the operation of 'B'/'AA' aircraft. Air HQ stated (January 2015) that 'AA' aircraft, being a more recent acquisition with more powerful engines, operated with its full payload on the existing runway while 'B' operated with limited payload (maximum up to 180 tonnes).

The reply is not acceptable as the case for runway extension was initiated (July 2005) after award of the contract (March 2004) for 'AA' aircraft, when IAF was already aware of the configuration of engines. Thus, the requirement for a runway length of over 15000 feet was, accordingly, projected (July 2005) by IAF for the unhindered operation of 'AA'.

¹¹ Data furnished to Audit under Air Force Station, 'S-3' letters No. 4W/813/2/1/Met dated 22 June 2015 and even No. dated 24 August 2015.

¹² Under Para 11 of DWP- 1986-any local Commander may order the commencement of works in unexpected circumstances arising from unforeseen operational necessity or urgent medical grounds, natural disasters which make it imperative to short-circuit normal procedure and when reference to appropriate Competent Financial Authority would entail dangerous delay.

Air HQ further informed (June 2015) that the case for acquisition of land initiated in May 2004, was closed following direction (September 2006) of the Chief of Air Staff (CAS) for a review and since the proposal for acquisition of land was a time consuming process and not very cost effective, the same was dropped.

The reply regarding cost effectiveness of land acquisition needs to be seen against overall cost of 'AA' project being in excess of ₹5,000 crore, the ageing of three 'AA' inducted in IAF between May 2009 and March 2011, and the impact of ageing on AUW carrying capability of 'AA' given availability of less than optimal runway.

The fact remains that non-extension of the runway length to over 15000 feet, has limited the operations of 'AA' to an individual mission of seven and a half hours without landing. This operation/ air time is further constrained due to higher temperature at the 'Sq-7' Squadron /Air Force Station, 'S-3', for major part of the year. Further, as 'B' aircraft would provide air-to-air refueling to 'AA' in future as discussed in *paragraph 2.1.2.2*, the limited payload restriction on 'B' due to short runway length at AF Station 'S-3' has the potential to impede the operation of 'AA'.

2.1.2.4 Delay in work services for installation of GES at 'S-1'

Ground Exploitation Station (GES) facilitates in establishing data and voice link and exchange of operational data with 'AA' aircraft. Audit observed (July 2014 to September 2014) that GES was installed and operationalised at six units¹³ between September 2009 and February 2012. The location of one of these GES initially planned for installation at 'S-22' by September 2009, was however changed (February 2009) to 'S-4' on technical grounds and subsequently (July 2010) to 'S-1' in view of operational necessity.

¹³ 'S-6', 'S-3', 'S-7' 'S-8', 'S-1' (temporarily installed at 'S-5') and 'S-9'.

It was further observed in Audit that the GES for 'S-1' was received at 'S-5' in April 2011 and was installed (February 2012) at 'S-5' on temporary basis to make it operational and avail the maximum warranty period. The administrative approval (AA) for the work services at 'S-1' was accorded in November 2011 at a cost of ₹3.07 crore, six months after receipt of the GES. The PDC of 102 weeks *i.e.* by November 2013 specified in the AA had lapsed and the work was in progress.

Air HQ, in reply, stated (June 2015) that due to additional requirements projected by OEM subsequent to their visit in June 2014, a revised administrative approval had been issued in April 2015 for ₹3.67 crore with PDC revised to July 2015 and the progress of the work services was 82 *per cent* (June 2015).

The fact remains that there has been a lack of urgency in planning /execution of work services at 'S-1', leading to delay of over four years (till June 2015) in installation of the GES since its receipt (April 2011). Thus, operational requirement (July 2010) for the GES at 'S-1' was still (June 2015) to be realised.

2.1.2.5 Shortage of aircrew

Ministry issued (June 2007) the Policy Page prescribing the sanctioned establishment of aircrew (*i.e.* pilots, navigators and flight engineers) of the 'Sq-7' Squadron for 'AA' at AF Station 'S-3'. Periodic reviews are carried out to determine the minimum manpower requirement, which is termed as 'To Be Manned (TBM)'¹⁴.

Audit noticed (July 2014) from the QFTRs¹⁵ of the Squadron that the actual strength of aircrew was less than the sanctioned strength during 2011-12 to 2013-14 as given below:-

¹⁴ TBM is the minimum level of manpower necessary to run an organisation.

¹⁵ Quarterly Flying Training Returns

Table 2.2: Shortage of aircrew

Aircrew	Establishment	2011-12				2012-13			2013-14		
		Average Strength	Deficiency		Average Strength	Deficiency		Average Strength	Deficiency		
			Nos.	%		Nos.	%		Nos.	%	
Pilots	12	8.25	3.75	31.25	7	5	41.66	6.25	5.75	47.92	
Navigators	6	4.5	1.5	25	4	2	33.33	4	2.0	33.33	
Flight Engineer	7	6	1.0	14.29	6	1	14.29	6.25	0.75	10.71	

As seen from the Table, the shortfall ranged between 31.25 *per cent* and 47.92 *per cent* in respect of pilots and between 25 *per cent* and 33.33 *per cent* in respect of navigators. Further, shortfall in Pilots and Navigators showed increasing trend over 2011-12 to 2013-14.

Audit enquired (July 2014), the reasons for the deficiency in strength of aircrew and its impact on operation of 'AA' aircraft. Air HQ, in reply, stated (January 2015) that there had not been any significant impact of shortfall in aircrew strength during peacetime operations as the available strength allowed two sets of crew under normal circumstances and two missions could be undertaken on a daily basis; however, it would have an impact during hostilities in view of the increased tasking. The reply was silent on reasons for deficiency and also as to how the shortfall in aircrew would be met in case urgency erupts as a result of hostilities. Air HQ also stated (22 January 2015) that as per their records the average number of pilots at 'Sq-7' Squadron 'S-3' was 11.5 in 2011-12, 11.25 in 2012-13 and 10.75 in 2013-14 against the established strength of 12 during these years, after considering pilots from fighter stream which were not reflected in actual strength of the Squadron. Regarding short strength of navigators, Air HQ stated (January 2015) that the average number of strength of 4 to 4.5 is in line with the approved TBM level of 4 numbers.

The reply is not in sync with the Policy Page of 'Sq-7' Squadron which does not prescribe that the establishment of 12 pilots will include the pilots from fighter stream. Thus, Air HQ reply (January 2015) is neither buttressed by the Policy Page nor by the role of the fighter pilot *vis-a-vis* a system meant for air and surface surveillance.

2.1.3 Maintenance

Maintenance in IAF for 'AA' comprises of following:

- Ist line servicing ('O' level maintenance),
- IInd line servicing ('T' level maintenance), and
- IIIrd & IVth line servicing ('D' level maintenance).

'O' level maintenance is performed at the aircraft flight line parking area and include fault detection and isolation down to Line Replaceable Unit (LRU)¹⁶ level, removal and replacement of faulty LRU, and forwarding the faulty LRU to 'T' level for further testing and repair. 'T' level maintenance is performed at the airbase laboratory/shop and includes fault detection and isolation of faulty Shop Replaceable Unit (SRU)¹⁷ within LRU using appropriate test equipment. 'D' level maintenance consists of repair or overhaul of repairable SRUs, which is carried out either by vendor or Base Repair Depot (BRD) of IAF. Annual Maintenance Contracts (AMCs) are also entered to ensure serviceability of sub-systems of 'AA'.

2.1.3.1 Maintenance of 'AA'

Audit evaluated maintenance of 'AA' and observed as follows:

(a) 'AA' - MSA¹⁸: The Cabinet Committee on Security (CCS) approved (January 2004) comprehensive AMC for MSA for a period of two years at a cost of 10.6 MUSD (₹48.23 crore) per annum and thereafter limited AMC

¹⁶ LRU is a modular component of a device that is designed to be replaced at an operating location.

¹⁷ Shop Replaceable Unit is sub-part of line replaceable unit (LRU).

¹⁸ 'AA' Mission System Avionics *i.e.* system mounted on aircraft

(other than critical items) at an annual cost of 8.5 MUSD (₹38.67 crore) along with setting up of 'D' Level facility at a cost of 15.5 MUSD (₹70.52 crore) for critical items, like Transmit/Receive (TR) units and Radio Transmission sets.

The contract (March 2004) for 'AA', however, provided only for an option for 'D' level maintenance facility' and AMC in respect of MSA and the option was to be exercised no later than the end of the warranty for first 'AA'. This was significant departure from the maintenance arrangement approved by the CCS. Further, it was also noticed that the option provided in the contract was not exercised by IAF, validity of which expired in December 2011.

(b) 'AA' - aircraft (platform): The CCS approved (January 2004) aircraft maintenance (*i.e.* unit and base level repair) up to 300 hours as per Integrated Logistic Support (ILS) offered within the final price by the vendor. Further maintenance beyond 300 hours, for certain uncommon items between the 'AA' aircraft and the already held 'A' platform with IAF, was to be provided by the vendor free of charge for expenditure up to one MUSD and for expenditure exceeding one MUSD, the same was to be decided by mutual consultations between IAF and the vendor.

The contract (March 2004) provided for ILS for aircraft maintenance up to 300 hours and kept a clause for maintenance of uncommon items of aircraft as per CCS approval. However, separate arrangement for maintenance of uncommon items of the 'AA' aircraft beyond 300 hours as per CCS approval, was not made by MoD/IAF, as complete details on Russian equipment and systems were not made available by the Russian side till contract finalization.

Complexities of the 'AA' programme, non-commonality of the major systems¹⁹ of the 'AA' aircraft platform with the existing 'A' aircraft, operating experience of 'AA', *etc.*, necessitated search for alternate maintenance arrangements as discussed in succeeding paragraphs:

¹⁹ Major systems such as Auxillary Power Unit (APU), Electrical system, Communication system, weather radar, liquid coolant system *etc.*

Long Term Maintenance Agreement (LTMA): As informed (July 2015) by Air HQ to Audit that during warranty period of the first aircraft, IAF proposed to the Ministry for two separate maintenance contracts for 'AA'-MSA (July 2009) and 'AA'-aircraft (September 2009) respectively. Ministry advised (January 2010) to set up the 'D' level facility for MSA. However, taking into account the issue of multiplicity of vendors (OEMs from four countries), the Ministry advised (February 2010) to explore the feasibility of a comprehensive maintenance agreement. Thereafter, Air HQ moved (September 2010) a case for LTMA covering complete 'AA' (MSA and aircraft). The Raksha Mantri accorded 'in principal' approval for the LTMA on 12 December 2011. However, the LTMA was not finalised and the CCS was not informed of the non-implementation of its approved maintenance arrangement till date (July 2015).

Interim Maintenance Services (IMS) contract: As maintenance arrangements approved by the CCS were not implemented by Ministry/Air HQ and alternate maintenance arrangement proposed as LTMA was also not finalised, the serviceability of 'AA' was met by IAF through ILS spares since the expiry of warranty period of first 'AA' in December 2011. However, as an interim measure, an IMS contract for maintenance of 'AA' (aircraft and MSA) was concluded with M/s 'V-1' on 19 September 2013, for a period of one year at an annual cost of 98 MUSD (₹607 crore). The IMS contract was extendable by six months. As informed by Air HQ in July 2015, the LTMA could not be concluded and therefore the IMS contract had been extended till March 2016.

Thus, cost of repair and maintenance which as per CCS note was ₹50 crore (approx.) per annum for MSA, became ₹607 crore (approx.) per annum under IMS contract.

Air HQ stated (July 2015) that cost (98 MUSD per annum) of IMS included maintenance of entire platform, MSA, ATE, Mission Support Segment (MSS), Mission Support Facility (MSF) and six GES spread across India at dispersed

locations. Air HQ further stated that IMS provided OEM specialist cover, repair of all failed items, supply of consumables of all scheduled and unscheduled activity, and routine health checks of the entire fleet.

Air HQ reply may be viewed in the light of CCS approved (January 2004) arrangements according to which:

- the AMC was to cover all sub-systems of MSA, other than those items for which D level maintenance facility would be established by M/s 'V-1';
- MSS, MSF and GES are sub-systems of MSA and were included in the cost (750 MUSD) of 'AA'-MSA approved by the CCS. ATEs were supplied as part of 'AA'-MSA and 'AA'-aircraft and no separate cost was provided for the same;
- repair of all failed items, replacement of consumables and specialist cover for MSA was also the part of AMC approved by the CCS and included in the option clause of the contract for 'AA';
- for platform, maintenance was to be arranged separately for uncommon items only.

Thus, there was departure from maintenance arrangements as approved by the CCS. Further, LTMA which was alternatively proposed for not implementing arrangements as approved by the CCS, was also not concluded in spite of its in-principle approval by the RM in December 2011. An interim arrangement through IMS contract was being followed since September 2013.

2.1.3.2 Unserviceable Automatic Test Equipment (ATE)

Communication Automatic Test Equipment (ATE) ²⁰ is the test equipment used for 'I' level maintenance of communication system *i.e.* to test and isolate

²⁰ ATE is a computer controlled system, consisting of rack mounted Standard Test Equipment and dedicated test equipment. The ATE provides a convenient maintenance tool for LRU troubleshooting and testing at the required level.

fault in LRUs of the communication system up to SRU level. The cost of communication system for which Communication ATE was procured under the contract (March 2004) for 'AA' was 43.4 MUSD (₹197.47 crore²¹).

Audit noticed (May 2014) that Communication ATE installed (March 2011) at 'Sq-7' Squadron 'S-3' was unserviceable since inception as out of 130 LRUs tested²², 94 LRUs did not match the ATE test pattern, though LRUs were serviceable.

Air HQ stated (May 2014) that the vendor (M/s 'V-1') had suggested that the test limits of the ATE checks were stringent and needed to be redefined in consultation with the OEM (M/s 'V-4') to make the ATE serviceable. As such the ATE was not capable of testing and isolating the fault up to SRU level in LRUs of communication system of 'AA'. Air HQ further stated (June 2014) that un-serviceability of LRUs of the communication system was being ascertained in the aircraft by change of SRUs, and that complete LRU needed to be sent for repair as it was not often possible to isolate the fault up to SRU level without the 'I' level maintenance facility.

In response to an audit enquiry (March 2015) on current status of the ATE, Air HQ stated (May 2015) that M/s 'V-1' had intimated that a contract had been signed by them with M/s 'V-4' and the Communication ATE was likely to be made compatible by August 2015. Air HQ also informed (May 2015) that eight LRUs of communication system were repaired by OEM since induction of 'AA' (after warranty period) at a total cost of 19,37,640 USD (₹11.63 crore²³) and 15 LRUs were lying unserviceable.

²¹ 1 USD = ₹45.50

²² As intimated (May 2015) by Air HQ, most of the testing was carried out during acceptance of ILS spares and/or to facilitate the OEM in understanding the test wise exact threshold values and/or limits required for ATE modifications and not necessarily for un-serviceability.

²³ 1 USD = ₹ 60 on approximate basis

Thus, ATE since its installation (March 2011) at 'Sq-7' Squadron, had not been rectified so far (July 2015). Further, due to un-serviceability of the ATE, IAF had been dependent on OEM in determining the extent of fault in LRUs up to SRU level. Moreover, complete LRU had to be sent to OEM (M/s 'V-4') for testing and repair instead of defective SRU only for repair resulting in longer turn-around time (TAT)²⁴ in servicing, thereby entailing operational risks in maintenance of communication system.

2.1.3.3 'I' level maintenance support for IFF system

The Identification of Friend or Foe (IFF) system provides identification of enemy or friendly aircraft based on responses to interrogation, as well as determination of their positional and height data. The role of IFF system is to interrogate the various transponders in its coverage area.

The 'I' level maintenance facility for IFF system installed in 'AA' aircraft was to be set up by M/s 'V-1' as per the 'AA' contract (March 2004). The cost of IFF system under the contract (2004) was 22.2 MUSD²⁵ (₹122.10 crore).

Audit noticed (May 2014) that M/s 'V-1' had expressed (July 2013) inability to set up 'I' level maintenance facility for IFF system stating that manufacturer (sub vendor M/s 'V-3') had been demanding a very high price for design and manufacturing of special test equipment which was essential for setting up of its 'I' level facility. M/s 'V-1' instead had suggested lifetime support (30 years from the effective date of contract) for it and moved a contract amendment. However, the Ministry did not agree (July 2013) to the proposal and insisted upon supply of 'I' level facility as per the original contract.

Air HQ stated (March 2015) that a contract for 'I' level tester for IFF was likely to be signed between M/s 'V-1' (vendor) and M/s 'V-3' (OEM) and 'I' level maintenance facility was expected to be functional by August 2015.

Air HQ further stated (May 2015) that three IFF Interrogators which required testing since induction of 'AA', were tested and repaired by OEM without any

²⁴ Time period consumed from the date of sending unserviceable item /equipment from the unit to OEM and its receipt after repair.

²⁵ 1 USD = ₹45.50

charges being within the warranty period and there was one spare IFF Interrogator available in each aircraft that was used during the un-serviceability of IFF interrogators.

Thus 'I' level maintenance facility for IFF system had not been set up (July 2015) which was in violation of the contractual provisions. This had led to operational risks due to high turn-around-time involved as the complete LRU was required to be sent to OEM (M/s 'V-1') instead of SRU only for repair, besides the dependency on OEM in determining the extent of fault in LRU up to SRU level.

2.1.3.4 Inadequate provisioning of spares resulting in low serviceability of 'AA'

Spares are parts to replace components of an article of equipment specific to that article or that type of article. Spares which are capable of being repaired and reused are called rotables. Appropriate stock of spares is required for maintaining optimum serviceability of any equipment or system.

There were Integrated Logistic Support (ILS) spares to be supplied under the contract (2004) for 'AA'. Besides, Scale of Rotables of 'AA' was determined based on professional evaluation by OEM trained specialists and approved by Air HQ in the year 2010. The authorization and actual holdings of rotables for three years are tabulated below:-

Table 2.3 : Authorisation and Actual Holding of Spares

Year	Rotables Authorisation	Rotables Holding	Deficiency	
	Items (Nos.)	Items (Nos.)	Items (Nos.)	(%)
2011-12	1827	130	1697	92.88
2012-13	1827	826	1001	54.78
2013-14	1827	773	1054	57.69

Thus as against the approved Scale of Rotables, there had been acute deficiency in holding of rotables during 2011-12 to 2013-14.

In response to an audit enquiry (March 2015), Air HQ admitted (May 2015) that shortage of rotables affected the serviceability of 'AA' and one aircraft was on aircraft on ground (AOG) for want of rotables. Audit also observed (June 2014) that the inadequate provisioning of rotables / spares had adversely affected the serviceability of 'AA' as was evident from a letter written (May 2014) by the operating unit ('Sq-7' Squadron 'S-3') to Air HQ on critical issues of maintenance, which raised the concerns that:

- due to inadequate spares back-up, the squadron was facing difficulties in maintenance and servicing of aircraft.
- due to non-availability of spares at the 'X' Equipment Depot (ED) and non-commonality with 'A' / 'B' aircraft, the Squadron had to resort to the option of cannibalisation for serviceability of 'AA'.
- certain ILS spares (seven items of platform and 45 items of MSA) were yet to be delivered by vendor though these spares were critical for maintenance and required on priority.

Air HQ stated (July 2014) that the Scale of Rotables was under review and added that the operation and maintenance of 'AA' were being sustained through rotables (ILS spares) received against 'AA' contract (2004), procurement of additional requirement of rotables through subsequent contracts and the Interim Maintenance Services (IMS) contract.

The reply may be seen in view of admission (January 2015) of Air HQ that low serviceability was one of the factors which affected the 'AA' availability and its flying tasks as discussed in *para 2.1.2.1*.

Fact remains that Air Force authorities failed to arrange appropriate provisions of spares/rotables, thereby adversely affecting the serviceability of 'AA' aircraft.

2.1.3.5 Availability of infrastructure

Audit observed (May-July 2014) that the setting up of infrastructure was not synchronised with the procurement of 'AA' in following cases due to delays in sanctioning and execution of these projects.

(a) Delay in Modification of Hangars

Two existing hangars at 'S-3' were required to be modified to enable safe parking and maintenance of 'AA' aircraft. The modification work was, therefore, supposed to be completed before induction (May 2009) of the aircraft to ensure its safety.

The contract for acquisition of 'AA' was concluded in March 2004 and scheduled date of delivery of first 'AA' aircraft was November 2007. The work services for modification of two existing hangars were, however, sanctioned by Air Officer Commanding (AOC) AF Station 'S-3' in April 2007 under Para 11²⁶ of Defence Works Procedure-1986. The contract was concluded in March 2008 for ₹11.98 crore with probable date of completion (PDC) as April 2009. The work could only be completed in January 2011.

Meanwhile two of the 'AA' aircraft received at AF Station 'S-3' in May 2009 and March 2010 had to be parked in the open with a cloth blanking, despite the risk that parking of aircraft in the open could degrade radar performance by adversely impacting on radome²⁷ surface smoothness.

Audit noticed (May 2014) from the records at Air HQ that, in May 2010, AF Station 'S-3' was hit by a gale storm accompanied with rains and fabric covers of all four aero engines of one aircraft were ripped open and foreign objects including pieces of cover, bitumen pieces and small pebbles got ingested into aero engines. Out of these, one aero engine was cleared for operation on 20 August 2010 after removal of damage by foreign objects and

²⁶ Procedure for commencement of work under unexpected circumstances.

²⁷ The Radome is a primary structure on an aircraft, which houses the antenna.

other three aero engines were replaced by spare engines supplied under the 'AA' contract. This aircraft was thus not available for operations from 7 May to 25 August 2010. The damaged aero engines were made serviceable in February 2011 by the OEM under the warranty obligation.

Audit enquired (May 2014) the reasons for delay in sanctioning and execution of the work services for parking of 'AA' aircraft. Air HQ in reply stated (January 2015) that 'AA' parking outside the hangar was preferred during gale considering the possibility of aircraft being damaged by construction material itself as the hangars were under final stages of completion. The reply was silent about the reasons for delay in sanction and execution of the work services for modification of hangars.

Fact remains that the delay in modification of hangars was avoidable and resultantly one 'AA' aircraft remained grounded for more than three months. Moreover, the very purpose of execution of the work services under Para 11 of DWP could not fructify.

(b) Delay in setting up storage facility for 'AA' equipment

'X' Equipment Depot (ED) at AF Station 'S-3' was to store the equipment of the 'AA' aircraft. The modified aircraft platform, Radar dome and associated equipment required special infrastructure for storage purpose.

A Board of Officers (BOO) assembled in July 2005, to assess the requirement of work services for provision of storage facility for 'AA' equipment at AF Station 'S-3', recommended demolition of certain temporary buildings and erection of single storied air-conditioned building. The Board Proceedings (BPs) for sanctioning the work services were forwarded to HQ CAC in March 2006. Air HQ, however, sanctioned the work services in January 2009 for ₹2.68 crore with PDC of 120 weeks *i.e.* May 2011. A period of 34 months was, thus, taken in issue of administrative approval (AA) since the finalisation of BPs as against the prescribed timeframe of 28 weeks (seven months)

prescribed in the Defence Works Procedure (DWP) *i.e.* a delay of 27 months in according the AA .

Further, based on a proposal (May 2010) of Chief Engineer (AF) Allahabad, Air HQ issued corrigendum in February 2011 to the administrative approval based on Market Variation (MV) of December 2008 instead of March 2007 incorrectly adopted earlier, thereby revising the sanctioned cost to ₹3.21 crore with PDC as June 2013. Chief Engineer (AF) Allahabad concluded a contract in August 2011 for ₹2.57 crore with PDC of September 2012. The work was actually completed in March 2013.

The Equipment Depot (ED) had started receiving 'AA' spares since April 2009 onwards and the spares so received had to be accommodated in an old hangar along with the stores of other systems *viz.* 'A' / 'B', as an interim measure, because there was no independent storage available for sensitive 'AA' equipment. This had not only cramped the available store due to scarcity of space but also made the stores accessible to more than one storekeeper.

In response to audit observation (November 2014) on the impact of delay in completion of separate storage facility for 'AA', Air HQ stated (January 2015) that the spares of 'AA' were stored in available stores of the 'X' ED and necessary precautions were taken to ensure that no damage was caused to spares even though the space was limited.

Thus, there had been a delay of over three years in issue of administrative approval and issue of Corrigendum due to application of incorrect MV in preparation of the AEs, which delayed construction of storage space. As a result the independent storage accommodation was not available for 'AA' equipment for about four years (April 2009 to March 2013).

(c) Delay in setting up infrastructure for trainings activities related to 'AA'

Technical Type Training (TETTRA) school exists at AF Station 'S-3' for imparting training to operational and maintenance staff on 'A' / 'B' aircraft. With the induction of 'AA', the school was assigned (May 2009) additional responsibility to conduct training on 'AA' platform and 'Sq-7' Squadron was given the responsibility to impart training on Mission System Avionics (MSA). In May 2013, the responsibility for training on MSA of 'AA' was also shifted from 'Sq-7' Squadron to TETTRA school.

In order to make TETTRA school a quality oriented training institution for 'AA' and to provide training-cum-administrative accommodation in permanent structure, Board of Officers (BOO) was convened and BPs finalised (February-March 2006) and Administrative Approval (AA) accorded (January 2009) for ₹3.48 crore for the work services with PDC as July 2011. AA was revised (June 2010) to ₹3.80 crore as the lowest tendered amount was higher by more than 10 *per cent* of the sanctioned amount. Contract was awarded (June 2010) for ₹2.84 crore and the work was completed in September 2013, after a delay of more than two years from PDC.

Thus, there had been delays at every stage since finalisation of BPs in execution of work services for the independent training facilities for 'AA'.

Air HQ in reply stated (January 2015) that the training requirements of 'AA' were being met regularly through existing TETTRA school and training for 'AA' was never affected. Air HQ, however, did not furnish the reasons for delay in sanctioning/execution of the work services.

Air HQ reply may be seen in light of the fact that work services for creation of a dedicated training infrastructure were sanctioned (January 2009) for imparting quality training to operation and maintenance crew of 'AA' and

there was a delay of more than two years in completion (September 2013) of the work services against the PDC of July 2011.

2.1.4 Conclusion

There was sub-optimal utilisation of operational capabilities of 'AA' in terms of flying task achieved mainly due to un-serviceability of 'AA'. Besides, scope for increasing operational efficiency of 'AA' aircraft was restricted due to the non-imparting of training to aircrew on air to air refuelling (AAR) and non-acquisition of additional land for extension of runway length at AF Station 'S-3'.

There was delay in installation of Ground Exploitation Station at intended location ('S-1') due to lack of due diligence in planning of work services. There was shortage of aircrew which may impact the operations of the 'AA' aircraft during hostilities.

No long-term arrangement existed for maintenance of 'AA' which was being managed with interim maintenance services contract. Supply of defective Automatic Test Equipment for Communication System, the non-supply of 'I' level facility for IFF system and short provisioning of stores / rotables had adversely affected the serviceability of 'AA'.

Certain infrastructure facilities were not synchronised with the induction of 'AA' as there was delay in completion of work services for modified hangars, independent storage facility and separate training-cum-accommodation centre at AF Station 'S-3', which affected smooth functioning of 'AA'.

2.1.5 Recommendations

Audit recommendations arising out of audit analysis for appropriate paragraphs of this report are as under:

- I. IAF may review utilization of 'AA' aircraft with a view to enhance its capacity utilization, so as to bring it at par with the established task

fixed by the Ministry; or the Ministry may suitably revise task in its Policy Page.

(Para 2.1.2.1)

- II. Ministry/IAF may investigate reasons for non-inclusion of training in AAR in the contract (2004) for 'AA' and issue necessary instructions, so that in future the provisions of training required for operation of vital capabilities of an asset is not missed while concluding the contracts.

(Para 2.1.2.2)

- III. Extension of Runway length at 'S-3' to over 15000 feet, by acquiring the additional land may be reviewed so as to meet the requirement of 'AA' and 'B' aircrafts to take-off with full payload.

(Para 2.1.2.3)

- IV. Overall arrangement for maintenance of 'AA' be finalised as early as possible to ensure optimum availability thereof at optional cost. It may further be ensured that 'I' level facility is set up by OEM as per the contractual provisions so that dependency on OEM for testing of LRUs for isolation of fault up to SRU level and turn-around-time in servicing of LRU/SRU is minimised.

(Paras 2.1.3.1 to 2.1.3.3)

2.2 Operational works in IAF

Operational works are undertaken to meet the temporary requirement of operational necessity, and hence have significant role in operational preparedness of IAF. ₹90.35 crore was spent by IAF on operational works during 2010-11 to 2013-14. Audit found inclusion of ineligible works in Annual Operational Works Plans (AOWPs) and undefined timelines for all stages of operational works viz. delays in declaring operational works area, approval of AOWPs, award of contracts and execution of operational works.

2.2.1 Introduction

Operational works are works of temporary nature required for execution of operations in areas declared as 'operational works area' by competent

authority, as per 'Procedure for Operational Works', issued by the Ministry of Defence (MoD) in 1948. Further, operational works can be undertaken only in such areas as warranted by military situation, and are specifically declared as 'operational works area'.

Operational works are thus undertaken to meet the temporary requirement of operational necessity, considering the potential threats to the country's security, and hence have significant role in operational preparedness. Operational works areas are declared for a two year cycle by the Directorate General of Military Operations (DGMO), Integrated Headquarters of Ministry of Defence 'MoD' (Army) as per their operational requirement and tactical criteria. IAF follows declaration of area by DGMO for planning operational works. ₹90.35 crore was spent by Air Force (AF) on operational works during 2010-11 to 2013-14, covering two blocks of two years each.

2.2.2 Organisational Structure for Operational Works

At the apex level, at Air Headquarters (Air HQ), Directorate of Air Operations headed by Director General Air (Operations) is responsible for approval of Annual Operational Works Plan (AOWP). AOWP is initiated at the unit level and consolidated at the Command level. Directorate of Air Force Works which is headed by Assistant Chief of Air Staff, Air Force Works (ACAS, AF Works) is responsible for vetting the proposals of AOWP.

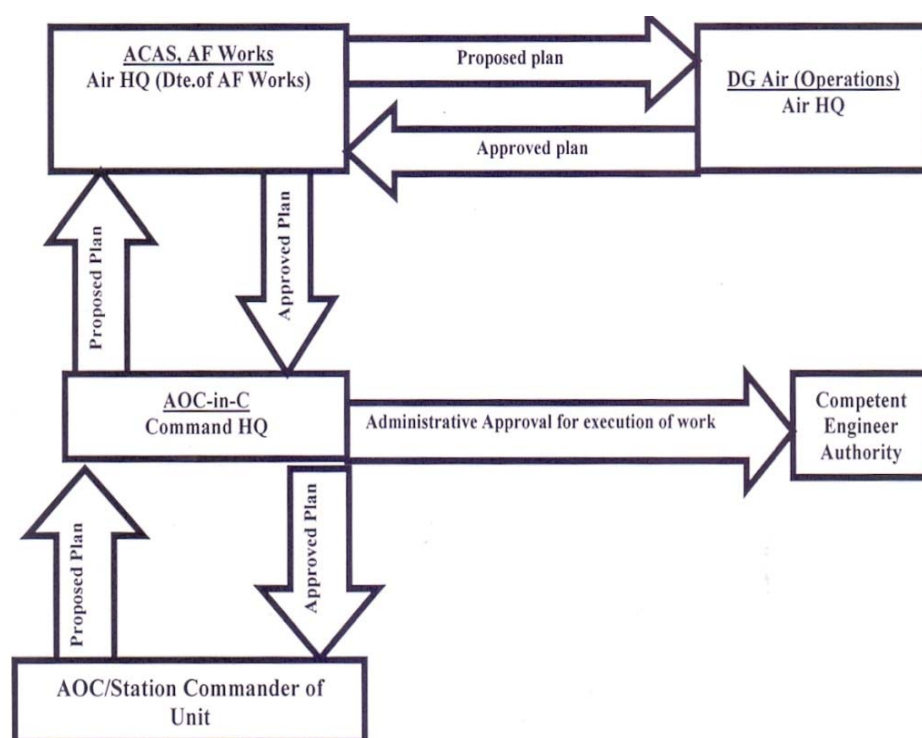
After approval by Air HQ, Air Officer Commanding-in-Chief (AO C-in-C) at Command level issues Administrative Approval (AA).

Competent Engineer Authorities of Military Engineer Services (MES)²⁸ are responsible for issue of Technical Sanctions and Garrison Engineers (GEs) working under the administrative control of the Chief Engineer (CE) / Commander Works Engineer (CWE) for execution of operational works.

²⁸ Most of the operational works are executed by MES, but it can be given to other agencies such as Border Roads Organisation, etc.

Various levels of Air Force authorities involved in approval of AOWP, issue of administrative approvals (AAs) and execution of operational work services are depicted in the flow diagram below:

Figure 2.1: Flow Diagram of Operational Works Approval



As per the 'Procedure for Operational Works', the MoD/GoI used to declare 'operational works area' for undertaking operational works. In September 2001, the Vice Chief of Army Staff was authorised by MoD as approving authority to declare operational works areas. In October 2002, the Vice Chief of Air Staff was authorized by MoD as approving authority to declare 'operational works area' for Air Force within the areas already declared as operational works area by Army HQ.

2.2.3 Audit Objectives

Audit covered the process relating to declaration of operational works area, identification of operational works, approval of annual operational works plan, sanction/AAs of operational works and execution of the works to see whether operational works were planned, sanctioned and executed in time and in accordance with Procedure for Operational Works issued by the MoD in 1948 and Management of Operational Works issued by Air HQ in June 1999.

2.2.4 Sources of Audit Criteria

The audit criteria used for benchmarking the audit findings were derived from:

- Procedure for Operational Works issued by the MoD in 1948
- Management of Operational Works issued by Air HQ in June 1999
- Annual Operational Works Plan (AOWP) and administrative approvals (AAs)/sanctions
- Regulations for MES, Defence Works Procedure (DWP) 2007, terms & conditions of the contracts

2.2.5 Audit Scope and Methodology

Audit reviewed performance relating to operational works for a period of four years from 2010-11 to 2013-14 covering two blocks of two years each. During this period, operational works areas were declared under Western Air Command (WAC), South Western Air Command (SWAC) and Eastern Air Command (EAC) by the Air HQ. 115 operational works were included in AOWP and 93 AAs involving ₹124.44 crore were accorded by WAC and SWAC for operational works in 13 Air Force (AF) units²⁹ during the same

²⁹ Seven units under WAC and six units under SWAC.

period. No operational works were proposed by EAC as their requirements were being met under North East Project³⁰.

Audit objectives, scope, criteria and methodology were discussed in an entry conference held on 4th August 2014 at Air HQ. Audit was conducted during August 2014 to November 2014 at Directorate of Operations and Directorate of AF Works at Air HQ; Command Works and Command Operations at HQ WAC and HQ SWAC; 13 AF units³¹; Chief Engineers (AF) at Udhampur and Gandhinagar and Garrison Engineers executing the operational works at AF units. Besides, nine operational works (**Annexure-IA**) for which administrative approvals (AAs) were accorded prior to year 2010-11 but not completed as of March 2014 were also included in audit.

An exit conference to discuss major audit findings with Air Force authorities³² was held on 26 February 2015. Draft report after incorporating the views of the AF authorities expressed in the exit conference was issued to MoD in March 2015 and revised draft report in July 2015; reply was awaited (September 2015).

2.2.6 Audit findings

AOWP approved by Air HQ, administrative approvals (AAs) issued by the Commands, contracts concluded and works completed by the engineer authorities during the period yearly from 2010-11 to 2013-14 are given below:

³⁰ A separate project planned for works to be undertaken in AF bases in North Eastern part of the country.

³¹ 'W-6' Wing (Wg), 'W-7' Wg, 'W-1' Wg, 'W-10' Wg, 'Y' Signal Unit (SU), 'R' Forward Base Support Unit (FBSU), 'W-8' Wg, 'W-14' Wg, 'W-11' Wg, 'W-12' Wg, 'P' FBSU, 'Q' FBSU and 'Z' SU.

³² Air Force (AF) authorities: Representatives of Air HQ (Directorate of AF Works and Directorate of Accounts) and Commands WAC/SWAC.

Table 2.4: Annual Operational Works Plan

Year	Command	Approved Annual Operational Works Plan		Administrative Approvals accorded		Administrative Approvals cancelled		Contracts concluded and works completed (till March 2015)	
		(Nos)	(₹ in Crore)	(Nos)	(₹ in Crore)	(Nos)	(₹ in Crore)	Concluded (Nos)	Completed (Nos)
2010-11	WAC	17	19.55	12+2**	21.74	1	0.64	13	6
	SWAC	7	13.85	7	10.76	Nil	Nil	7	7
2011-12	WAC	20	20.00	14	21.02	1	0.17	12	4
	SWAC	7	9.95	7	14.45	Nil	Nil	7	6
2012-13	WAC	23	20.35	19	19.97	2	3.03	16	4
	SWAC	9	18.60	7	12.57	Nil	Nil	7	6
2013-14	WAC	25	19.92	20	19.20	1	4.10	18	2
	SWAC	7	6.60	5	4.73	Nil	Nil	4	1
Total	WAC	85	79.82	67#	81.93	5	7.94	56+3#	16
	SWAC	30	49.00	26	42.51	Nil	Nil	25	20
Grand Total		115*	128.82	91*+2**	124.44	5@	7.94	84***	36****

*24 (115-91) Operational works which were approved in the annual Plan, but administrative approvals (AAs) not accorded there-against within the financial year of Plan are discussed in Para 2.2.7.4.
**2 AAs were accorded by HQ WAC even though not included in approved plan as discussed in Para 2.2.8.1.
@Out of 93 (91+2) AAs, five administrative approvals accorded by HQ WAC were subsequently cancelled during the same financial year on various reasons such as unfavourable results of non-destructive testing (one case), non-requirement of work (two cases) and non-transfer of funds to Border Roads Organisation (two cases).
***Against 88 (93-5) AAs, the contracts were concluded for 84 operational works. The details for 4 operational works for which the contracts were not concluded by engineer authorities against the AAs are given in **Annexure-III** and also discussed in Para 2.2.9.2.
****Out of 88 AAs, five AAs were having PDCs beyond March 2015. Against the remaining 83 AAs for which operational works were to be completed by March 2015, 47 (83-36) operational works were not completed. Out of these incomplete works, the details of 45 operational works being executed by Military Engineer Services (MES) are given in **Annexure-IV** and also discussed in Para 2.2.9.3. The remaining two works were not completed by Border Roads Organisation (BRO).
Out of 62 (67-5) AAs accorded by HQ WAC, 3 AAs were meant for execution of operational works by BRO and remaining 59 AAs for execution by MES.

IAF had planned 115 operational works during 2010-11 to 2013-14 against which AAs were issued in 93 cases involving ₹124.44 crore. Further, against the 93 AAs, contracts were concluded by MES in 81 cases and work orders

issued by BRO in 3 cases but the works could be completed only in 36 cases by March 2015.

2.2.7 Planning for Operational Works

Audit findings on planning process for operational works are detailed in the following paragraphs:

2.2.7.1 Delay in declaration of operational works areas

As per MoD directives, from April 2002 onwards Army HQ declares 'operational works areas' for Army and, thereafter Air HQ declares 'operational works areas' for Air Force, within the areas already declared by Army HQ.

Army HQ declared 'operational works areas' for Forward category³³ in March 2010 and March 2012 for block of two years ending March 2012 and March 2014 respectively. Subsequently, Air HQ declared their own 'operational works areas' within the operational works areas declared by Army HQ, in July 2010 and October 2012 respectively, after calling for the list of AF units from the respective Commands falling under operational works areas. Thus, Air HQ took three months in 2010 (for 2010-12) and six months in 2012 (for 2012-14) from the date of declaration by Army HQ, to declare its operational works areas.

In view of the fact that operational works are undertaken to meet temporary operational requirement, planning and execution for operational works depends on initial declaration of operational works area and therefore any delay in the declaration of the same will have cascading effect. It was also seen that no timeline/period was prescribed by MoD/Air HQ for identification of AF units falling under the operational works areas declared by Army as well as for the declaration of operational works areas by Air HQ.

³³ Army HQ declared the areas under the states of Jammu & Kashmir, Punjab, Rajasthan, Gujarat, Himachal Pradesh, Uttarakhand and all north-eastern states except Assam as 'Forward category' for declaration of operational works areas. The state of Assam was only placed under 'Second category'.

In response to audit observation Directorate of Air Force Works stated (December 2014) that in normal course the entire process from identification of units to declaration of 'operational works areas' would take 3½ to 4 months. During exit conference (February 2015), AF authorities assured that 2-3 months period would be prescribed for declaration of the operational works areas.

2.2.7.2 Irregular identification of operational works

As per definition³⁴ Operational works are works of a temporary nature. Further, temporary works are meant for short term requirement having maximum life of five years from the date of completion of work, as per Defence Works Procedure (DWP), 2007. As against this, permanent nature of works are meant for long term requirement having life over five years, as per DWP 2007. A separate code under Revenue Head³⁵ has been kept for accounting purpose of operational works. Air HQ also instructed (June 2012) the Commands that works in the declared 'operational works areas' should be of urgent operational necessity.

It was observed that in 23 cases (out of 88 cases examined by Audit), work services of permanent nature valuing ₹36.58 crore (**Annexure-II**) were included by the AF units and recommended by the Commands in the AOWP during 2010-11 to 2013-14. Out of these 23 cases, in 19 cases involving ₹14.97 crore even Engineer Appreciations³⁶ (EA) were prepared for permanent works. These works *viz.* water supply for AF stations, construction of shed for housing of satellite communication (SATCOM) equipment, renovation of blast pens, infrastructure for special projects, *etc.*, with a life span of more than five years, were of permanent nature, and thus, were required to be done as capital works under Defence Works Procedure, 2007, after approval of the competent financial authority. Some of these important cases are highlighted below:

³⁴ Procedure for Operational Works, 1948 and Management of Operational Works, 1999.

³⁵ Major Head 2078 Minor Head 111 Sub Head (a) 756/01.

³⁶ Engineer Appreciation is a document about the work prepared by engineer authority for Board of Officers.

(a) Infrastructure for Special Project

The Cabinet Committee on Security (CCS) approved (March 2008) creation of infrastructure associated with procurement of 'CC'³⁷ system as capital work (of permanent nature) at a cost not exceeding ₹42 crore. Accordingly, work services for creation of infrastructure at six AF units³⁸ were sanctioned by the respective Competent Financial Authorities (CFA) as capital works between February 2010 and April 2012.

It was observed that in another AF unit *i.e.* 901 SU under HQ WAC, the same work services had been recommended (July 2010) by HQ WAC (although not proposed by the unit) and also approved (August 2010) by Air HQ in AOWP 2010-11 as an operational works. Accordingly, the work services were sanctioned (February 2011) at a cost of ₹6.84 crore and subsequently revised (November 2012) by HQ WAC at a total cost of ₹8.64 crore³⁹ under operational works which included special items of work valuing ₹4.95 crore, and also did not qualify for operational works as discussed in para 2.2.8.2. As the work of 'CC' system was a capital work of permanent nature, sanctioning of the same as operational works was irregular.

The Command HQ replied (September 2014) that certain works of permanent specification had been sanctioned for improvement of field defence, roads, operational and technical accommodations of the operational area units for which temporary specification work may not sustain at all.

The fact remains that works of permanent specifications were sanctioned in violation of Directives for sanction/regulation of operational works.

³⁷ Surface to Air 'GG' and 'HH' Air Defence System.

³⁸ Three units ('W-5' Wg, 'W-4' Wg, 'X' SU) of HQ WAC, two units ('W-11' Wg, 'W-12' Wg) of HQ SWAC and one unit ('X' BRD) of HQ Maintenance Command.

³⁹ This included Special items of work valued at ₹4.95 crore (for Building works-₹4.59 crore, EOT Crane-₹0.18 crore and DG Set-₹0.18 crore). Other major works were Site clearance-₹1.16 crore, Protective work-₹0.64 crore, Road/Path/Culvert- ₹0.97 crore, External Electric Supply- ₹0.48 crore and seven other works including contingencies- ₹0.44 crore.

(b) Enhancement of Water Supply for AF Stations

(i) Air Force Station(AFS) 'S-18':

AFS 'S-18' was getting 5 to 5.5 lakh gallon per day (LGPD) water *vis-a-vis* 10 LGPD required and prescribed in the agreement with 'S-18' Municipal Corporation (JMC). A Board of Officers (BOO) at the AFS recommended (April 2010) augmentation of water supply at the station as operational works to achieve a permanent solution. The work services recommended (August 2010) by HQ SWAC were approved (August 2010) by Air HQ in AOWP 2010-11. Administrative approval was accorded (September 2010) by HQ SWAC for the above work services at an estimated cost of ₹6.67 crore which was revised (November 2013) to ₹7.33 crore.

It was also noticed (August 2014) that while approving (June 2011) AOWP 2011-12, Air HQ did not approve works relating to supply of Narmada water at AFS 'S-19', 'S-20' and 'S-2' on the grounds that the same were not covered under the Procedure for Operational Works, 1948.

Hence, approval of the work for augmentation of water supply at AFS 'S-18' in AOWP 2010-11 as operational works was irregular.

AF Station 'S-18' stated (October 2014) that the convening order from HQ SWAC for BOO for the said work was received as operational works.

The reply is not acceptable as works for only 'field water supply' are prescribed in Procedure for Operational Works (1948) and AF Stations are not field areas.

(ii) AF Station 'S-21'

Audit observed (September 2014) that AFS 'S-21' proposal (May 2010) of drinking water connection from Gujarat State Water and Sewage Board by using Narmada water as a permanent solution to water shortage at the AFS recommended (August 2010) by HQ SWAC, was approved (August 2010) by Air HQ in AOWP for 2010-11 as operational works. HQ SWAC accorded AA (September 2010) for the work at an estimated cost of ₹1.14 crore.

The AF Station replied (October 2014) that the work was permanent only to solve the basic problem and not the complete solution, and hence the work was taken up as operational works.

The reply is not acceptable as operational works being works of temporary nature were meant for operational necessity, and only 'field water supply' was eligible for the same, whereas AF Stations are not field areas.

(c) Renovation of Blast Pens

Audit observed (September 2014) that work services for renovation of blast pens⁴⁰ at AF Station 'S-2' proposed (August 2010) by HQ SWAC, were not approved (August 2010) by Air HQ for AOWP 2010-11 on the ground that the nature of work could not be categorised as operational works.

However, the same work services proposed (January 2011) again by HQ SWAC, were approved (June 2011) by Air HQ as operational works for AOWP 2011-12. AA for the work was accorded (December 2011) by HQ SWAC at an estimated cost of ₹4.50 crore.

HQ SWAC stated (September 2014) that the work had been sanctioned to meet the operational commitments at the earliest.

The reply is not acceptable as renovation of Blast Pens being a work of permanent specifications, does not qualify the criteria of temporary nature of works as prescribed under the Procedure for Operational Works (1948) or Management of Operational Works (June 1999). Moreover, if urgency was the only factor, the work could be executed under para 35 of Defence Works Procedure (DWP) 2007.

(d) Works for AFNET

HQ WAC proposal (May 2012) for operational work services for AFNET⁴¹ at Op location of 'X' Transportable Radar Unit (TRU) at a cost of ₹47 lakh, was not approved (June 2012) by Air HQ for AOWP 2012-13, on grounds of it being of permanent nature.

⁴⁰ Blast pens are parking shelters with special protection for fighter planes

⁴¹ Air Force Network

Audit also noticed from Air HQ directives issued (June 2012) to Commands that the works relating to AFNET were of capital nature and hence could not be sanctioned under operational works.

However it was noticed that HQ WAC changed (July 2012) the nomenclature of above work to 'Provision of Porta cabin at Op location of 'X' TRU' with the same cost and Air HQ approved (October 2012) the proposal as operational works *vis-a-vis* the AOWP 2012-13.

(e) Sheds for 'FF'

Work services for 'provision of sheds for FF'⁴² at a Signal Unit (SU) under HQ WAC were approved by Air HQ (February 2013) as capital works under Annual Major Works Programme (AMWP) for the year 2012-13, but funds were not released. However, these work services were recommended (April 2013) as operational works by HQ WAC, and approved (July 2013) by Air HQ under AOWP for the year 2013-14. AA (January 2014) was given by HQ WAC at a cost of ₹14.90 lakh.

Thus, out of 93 operational works approved during 2010-11 to 2013-14, 23 works did not fall into category of 'operational works'. ₹36.58 crore were sanctioned for these ineligible works as against total sanction of ₹124.44 crore on all operational works during the same period.

During the exit conference, AF authorities explained (February 2015) that considering the specialized requirement in AF, temporary nature of works alone would not be useful and therefore it required works of lasting nature. It was also stated that they would frame a policy with the approval of MoD to undertake works of lasting nature under operational works.

The fact remains that AF authorities have not strictly adhered to the criterion of 'temporary nature of works' laid down under the Procedure for Operational Works (1948) and Management of Operational Works (June 1999).

2.2.7.3 Approval of Annual Operational Works Plan

Audit analysis of the process of AOWP revealed the following deficiencies at various levels:

⁴² 'FF' is a Russian portable surface-to-air missile system

(a) No timelines prescribed for Annual Operational Works Plan

The controlling Commands in AF issue instructions in January/February each year, to the respective units to submit AOWP. Any planning process should normally be completed before commencement of the Plan period. No timelines are however prescribed by the MoD/Air HQ for submission and approval of the AOWP.

The details of time taken at various stages of AOWP are given below:

Table 2.5: Important dates in Operational Works Plans

Block years of declaration of Op works area	Date of declaration of Op works area by Army HQ	Date of declaration of Op works area by Air Force/ Time taken	Year of Op works plan	Date of forwarding of proposed plan by Commands		Date of approval of plan by Air HQ	Delays in months from April of that year
				WAC	SWAC		
2010-12	25/3/2010	12/07/2010 3 months	2010-11	19/07/2010	10/08/2010	25/08/2010	4
			2011-12	09/05/2011	03/01/2011	27/06/2011	3
2012-14	26/3/2012	01/10/2012 6 months	2012-13	16/07/2012 ⁴³	04/01/2012 and 26/07/2012 (Revised) ⁴⁴	17/10/2012	6
			2013-14	29/04/2013	03/06/2013	15/07/2013	3

⁴³ Advance operational works plan submitted by HQ WAC under Air HQ instructions dated 19-06-2012.

⁴⁴ Advance operational works plan submitted by HQ SWAC under Air HQ instructions dated 24-07-2012.

Audit observed that:

- a) There were delays of three to six months in approval of AOWP from April of the relevant years.
- b) While delayed declaration of operational works areas may be one of the reasons for subsequent delay in approval, the delays occurring in second year of the block was incomprehensible.
- c) AOWPs for block 2012-14 were submitted by Command HQ well in advance of declaration of operational works area, under instructions from Air HQ.

Thus there were delays in proposal/approval of operational works plans and there were no timelines prescribed for the same.

Accepting Audit observation on absence of timelines for submission and approval of AOWP, AF authorities stated (February 2015) during exit conference that the present policy and procedures would be reviewed and revised to ensure that operational works are planned in time and executed effectively.

(b) Approval of Annual Operational Works Plan by Air HQ without Board Proceedings (BPs)

As per Air HQ directives (June 1999), each unit has to prepare AOWP along with board proceedings⁴⁵ (BPs) and forward the same to their respective Commands for onward submission to Air HQ for approval.

Audit observed that BPs were being finalised by the units only after approval of the AOWP by Air HQ. Further, Directorate of AF Works (Air HQ) did not insist for BPs along with the proposed plan. Thus, there was a systemic failure which vitiated the entire process as significant number of ineligible works were approved in AOWP at Air HQ (as discussed in *paragraph 2.2.7.2*).

⁴⁵ Board Proceedings of a work contain recommendation of Board of Officers on the proposed work along with approximate estimate prepared by engineer authorities.

Air HQ stated (December 2014) that departmental directives were issued (June 1999) by it as guidelines to provide the detailed procedure on management of operational works. While practicing the same, it was realized that obtaining approval of BPs was time consuming and was against the basic spirit of the conduct of operational works. The deviation by AF authorities from the directives of June 1999 was therefore taken. During the exit conference, AF authorities assured (February 2015) that the present policy/procedures would be reviewed and revised.

The fact remains that Air HQ did not ensure adherence to its own directives (June 1999) which resulted in approval of ineligible works as operational works.

2.2.7.4 Non-issue of sanctions for operational works approved in plan

Audit was informed (September 2014) by HQ WAC that AF units in declared operational works area project their requirements of operational works through AOWP. The requirements thus projected are prioritised at Command/Air HQ level according to availability of funds and the left over works were carried forward to subsequent year proposal on 'roll on' basis till approval, if the requirement still exists.

Audit observed (September 2014) that AAs for 24 operational works approved in AOWPs were not accorded by the Commands. Details of these 24 operational works including the works rolled over to next year's approved plan are given below:

Table 2.6: Rollover of Operational Works

Year	Number of works / estimated cost (in crore)	WAC		SWAC		Total	
		No. of works approved in Plan	No. of works for which AAs not accorded (rolled over in next year's approved plan)	No. of works approved in Plan	No. of works for which AAs not accorded (rolled over in next year's approved plan)	No. of works approved in Plan	No. of works for which AAs not accorded (rolled over in next year's approved plan)
2010-11	No. of works	17	5(4)	7	Nil (Nil)	24	5 (4)
	Estimated cost	19.55	4.46 (2.53)	13.85	Nil (Nil)	33.40	4.46 (2.53)
2011-12	No. of works	20	6 (Nil)	7	Nil (Nil)	27	6 (Nil)
	Estimated cost	20.00	5.62 (Nil)	9.95	Nil (Nil)	29.95	5.62 (Nil)
2012-13	No. of works	23	4 (Nil)	9	2 (Nil)	32	6 (Nil)
	Estimated cost	20.35	2.82 (Nil)	18.60	8.17 (Nil)	38.95	10.99 (Nil)
2013-14	No. of works	25	5 (Nil)	7	2 (Nil)	32	7 (Nil)
	Estimated cost	19.92	3.74 (Nil)	6.60	2.80 (Nil)	26.52	6.54 (Nil)
Total	No. of works	85	20 (4)	30	4 (Nil)	115	24 (4)
	Estimated cost	79.82	16.64 (2.53)	49.00	10.97 (Nil)	128.82	27.61 (2.53)

Thus out of 24 operational works for which AAs were not accorded, only four operational works were rolled over to next year's approved plan. Remaining 20 operational works were either cancelled or BPs were not finalised for various reasons such as inclusion of the same works in capital works plan (four cases), non-obtaining of 'no objection certificate' for availability of land from Army (one case), non-transfer of assets from BRO to MES (one case), operational reasons (two cases), *etc.* Two such instances, one of cancellation of work and another of non-finalisation of BPs, are discussed below:

- **Cancellation of Operational Work:** The work services relating to construction of traverses around missile preparation shed (MPS) at AFS 'S-10' were sanctioned (July 2012) by HQ SWAC for ₹26.94 lakh under 'Capital' works plan for the year 2012-13. However, the same work was also approved (October 2012) for ₹17 lakh by Air HQ in AOWP 2012-13 and, therefore, the operational work was cancelled.

- **Non Finalisation of BPs:** The work services in respect of power and water supply for operational cum training sites of MR SAM⁴⁶ for 'W-8' Wing were approved (October 2012) by Air HQ at a cost of ₹8 crore in AOWP 2012-13, but the BPs could not be finalised in that year.

To an audit observation (September 2014) on non-issue of AA for the above work, 'W-8' Wing replied (September 2014) that BPs were pending for want of clarifications on Facility Requirement Document from Air HQ. Further, HQ SWAC stated (August 2015) that work services for induction of MR SAM was a turn-key project and being executed by Defence Research and Development Organisation (DRDO) and external services such as road, water, electricity, sewage disposal are to be provided by AFS 'S-2'. The requirement of Board Proceedings could not materialise due to non-availability of requisite details of work service by DRDO.

Thus, there were operational works which were approved but not sanctioned for various reasons, raising doubts about their requirement as operational works.

AF Authorities stated (February 2015) in exit conference that the present policy and procedures would be reviewed and revised to ensure that operational works are planned and executed effectively.

The fact remains that out of 115 operational works approved by Air HQ, 20 operational works (*i.e.* 17 per cent) were not sanctioned, which is indicative of deficiencies in planning for temporary assets of urgent operational necessity.

2.2.8 Sanction of Operational Works by Commands

Audit findings on sanction of operational works are detailed in the following paragraphs:

⁴⁶ Medium Range Surface to Air Missile

2.2.8.1 Issue of Administrative Approvals (AA) by Command HQ without approval of Air HQ

As per directives issued (June 1999) by Air HQ, Command HQ can issue AA for operational works only after approval of the same under Annual Operational Works Plan (AOWP) by Air HQ.

It was observed (August 2014) that HQ WAC had accorded (November 2010 and January 2011) AAs valuing ₹230.23 lakh for two operational work services⁴⁷ which were not included in AOWP 2010-11 approved by Air HQ.

In response to audit observation, AF authorities stated (February 2015) in the exit conference that the matter would be reviewed and the reply provided to audit. The reply was awaited (September 2015).

2.2.8.2 Inclusion of Special Items of Works in Operational Works

Most of the work services in IAF are designated as ‘authorised works’, as for these works scales are authorised in regulations or by separate orders issued by MoD. Work services other than the authorised are referred to as ‘special works’. Special works may be approved only when exceptional local conditions justify the necessity, as per Defence Works Procedure, 2007.

MoD (January 1948) and Air HQ (June 1999) directives are silent about inclusion of special items of works in the operational works. Audit, however, noticed that HQ WAC had written (January 2013) to the AF unit (‘W-7’ Wing) that, “No special items of works should be catered in operational works”.

Audit observed that, during 2010-11 to 2013-14, HQ WAC and HQ SWAC accorded nine⁴⁸ AAs for operational works valuing ₹1720.57 lakh (₹1298.14 lakh under WAC + ₹422.43 lakh under SWAC) which contained

⁴⁷ Provision of four pre-fabricated shelters for accommodation at ‘W-6’ Wing; and Levelling and compacting of runway shoulders for fighter operations at ‘W-10’ Wing.

⁴⁸ Out of nine, five AAs were accorded by HQ WAC and four AAs by HQ SWAC.

special items of works⁴⁹ valuing ₹534.38 lakh (₹519.69 lakh under WAC + ₹14.69 lakh under SWAC). It was also noticed that the life of special items of works was more than five years.

Audit also found that since the BPs were neither submitted to Commands/ Air HQ by the AF units along with the operational works plan nor their submission insisted upon by the Air HQ for scrutiny prior to approval of AOWP, as mentioned earlier at *paragraph 2.2.7.3(b)*, inclusion of special items of works in AAs remained un-checked.

In response, HQ WAC stated (August 2014) that there was no restriction with respect to sanctioning of special works under operational works.

The reply of HQ WAC is contradictory to its own instructions issued (January 2013) earlier to one of its units. Further, Air HQ's approval of the AOWPs not supported by the BPs led to un-checked inclusion of special items of works in operational works. In the exit conference, AF authorities stated (February 2015) that the matter would be reviewed and the reply would be provided to audit. The reply was awaited (September 2015).

2.2.9 Execution of operational works

2.2.9.1 As per Air HQ directives (June 1999), operational works may be ordered for execution on any one of the following agencies:-

- (a) Formation Engineers⁵⁰
- (b) Border Roads Organisation
- (c) Military Engineer Services
- (d) Other departmental construction agency like State Public Works Department and Central Public Works Department

⁴⁹ Special items of works valuing ₹4.95 crore (Building works - ₹4.59 crore, EOT Crane- ₹0.18 crore and DG Set - ₹0.18 crore) sanctioned for 'CC' project. Other special items of works were Water filtration plant-₹0.15 Crore, Furniture-₹0.05 crore, Air conditioners - ₹0.07 crore and additional items of low value-₹0.12 crore.

⁵⁰ Engineer Regiments affiliated to Division/Corps for providing Engineer support.

HQ WAC and HQ SWAC sanctioned⁵¹ 88 operational works during 2010-11 to 2013-14 for execution by Military Engineer Services (MES); besides five operational works were entrusted for execution by Border Roads Organisation. Thus a significantly large number of works (95 *per cent*) were being given to MES.

2.2.9.2 Delay in conclusion of contracts by MES authorities

As per MoD instructions of April 1986, Chief Engineers should conclude the contracts (for other than married accommodation) within a period of 22 weeks from the date of receipt of AAs.

Review of the contracts concluded by MES *vis-a-vis* the operational works sanctioned under WAC and SWAC during the period covered in audit is discussed below:

(a) WAC

MES concluded 56 contracts till March 2015, against 59 AAs issued by WAC. An examination of 34 contracts details of which were provided to Audit, revealed that the contracts were concluded between four to 32 months since issue of AAs. Further, 25 of these contracts were concluded beyond stipulated period of 22 weeks *i.e.* five and a half months.

Audit also noticed that three⁵² contracts for operational works sanctioned by WAC in 2011-12, 2012-13 and 2013-14 could not be concluded by MES due to delay in tender action and change in scope of work services.

Chief Engineer (AF) Udhampur stated (February 2015) that there was acute shortage of staff which led to the delay in preparation and finalization of drawings as well as conclusion of contracts.

⁵¹ 62 AAs accorded by HQ WAC and 26 AAs accorded by HQ SWAC.

⁵² Work services relating to construction of four guard posts at an operational location, provision of overhead water tank filling facility for Crash Fire Tender and provision of hard standing for radar vehicle and room for AFNET at an operational location.

(b) SWAC

MES concluded 25 contracts till March 2015, against 26 AAs for operational works issued by SWAC during the period covered in audit. An examination of contracts revealed that the contracts were concluded between two to 10 months from Administrative Approval. Seven contracts were concluded beyond the stipulated period of 22 weeks.

The details of 4 AAs (three by WAC + one by SWAC) for which the contracts were not concluded by MES as of March 2015 are given in **Annexure-III**. The delay in conclusion of contracts would affect the timely execution of these operational works.

During exit conference, the AF authorities stated (February 2015) that there would be interaction with MES to minimize the time taken in conclusion of contracts and for difficult area, like Jammu & Kashmir, different procedures and/or management strategy would be explored and prescribed.

2.2.9.3 Delay in execution of operational works by MES

Army HQ issued instructions (January 1975) that execution time for operational works should not extend beyond two working seasons. No such instructions were, however, issued by Air HQ.

Audit observed that out of 56 operational works of WAC contracts of which were concluded by MES during the period covered in audit, 43 (76.8 per cent) operational works were not completed by March 2015. This was despite expiry of PDC specified in AAs, as per details given below:

Table 2.7: Operational Works not completed under WAC

Year	No. of operational works for which AAs (excluding cancelled AAs) were issued by HQ WAC	No. of contracts concluded	No. of operational works not completed and PDC specified in AAs, expired as on March 2015
2010-11	12	12	6
2011-12	12	11	8
2012-13	16	15	13
2013-14	19	18	16
Total	59	56	43

Audit also noticed that six operational work services⁵³ sanctioned in 2010-11 relating to WAC were not completed as of March 2015. In SWAC, Audit noticed that execution of two operational works⁵⁴ sanctioned in 2011-12 and 2013-14 were not completed as of March 2015.

The details of 45 operational works which were not completed by March 2015 despite expiry of PDC are given in **Annexure-IV**.

It was further observed that nine operational works amounting to ₹22.91 crore sanctioned by HQ WAC between 2003-04 and 2009-10 had not been completed as of March 2015 (**Annexure-IA**) due to reasons like land dispute, delay in approval of design, slow progress by the contractors, work stopped by the contractor, *etc.* On the delays in execution of operational works, HQ WAC wrote (July 2014) to MES authorities that inordinate delay in execution defies the very purpose of sanctioning operational works.

In response to an audit observation (September 2014) relating to delays in completion of works in respect of WAC, Chief Engineer (AF) Udhampur stated (February 2015) that the progress of works was slow on account of remoteness of places from established market, limited working season, extreme climatic conditions, non-availability of efficient working contractors and non-availability of skilled labourers. During exit conference, AF authorities further contended (February 2015) that there were difficulties in respect of operational works executed in difficult areas like Leh and Thoise.

The contention of AF authorities is not tenable as there was provision of higher percentage over Standard Schedule of Rates⁵⁵ (SSR) for these difficult

⁵³ Operational work services for induction of 'CC', construction of FRP shelters, provision of pre-fab living in accommodation with bunk bed, pre-fab shelter for power plant and hard standing at Operational location.

⁵⁴ Work services relating to construction of tarmac at an operational location and fibre glass shelter for missile storage and fire fighting works.

⁵⁵ Percentage over Standard Schedule of Rates are fixed quarterly by the Zonal Chief Engineers

stations and the AAs were supposed to specify the PDC after taking into consideration these difficulties.

2.2.10 Conclusion

Operational works are undertaken to meet temporary requirements of operational necessity. Audit scrutiny of such works for 2010-11 to 2013-14 revealed that 26 *per cent* ineligible works were approved as operational works. Timelines of declaration of operational works areas and completion of operational works plan were not defined. Although Army HQ had issued instructions that execution of operational works should not extend beyond two seasons, similar orders were not issued by Air HQ.

There was systemic failure of getting Board Proceedings after the approval by Air HQ, rather at the time of submission of proposal. There were instances of taking divergent decisions on similar issues (approving water supply in two cases and denying in many others on the plea of non coverage of such works under 'operational works'), changing nomenclature of the work to approve subsequently.

A significant proportion of operational works were given to MES (95 *per cent*). There were delays at each stage of operational works, from declaration of area, planning, sanction, conclusion of contract and execution, resultantly out of 88 works sanctioned during 2010-11 to 2013-14 only 36 could be completed by March 2015.

Thus works which were required for operational necessity as warranted by military situation were not being planned and executed in an efficient way.

2.2.11 Recommendations

Audit makes following recommendations as a result of analysis.

- I. Timelines for declaration of operational works area and submission and approval of AOWP need to be prescribed. Air HQ may also limit period of completion of operational works, as was done by Army HQ.

(Para 2.2.7.1, 2.2.7.3(a), 2.2.9.3)

- II. Works of permanent nature should not be included under 'operational works'.

(Para 2.2.7.2)

- III. Board Proceedings as one of the checks on actual requirement of operational works, should be part of proposal of operational works, before it is approved by Air HQ.

(Para 2.2.7.3 (b))

2.3 Operation and maintenance of 'C' aircraft

In order to maintain a credible level of deterrence, Indian Air Force (IAF) procured 'C' aircraft from 1996 onwards. Shortfalls in performance of aircraft and airborne system as received from OEM/BEL were yet (August 2015) to be resolved. Setting up of service support centres was inordinately delayed for want of required systems / equipment. Serviceability of aircraft fleet was also low. Manpower for 'C' aircraft squadron was not sanctioned even after 19 years of its induction.

2.3.1 Introduction

In order to maintain a credible level of deterrence, Indian Air Force (IAF) contracted with OEM⁵⁶ for import of 50 'C'⁵⁷ aircraft (1996-98) and subsequently (2006-2012) for 222 aircraft under license production from HAL⁵⁸. Against 272 aircraft contracted with OEM/HAL, 204 aircraft were delivered (March 2015) to IAF. The issues relating to acquisition, licence manufacture, offset, establishment of repair facilities, etc., have been commented upon in C&AG's Audit Reports, which along with Action Taken Notes (ATNs) and assurances given by the Ministry to Public Accounts Committee (PAC) are summarized in **Annexure-V** to this report.

The operation and maintenance of the fleet covering the period from 2004-05 to 2008-09 was initially reviewed in audit during October 2009 to April 2010.

⁵⁶ M/s 'V-4', Russia

⁵⁷ 'C', a twin engine aircraft, is a fourth generation multi role aircraft.

⁵⁸ M/s Hindustan Aeronautics Limited

After addressing the Ministry's security concerns, the subject paragraph was issued (May 2012) to the Ministry and reply was received in December 2012. Air HQ/ Ministry furnished certain clarifications and updated status (March / November 2014 and February 2015). The Ministry's replies (November 2014/April 2015) have been suitably incorporated in the paragraph.

2.3.2 Audit Findings

2.3.2.1 Shortfall in performance of aircraft procured from OEM

The evaluation of the aircraft supplied by OEM with different⁵⁹ software version was carried out by the Aircraft Systems Testing Establishment (ASTE)⁶⁰ during April 2003 and March 2007. Audit observed (February 2011) from the report of ASTE that certain systems and modes of operation such as air to air/air to ground operation of the radars, Electronic Counter Counter Measures (ECCM) functionalities, group action and air to ground bombing modes had not met the contractual specifications, which substantially reduced the effective utilization of the aircraft in its intended role.

In response to audit observation (February 2011) Air HQ stated (March 2011) that the radar and weapon modes had been addressed by the OEM in the 11-I update of the aircraft, trials for which were planned (February 2011) by IAF for evaluating efficacy and completeness of software for envisaged role.

The Ministry in regard to shortfall in performance of OEM aircraft, stated (December 2012) that the software version 11-I had been fully evaluated by IAF and the consolidated report was submitted to the OEM in May 2012. On receipt of final version of software/hardware/firmware configuration from

⁵⁹ 3-I, 7-I and 10-I software versions were used in the aircraft from time to time supplied by OEM. Final SOP standard for 'C' was 11-I software version.

⁶⁰ ASTE, Bengaluru is a unit of IAF that evaluates aircraft and systems for induction into user organisations. Most new aircraft types and major airborne systems must have ASTE stamp of approval to be considered fit for service in India.

OEM, Standard Operating Procedure (SOP) would be implemented in 'C' fleet.

The Ministry informed (March 2014) that 11-I version had been successfully tested and implemented on 45 aircraft and the entire fleet would be upgraded to 11-I version standard by June 2014 and after its implementation, there would be no performance shortfall.

However, 70 aircraft (out of 204 aircraft) still remain to be modified to 11-I standards and modification was expected to be completed by July 2015 as per the Ministry's reply (April 2015).

Regarding details of performance shortfalls eliminated after implementation of 11-I software and impact of non-availability of 70 aircraft in 11-I standards on the role envisaged for 'C' fleet, Ministry's response was awaited (September 2015).

2.3.2.2 Non availability of Critical Airborne Systems

The airborne systems such as radar warning systems, automatic flight control systems are critical equipment for success of a mission in modern warfare. Status of integration of these airborne systems having operational ramifications on the 'C' aircraft fleet are discussed below:

(a) Deficient Radar Warning Receiver

The Radar Warning Receiver (RWR) system as a part of Electronic warfare (EW) system is used in military aircraft to alert aircrew of the presence of hostile emitters. RWR in its basic form (named Tarang-30) with frequency coverage of 2-18 GHz was developed by DARE and integrated initially on the 'C' aircraft supplied by OEM. During evaluation of the aircraft fitted with Tarang-30, IAF found that masking⁶¹ of RWR antennae existed in a very large

⁶¹ In R-118 system antennae are mounted at specific locations on aircraft for optimal coverage. However, due to geometry of aircraft / manoeuvres the antennae may not detect signals and have 'nil' pick up or 'masking' in certain directions.

area in the front and the rear hemispheres of aircraft thereby affecting its envisaged role. Subsequently DARE enhanced the frequency coverage of RWR (Tarang-30) to 1-18 GHz, known as RWR 'R-118'.

Audit observed that after the flight trials conducted in July-August 2007 and February- March 2008, DARE found that masking could not be improved and the problem would need to be fixed through hardware modifications.

Audit observed from the records of Air HQ that in the meantime, the Ministry concluded (March 2006) two contracts with M/s Bharat Electronics Limited (BEL) for supply of 200 sets of RWR. However, before supply of RWR R-118, BEL approached (October 2007) Centre for Military Airworthiness & Certification (CEMILAC) for clearance of RWR R-118 in order to avoid liquidated damages (LD) for supply beyond the prescribed delivery schedule. It was seen in Audit that even though CEMILAC opined to Air HQ that clearance of RWR R-118 before the development and flight testing was not in order, it issued (October 2007) the clearance certificate.

Thus, 200 sets of RWR were cleared by CEMILAC without hardware modifications for integration on the aircraft.

In response to audit observation regarding system performance shortfalls, DARE stated (March 2011) that these deficiencies were due to design limitations and could not be eliminated without major re-design, including upgrading to digital receiver technology.

In response to draft paragraph (May 2012), the Ministry stated (December 2012) that design limitations had been addressed and the RWR R-118 was currently the SOP⁶² for 'C' aircraft. Ministry further stated (March 2014) that all the 'C' aircraft had always been equipped with RWR.

Regarding DARE's response (March 2011) relating to major re-designing of RWR R-118 including upgrading to digital receiver technology, Ministry

⁶² Standard of Preparation

intimated (April 2015) that DARE had informed Air HQ that most of the observation would remain unresolved even with digital receiver system, accordingly Air HQ had directed (July 2014) DARE to foreclose the project.

The reply of Ministry confirms that 'C' aircraft fleet operates with 200 sets of RWR 'R-118' which were produced by BEL and cleared by CEMILAC for integration on the aircraft before development and flight testing to overcome the design deficiency. Further, though DARE carried out software fixes to overcome the problem, the RWR 'R-118' remained afflicted with inherent design limitations. Even the improvement project was closed (July 2014) in view of DARE's opinion that problems would remain unresolved. It was also seen from procurement contracts (March 2006) with BEL that 'I' level and 'D' level maintenance⁶³ were not catered for.

Therefore, due to design deficiencies of the RWR 'R-118' system, which continue to persist, has compromised the survivability of 'C' aircraft.

(b) Frequent Snags of FBW system

Audit Noticed (February 2011) from the reliability study of Fly by Wire⁶⁴ (FBW) system carried out (December 2009) by Air Force Station, 'S-12' that 'C' aircraft is a super maneuverable aircraft with an inherently unstable platform. Therefore it requires a FBW flight control system for stable flight. Audit observed (February 2011) from the reliability study report (December 2009) that 31 'C' aircraft (15 OEM manufactured and 16 HAL manufactured) were grounded since induction in 2007 to November 2009 (160 days in respect of HAL manufactured aircraft and 75 days OEM manufactured) due to 111 FBW snags (33 snags on OEM manufactured aircraft and 78 snags on HAL manufactured aircraft). The report (December 2009) attributed the down time of aircraft to quality of OEM supplied aircraft being better than those supplied by HAL; lower levels of expertise of IAF technicians as compared to the OEM

⁶³ Intermediate maintenance (I-Level) normally under taken at operating squadrons. Depot maintenance (D-Level) are being carried out at Base Repair Depots of IAF or at HAL.

⁶⁴ Fly-by-wire (FBW) is a system that replaces the conventional manual flight controls of an aircraft with an electronic interface and allows automatic signals sent by the aircraft computers to perform functions without the pilot's input, as in systems that automatically help stabilize the aircraft.

technicians; non-availability of adequate publications and test equipment; and limited knowledge on FBW system by maintenance personnel.

In response to audit observation (February 2011) regarding FBW snags in 'C' aircraft, Air HQ stated (February 2011) that failure of FBW system was being taken up on case to case basis with the OEM.

The Ministry in their reply to draft report, stated (December 2012) that the type of failures⁶⁵ referred in the reliability study report (December 2009) implied catastrophic failure. Ministry subsequently stated (April 2015) that FBW snags on 'C' aircraft had come down and five FBW components under the purview of 'high failure rate' aggregates have been studied by OEM based on failure data sent to them and changes have been introduced for reliability improvement.

The Ministry's reply (April 2015) did not confirm whether FBW snags were fully removed or not.

Thus, FBW system, which was supposed to have very high reliability index, was performing below expectations of IAF thereby affecting the required stability and controllability, flight safety and automatic flight control of 'C' aircraft.

2.3.3 Operational Readiness

2.3.3.1 Utilization rate, serviceability and Aircraft-on-Ground (AOG)⁶⁶ of aircraft

Audit examined efficiency of operation and utilization of the 'C' aircraft fleet and found that it was low due to high rate of AOG, low serviceability and less achievement in flying hours.

⁶⁵ Power supply and computing unit, power supply, Digital Signal corrector, Redundant Position Sensor, *etc.*

⁶⁶ AOG refers to those aircraft which are not airworthy.

Flying task for each type of aircraft is fixed by the Ministry and prescribed in the policy pages of the squadrons. As per these norms the serviceability⁶⁷ of aircraft should be maintained at 75 per cent.

The year-wise serviceability, AOG (2006-2010) and flying task achievement (2004-05 to 2008-09) are indicated in the Table below:

Table 2.8 : Serviceability and Achievement of Flying Task of ‘C’ aircraft

Low serviceability of aircraft (in percentage)			Achievement of Flying task (in hours)			
Year	Serviceability	AOG	Year	Task allotted by MoD	Task achieved	% of shortfall w.r.t MoD's approved task
2006	55.50	13.94	2004-05	2400:00	1373:55	42.77
2007	57.45	15.32	2005-06	3840:00	2644:57	31.13
2008	58.95	11.71	2006-07	5520:00	3149:30	42.95
2009	59.73	10.90	2007-08	8640:00	5032:30	41.76
2010	59.16	12.28	2008-09	12960:00	7381:70	43.05

Source- Air HQs (Dir of Eng A1) letter no Air HQ/S21577/9/EA1(T)/BM dated 21.3.2011

As against the prescribed norm of 75 per cent, average serviceability of the fighter fleet ranged between 55.50 and 59.73 per cent and AOG of the fleet ranged from 10.90 to 15.32 per cent respectively during the years 2006 and 2010 at six operating units.

There were significant shortfalls in flying efforts by squadrons with reference to the tasks prescribed in Policy Page⁶⁸ of the squadron. The shortfall in flying efforts ranged between 31.13 per cent and 43.05 per cent during 2004-05 to 2008-09. One squadron⁶⁹ stated (December 2009) that non availability of serviceable aircraft was the main reason for shortfall in achieving the flying task.

⁶⁷ Serviceability denotes aircraft are airworthy.

⁶⁸ Policy page issued by Government of India, Ministry of Defence defines the role and task to be performed by a unit and manpower sanctioned for its functioning.

⁶⁹ ‘Sq-3’ Squadron

Air HQ stated (March 2011) that reason for low serviceability was mainly non-availability of repair facilities at HAL divisions leading to long repair cycle, as Cat 'D' aggregates were being sent to OEM for repair. Due to low serviceability, the required number of aircraft was not in a ready to fly condition, adversely affecting their availability to the squadrons for use for the assigned task of Air Defense.

In response to audit observation (May 2012), the Ministry stated (December 2012) that situation would improve after setting up of repair/overhaul facilities at HAL by February 2013. However, the repair/overhaul facilities were incomplete as of December 2013 as commented upon in Paragraph 9.1.5.6 of the Report of C&AG of India, Union Government (Defence Services) Army, Ordnance Factories and Defence Public Sector Undertakings (Report No. 35 of 2014).

In response to audit query (November 2013) regarding the utilization of 'C' aircraft, the Ministry accepted (March 2014) that operational utilization of 'C' aircraft fleet was low on account of low serviceability rate and high percentage of AOG due to inadequate support from OEM / HAL.

To audit query (February 2015) regarding the present position of setting up of repair and overhaul facilities at HAL for 'C' fleet, the Ministry stated (April 2015) that repair and overhaul facility (ROH) of aircraft and all aggregates⁷⁰ had been set up at HAL, except for four aggregates. It was also stated that there had been delay in setting up of ROH facilities at HAL divisions due to delay in supply of jigs/fixtures, tools, *etc.*, by OEM resulting in delay in commissioning of ROH facilities and mastering⁷¹ by HAL.

Ministry's reply (April 2015) was silent as to impact of delay and measures taken to improve the utilization / serviceability /AOG of the 'C' fleet pending setting up of ROH facilities.

⁷⁰ Spares which could be repaired / overhauled for its further use.

⁷¹ Understanding the skills of ROH facilities

2.3.3.2 Manpower

IAF did not project any manpower requirement, at the time of obtaining approval of the Cabinet Committee on Security (CCS) for the procurement of the 'C' aircraft in 1996, on the ground of lack of adequate/field experience, as aircraft was first of its kind to be inducted in IAF. Induction of the 'C' aircraft commenced in June 1997.

Air HQ admitted (February 2010) that shortage of manpower led to sub-optimal performance of the 'C' aircraft squadrons.

In December 2010 (after 13 years), Air Force Standing Establishment Committee (AFSEC) recommended establishment of 686 personnel (58 Officers, 550 Airmen, 61NCs (E)⁷² and 17 Civilians) as a fleet standard per 'C' aircraft squadron. Thus, total manpower requirement for 11 squadrons was worked out to 7546.

Audit observed (February/March 2011) from the records of Air HQ that after considering the manpower available with the 'C' aircraft squadrons, Air HQ projected a requirement of 3317 personnel (351 Officers, 2739 PBORs, 152 NCs (E) and 75 civilians) for all 11 squadrons.

Regarding the present position of sanction for the required manpower for 'C' aircraft squadrons, Ministry stated (April 2015) that proposal in the form of a CCS Note was being processed.

Thus, in spite of induction of 'C' aircraft since 1997, no manpower has been sanctioned for 'C' aircraft squadrons and the deficiency of manpower continues to persist. Further, non-availability of required manpower with IAF led to sub-optimal performance of the 'C' aircraft squadrons as admitted (February 2010) by Air HQ.

2.3.3.3 Delay in setting up of Service Support Centre

The contract (November 1996) with OEM for 'C' aircraft envisaged setting up of Service Support Centre (SSC) at place close to operation of aircraft. The

⁷² Non Combatants (Enrolled)

purpose of setting up of SSC was to carry out limited repair of 'C' aircraft avionics and aero engines in order to reduce dependence on overhaul agency *i.e.* OEM/ HAL.

Audit commented in Paragraph No. 2.8 of the Report of C&AG of India (Report No.8 of 2000) regarding delay in setting up of SSC at Air Force Station (AFS) 'S-11'. Ministry in their Action Taken Note 'ATN' (2003-2004) stated that setting up of SSC was planned in three phases⁷³ and efforts were being made to ensure that repair and overhaul facilities would be ready in a phased manner within the stipulated timeframe *i.e.* by June 2006 to sustain the operations of fleet.

Delay in setting up of SSC at AFS 'S-11' was again commented upon in the Paragraph No.1.4.12 of the Report of C&AG of India (Report No.4 of 2006). The Ministry in its Action Taken Note (May 2011) accepted the facts without further commitment.

With the induction of HAL manufactured 140 'C' aircraft, IAF felt (October 2006) the need for establishing two more SSCs at AFS 'S-12' and 'S-13'. The test facilities for SSC at the first base for operation of 'C' aircraft⁷⁴ at AFS 'S-11' were set-up between the years 2006 and 2010 in phased manner⁷⁵.

Regarding status of procurement of equipment for three SSCs, Air HQ stated (March 2010) that procurement of equipment for AFS 'S-11' (12 equipment/ systems for Phase-III) and 23 equipment/ systems each for AFS 'S-12' and 'S-13', initiated in August 2007 had been delayed as OEM did not respond in time. Air HQ further informed (March 2011) that 95 *per cent* building work of SSC, 'S-12' was completed and building work for SSC 'S-13' had not yet commenced. In regard to the procurement of requisite equipment for

⁷³ Phase I by December 2004, Phase II by December 2005, and Phase III by June 2006.

⁷⁴ 50 aircraft were inducted between 1997 and 2004.

⁷⁵ At SSC 'S-11', 5 equipment/systems were procured and commissioned under Phase I during 2006 and 6 equipment/systems were procured and commissioned under Phase II during 2010. Phase III has not commenced so far.

installation at SSCs at 'S-12' and 'S-13', it was stated contract with M/s 'V-4'⁷⁶ was being processed for procurement of 18 equipment.

Regarding delay in setting up of SSCs and consequent impact on operational capability of IAF, Ministry stated (March 2014) that SSC at 'S-11' was fully established and accepted the fact that delay in setting up of SSCs at two other AFS, constrained IAF in support facilities.

Giving present status of SSCs at 'S-12' and 'S-13', the Ministry stated (April 2015) that the validity of the quote, for procurement of 19 systems⁷⁷ for repair facility for SSC at 'S-12' and 'S-13', had expired and vendor did not extend the commercial offer validity. Fresh Commercial Offer was being sought after the approval of Defence Procurement Board (DPB). Ministry also stated (April 2015) that work services for SSC at 'S-12' was completed in June 2011 and tender action for work services in respect of SSC 'S-13' was in process.

The Ministry's reply (March 2014) regarding full establishment of the SSC at 'S-11' may be viewed against the fact that Phase III of SSC which was to be completed by June 2006, had not commenced (April 2015) thereby hampering the SSC in undertaking repair of aggregates of 'C' aircraft.

Thus, in spite of the Ministry's assurance (December 2003)⁷⁸ to the PAC with respect to early setting up of SSC at 'S-11', there has been inordinate delay in establishment of SSC (Phase III) at AFS 'S-11'. Further, setting up of SSCs at AFS 'S-12' and AFS 'S-13' has also been delayed as contracts for procurement of the requisite equipment / systems for these SSCs from the OEM were yet to be finalized (April 2015). Further, while the work services executed for SSC at 'S-12', have remained idle since June 2011 for want of requisite equipment / systems, work services for SSC at 'S-13' were yet (April 2015) to commence pending conclusion of contract for the purpose.

In view of above, the envisaged aim of improving operational efficiency of the fleet through fast turnaround of failed aggregates by SSCs working close to operational squadrons of 'C' aircraft, is yet to be realized despite a lapse of over 19 years since induction of the aircraft in IAF.

⁷⁶ M/s 'V-4'

⁷⁷ One system from Israel and 18 systems from Russia.

⁷⁸ 59th Report of the Public Accounts Committee (2003-04).

2.4 Upgradation and maintenance of 'DD' aircraft

The up-gradation programme undertaken by IAF was neither completely successful nor comprehensive. IAF selected unproven 'BB' radar for use in Air Defence and ground attack role. Performance of radar had not been satisfactory due to various inadequacies in its air to ground range mode and beyond visual range capability. Due to unsuitability /deficiency of critical airborne electronic warfare (EW) systems the aircraft fleet remains vulnerable to EW threats. There was low serviceability and high percentage of Aircraft on Ground (AOG) due to non availability of spares which resulted in shortfall in flying efforts. There was overall shortage of operational and technical manpower at operating units which affected operation and maintenance of aircraft. The 'D' level facility created at HAL was limited to diagnostic and repair and therefore, dependence on OEM continued for major repair/overhaul of upgraded system involving long duration of time for repairs which affected the fleet serviceability.

2.4.1 Introduction

The 'D' is an agile fighter aircraft, best suited for the short range air defence role and for limited ground attack. The aircraft was inducted into IAF squadron service in 1978. The aircraft was also licence-manufactured at Hindustan Aeronautics Ltd. (HAL), Nasik Division which had manufactured 220 'D' aircraft up to 1987. IAF had 210 'D' aircraft in its inventory (1995).

To make the 'D' aircraft capable of effectively operating in the air defence role for the foreseeable future, Government approved (January 1996), the upgradation of 125 'D' aircraft at a total cost ₹2,003 crore. The main systems⁷⁹ identified (1995) by IAF for upgradation were envisaged to make the aircraft a viable combat aircraft.

⁷⁹ These systems were Multi-mode Pulse Doppler (KOPYO) radar, Inertial Navigation System (INS) / Global Positioning System (GPS), Radar Warning Receiver (RWR), Counter Measure Dispensing System (CMDs), Self Protection Jammer (SPJ), Advance air-to-air and air-to-ground weapons, Display system including a Head-up-Display (HUD) and Multi Function Display (MFD), Helmet Mounted Sighting Device (HMDS), Video Recording System (VRS), Single Piece Front Wind-shield and an HMDS compatible canopy and Incorporation of hand-on throttle and stick (HOTAS) concept

The upgradation was to be achieved by integrating advanced avionics and weapon which were either to be imported or developed indigenously. There were no plans of upgrading engine and airframe of 'D' aircraft. While the Design and Development (D&D) Phase of two aircraft was to be completed by original equipment manufacturer (OEM) at USSR by August 1998, the series modification of remaining aircraft was to be completed indigenously by HAL, Nasik Division by September 2001 and the upgraded 'D' was christened as 'DD'.

Delays in upgradation of 'D' and its impact were commented upon in Paragraph 6 of C&AG Report No 8 of 2001. In reply to a Public Account Committee (PAC)'s question, Ministry had stated (May 2004) that upgradation of 'D' aircraft was estimated to be completed by 2005-06.

Audit was informed by IAF (May 2009) that a total of 125⁸⁰ 'D' aircraft were upgraded by OEM and M/s HAL and inducted into IAF between 1998-1999 and 2007-08. Air HQ also intimated (February 2011) to Audit that calendar life of aircraft had been extended up to 40 years⁸¹. Upgraded 'D' aircraft were being operated from six IAF squadrons⁸² and one Tactical and Combat Development and Training Establishment (TACDE).

Audit reviewed the upgradation programme of 'DD' fleet during 2009-10 and after addressing the Ministry's security concerns the draft Report was issued in May 2012, the reply of which were received in December 2012.

⁸⁰ 2 'D' aircraft D&D phase and 123 'D' aircraft series upgradation

⁸¹ Directorate of Engg A2 'DD', Air HQ vide letter no. Air HQ/81756/5/9/EA2 (T) Dated 12 February 2011 intimated to DMP that the present TCL of 'DD' aircraft is 40 years.

⁸² 'Sq-1' Sqn, 'Sq-4' Sqn, 'Sq-6' Sqn, 'Sq-8' Sqn, 'Sq-5' Sqn, 'Sq-2' Sqn,

The matter was reviewed subsequently and status of issues raised in audit was requested from the Ministry in September 2014 and again in May / August 2015, the replies to which were awaited (September 2015).

Inadequacies in the upgradation of the fleet are discussed in the succeeding paragraphs.

2.4.2 Audit Findings

2.4.2.1 Role effectiveness and capability

(a) Inadequate combat capability due to sub-optimal performance of 'BB' radar system

To improve Beyond Visual Range (BVR) capability of 'D' aircraft, IAF selected (1995) Multi Mode Pulse Doppler Radar named 'BB'⁸³ which was to be fitted into aircraft, at a cost of USD 840,000 (₹2.89 crore)⁸⁴ per unit. The radar was to be used in the Air Defence and ground attack role for guiding of air-to-air missiles and air-to-ground weapons. Audit noticed (November 2009) that since its induction, the performance of the radar had not been satisfactory due to various inadequacies in the Air-to-Ground Range (AGR) mode.

One of the reasons for the poor performance was selection of unproven radar for induction by IAF, for which the software was still under development/modification (July 2009). IAF stated (November 2010) that OEM specialists were sent (November 2010) to the Air Force Station, 'S-17' to load a new software to resolve the inaccuracies in AGR mode. However, there was no improvement in the AGR mode further. Audit also noticed from the report submitted by 'W-9' Wing Air Force to SWAC (December 2010) that missile integration checks were successfully completed only in December 2010.

The Ministry stated (November 2012) that AGR mode did remain inconsistent and inaccurate but the BVR capability of an aircraft pertains to its capability to

⁸³ Russians developed this radar specifically for 'D' upgrade and named it 'BB'.

⁸⁴ 1 USD = ₹34.39

fire air to air missiles. The error in accuracy of AGR mode thus affected the delivery of air to ground weapons only and did not affect the BVR capability of the platform. Ministry also stated that further trial did not result into any significant inputs which could improve the AGR further.

The Ministry's contention was in conflict with its reply on sub optimal performance of 'BB' radar sub-assemblies and non-integration check of 'EE' Missile till July 2009 which affected BVR capability of the aircraft during this period and expiry of life of 'EE' Missile in December 2010 as discussed in para 2.3.2.4(a).

Ministry's response to Audit query (May 2015) regarding extension of life of 'EE' Missile and effect on BVR capability of 'D' aircraft, was awaited (September 2015).

(b) Increased vulnerability to detection due to non-installation of Self Protection Jammer Pods

The Self Protection Jammer (SPJ)⁸⁵ is a critical electronic warfare (EW) equipment of a strike aircraft that contributes to success of a mission. MoD procured (February 1996) 92 SPJ pods (82 for IAF and 10 for Navy) from M/s 'V-1', Israel. Out of 82 pods, 50 pods costing ₹152 crore were for the 'D' aircraft which were to be delivered between December 1997 and July 1999. However, these were actually delivered between August 2000 and December 2004.

It was observed (February 2011) that during series upgradation, all the 125 aircraft were modified for carriage of SPJ Pods. However, only 50 SPJ pods were procured. A case was initiated by Air HQ (July 2005) to procure additional 36 SPJ pods for 'DD' aircraft to cater to 70 *per cent* of the modified fleet and the approval of the Defence Acquisition Council (DAC) was obtained in January 2006. However, the proposal for procurement of additional SPJ pods for 'DD' aircraft was not processed in view of the limited

⁸⁵ The SPJ utilize various deception techniques to degrade the enemy radar tracking system to avoid a Lock-On and break it, if one has already been achieved

residual life of the aircraft. Thus, only 43 *per cent* of the 'DD' fleet was operated with SPJs, leaving the remaining aircraft vulnerable to detection by the enemy radars (February 2011) thereby affecting the operational capability of IAF.

Accepting the facts, the Ministry stated (November 2012) that the 'V-1' pods are easily removable/ fitted on any modified aircraft in a very short time and in case of exigencies the operational requirement would be met by re-distribution of available 'V-1' pods.

The reply may be seen in view of serious shortage (57 *per cent* in February 2011) of SPJs pods with the operating units. Further, non-procurement of pods after approval of DAC on the ground of limited residual life of aircraft is not tenable as the Total Technical Life (TTL) of the aircraft had been extended up to 40 years. Also, the very fact of initiation of proposal for additional pods in 2005 means that the Ministry's argument (November 2012) about easy removability and fitment of pods is an afterthought.

Present status of deployment of SPJ pods was requested (May 2015) from the Ministry; reply was awaited (September 2015).

(c) High failure rate of Radar Warning Receiver system

The Radar Warning Receiver (RWR) system as a part of EW system⁸⁶ is used in military aircraft to alert aircrew of the presence of hostile emitters. As a part of the upgrade programme, all the 125 'D' aircraft were to be fitted with indigenous 'Tarang' RWR developed by Defence Avionic & Research Establishment (DARE) and procured (September 2005) from M/s Bharat Electronics Limited, Bengaluru.

Audit observed (February 2011) that the operating units of IAF had been reporting (May 2009) high failure rate of 'Tarang' RWR which affected the

⁸⁶ Electronic Warfare (EW) system of a strike aircraft is the most critical equipment for the survival and success of the mission in the modern electronic battlefield.

operational capability of squadrons. In response to an audit query regarding performance of 'Tarang' RWR Air HQ stated (February 2011) that the 'Tarang' system was not able to detect future generation radars.

Delay in development of indigenous radar by DARE and its unsatisfactory performance were commented in para 2.2 of the Report of C&AG of India, Union Government, Defence Services (Air Force & Navy) for the year ended March 2011 (Report No. 17 of 2012-13). The Ministry stated (November 2012) that Design and Development of Digital RWR, an advance version of radar so as to resolve the existing performance issues, was under progress in DARE. Ministry, in their ATN also stated (November 2014) that the new radar was still under development at DARE. The Ministry further stated (April 2015) that digital technology based RWR projects has been closed, as discussed in *paragraph 2.3.2.2 (a)* of this report.

Therefore, deficiencies in RWR continue to persist, compromising survivability of the aircraft.

2.4.2.2 Performance of other upgraded system

(a) Unserviceability of Video Recording System

A Video Recording System (VRS) is used for de-briefing and off-line analysis of the sortie flown. 125 VRS were procured from M/s 'V-7', France under a contract (March 1996) at 24.80 million Franc (₹17.26 crore) for which the delivery was completed in November 2003.

Audit observed (April 2010) that performance of VRS had not been satisfactory since its induction due to frequent failure of its components. Unreliability and obsolescence resulted (July 2008) in difficulties in maintenance support from the OEM. The parts of the VRS continued to be

sent to OEM for repair under LTRA⁸⁷, involving high repair cost. During 2004-05 to 2009-10, a total of 44 Line Replaceable Units (LRUs) of the VRS were sent for repair to OEM, involving an expenditure of 175,797.00 Euro (₹1.04 crore)⁸⁸ on their repair. Air HQ had expressed its concern (August 2008) that the main reason for failure of VRS was unserviceability of its video tape recorder and planned (December 2008) to replace the existing VRS⁸⁹ with Solid State Digital Video Recording system (SSDVRS) and its ground replay system.

In reply to the audit observation (May 2012) regarding inordinate delay in replacing the existing VRS with SSDVRS, Air HQ stated (November 2012) that Acceptance of Necessity (AoN) had been granted (December 2010) for the replacement of existing VRS with SSDVRS on Limited Tender Enquiry (LTE) basis. Further, many vendors claimed to possess the capability to develop and provide SSDVRS. Hence, the instant case was referred to MoD for changing the mode of tendering from LTE to Open Tender Enquiry (OTE) and the matter was still pending.

The present status of replacement of VRS with SSDVRS was sought for from MoD (September 2014); their reply was awaited (September 2015).

(b) Design deficiency in 'LL' system

'DD' aircraft is incorporated with Flight Data Recorder in the form of 'LL'-B system. The 'LL' system comprises two component (i) 'LL' B – an air component meant for flight data acquisition and processing unit (ii) 'LL' N – a ground component system used for transfer, processing and analysis of flight data and testing of 'LL'-B system. 'LL' system was procured from Russia

⁸⁷ Long Term Repair Agreement

⁸⁸ 1 Euro = ₹ 59.55 (average rate for the period from April 2004 to 2010)

⁸⁹ Existing VRS is a tape driven video recording system which was to be replaced with solid state digital video recording system (SSDVRS).

between January 1999 and November 2006 at USD 6,419,613.39 (₹29.20 crore)⁹⁰ and inducted as part of the upgrade programme.

Audit observed (December 2009) that since induction, there had been a high failure rate of certain parts⁹¹ of 'LL' system due to design deficiency which was attributable to housing of these components near the engine and thus exposing them to high temperature. To overcome the problem, fleet modification was carried out by the OEM in 2006 free of cost. However, even after fleet modification the components continued to fail.

Audit further observed (December 2009) that from 2007 onwards, a total of 178 Line Replaceable Units (LRUs) failed, of which 82 LRUs were repaired through the OEM under Long Term Repair Agreement (LTRA) during 2007 to 2009 involving an expenditure of USD 1,628,521.30 (₹7.24 crore)⁹² and 14 LRUs were repaired through local vendor. As of December 2009, a total of 48 Aircraft on Ground (AOG) demands raised by the operating units between December 2008 and November 2009 were pending for materialization. The repair facilities for 'LL'-B system aggregates at HAL became functional from 21 August 2011 due to delays in ToT by the OEM.

The Ministry stated (November 2012) that due to the vintage airframe design of 'D' aircraft it was not possible to fit an off the shelf system. Therefore, Flight Data Recorder had to be designed especially for this aircraft and no design deficiency was envisaged during D&D phase.

In brief, IAF accepted a system with design deficiency for induction which led to frequent failure of its components involving an avoidable expenditure of USD 1,628,521.30 (₹7.24 crore) on repair of components by OEM.

⁹⁰ 1 USD = ₹45.5 (average rate for January 1999 to November 2006)

⁹¹ BSOI-1 and ZBN

⁹² 1 USD = ₹44.46 (average rate for the period 2007 to 2009)

2.4.2.3 Operational readiness

(a) Utilisation rate, serviceability and Aircraft-on-Ground (AOG)⁹³ levels of aircraft

Flying task for each type of aircraft is fixed by the Ministry and prescribed in the Policy pages of the squadrons. As per these norms the serviceability⁹⁴ of aircraft should be maintained at 75 per cent. The year-wise position with regard to serviceability, AOG and flying task achievement of aircraft from 2004-05 to 2008-09 were reviewed in audit during 2009-10 and is given in the Table below:

Table 2.9: Serviceability, AOG and flying task achievement for 'D' aircraft Sqns

Year	Percentage		Flying task (in hours)			Percentage of shortfall w.r.t Government approved flying task
	Service-ability (in %)	State of AOG (in %)	Flying Task allotted by Government ⁹⁵	Revised Flying Task allotted by Air HQ	Flying Task achieved	
2004-05	51.52	23.02	12698	5144	5626	55.70
2005-06	41.32	37.34	12884	5000	6270	51.34
2006-07	42.19	25.16	13257	5267	8448	36.28
2007-08	47.16	29.41	13444	5292	9533	29.09
2008-09	44.83	33.27	13631	5065	8961	34.26

Thus, against the prescribed norms of 75 per cent the average serviceability rate of aircraft ranged between 41.32 per cent and 51.52 per cent during 2004-05 to 2008-09 due to high rate of AOG. Actual flying tasks performed also fell

⁹³ Aircraft on Ground (AOG) refers to those aircraft which are not air worthy.

⁹⁴ Serviceability means aircrafts are airworthy

⁹⁵ The variation in task was due to reasons that actual strength of aircraft at the squadrons during the particular year was taken into account for calculation of allotted task.

significantly short of the flying task prescribed by the Ministry and ranged from 29.09 to 55.70 *per cent*. The Air HQ had also reduced the task on its own which was being achieved.

The Air HQ had stated (June 2010) that serviceability of aircraft was low due to low Mean Time Between Failure (MTBF)⁹⁶ of certain upgraded systems like 'BB' radar, VRS⁹⁷, INGPS⁹⁸ and 'LL' B⁹⁹. Although reliability issues had been addressed to a great extent, serviceability continued to suffer due to poor repair support of 'BB' radar aggregates by the OEM.

The Ministry while accepting fact stated (November 2012) that the task was reduced based on expected serviceability. Actual serviceability was low because of non-availability of spares and failure of items before their expected life. Ministry also added that contract for additional spares to cater for long repair cycle was concluded in June 2010 and deliveries were expected to be completed by September 2012. Ministry further intimated (March 2014) that there was low serviceability of aircraft and high percentage of AOG due to non availability of spares and failure of items before their expected life resulted in shortfall in flying efforts.

The current status was enquired (September 2014) from the Ministry; reply was awaited (September 2015).

Thus, the efficiency of operation and utilization of the 'DD' aircraft fleet was low due to high rate of AOG, low serviceability and less achievement in flying hours.

2.4.2.4 Beyond Visual Range (BVR) 'EE' Missile

'DD' aircraft was modified for fitment of BVR 'EE'-AE missile (*i.e.* an air-to-air missile) at the time of upgrade. IAF entered into a contract in March

⁹⁶ MTBF - Mean Time Between Failures means failure of equipments before their normal expected life.

⁹⁷ Video Recording System

⁹⁸ Inertial Global Positioning System

⁹⁹ Flight data acquisition and processing unit

1996 with M/s 'V-4' for procurement of BVR 'EE'-AE missiles which were delivered in 2002 with a shelf life of eight years. Audit observed (February 2010) that IAF had considered that integration checks for BVR 'EE' missile were not required as the upgraded aircraft was worthy of launching the missile. Audit further observed (February 2011) that fitment of 'EE'- AE missile on the 'DD' aircraft commenced from January 2009 only and as the missile could not be launched properly from the aircraft, Air HQ and HAL decided (July 2009) to undertake missile integration checks on all the Bison aircraft. The checks were successfully carried out (December 2010).

In response to draft report (May 2012), Ministry stated (November 2012) that the BVR 'EE'-AE missiles were used with 'DD' aircraft on various occasions prior to integration problem observed in 2009 due to unserviceability of 'BB' radar sub-assemblies and in the interim, the missiles were available for utilization on the 'C' aircraft.

Ministry further stated (March 2014) that integration of the BVR 'EE' missile had been completed during D&D phase in the year 1999 itself and the missile was successfully fired from Bison aircraft in 2006. Ministry, however, admitted that in a few cases the field units had reported integration issues owing to unserviceability of some components of 'BB' radar which resulted in non-identification of the missile by the aircraft.

Ministry's reply of November 2012 that BVR 'EE'-AE missile had been used with 'DD' aircraft on various occasions prior to integration problem observed in 2009 and their further statement of March 2014 that after integration of the missile, the 'EE'-AE missile was successfully fired from Bison aircraft in 2006 are not consistent in view of the following:

- As per weapon operating procedure, BVR 'EE' missile integration checks were necessary to ensure serviceability of communication channels between the aircraft and the missile. However, missile integration checks were not undertaken by IAF till 2009.
- Air HQ in its reply of February 2011 stated that at the time of procurement of 'EE'-AE missile during the series upgrade it was not realized to procure any mobile SK rig or any other related testers to conduct integration checks, as the OEM suggested to conduct the

integration check suspending live missile (BVR 'EE' AE missile) on the aircraft.

- As per IAF's own admission (February 2011) fitment of BVR 'EE' missile on 'DD' aircraft commenced only in January 2009 and the missile could not be launched properly from 'DD' aircraft. In view of this, IAF decided in July 2009 to go for integration check in all 'DD' aircraft.

Thus, by the time the missile integration checks were successfully completed on 'DD' aircraft in December 2010 the shelf life of BVR 'EE' missile had expired in 2010.

Ministry's response to Audit query (May 2015) regarding extension of life of 'EE' Missile, was awaited (September 2015).

2.4.2.5 Availability of manpower

During audit of fleet upgradation of 'DD' in 2009-10, position of sanctioned and available manpower was reviewed. Deficiency in operational manpower at the operating squadrons both at the level of officers and airmen during the period 2004-05 to 2008-09 was as under:

Table 2.10 : Manpower position at operating squadrons of 'DD' aircraft

Year	Operational manpower(Officers)			Technical manpower(Airmen)		
	Sanctioned	Posted	Deficiency in percentage	Sanctioned	Posted	Deficiency in percentage
2004-05	80	61	23.75	1018	635	37.62
2005-06	80	75	06.25	1021	694	32.03
2006-07	80	64	20.00	1021	699	31.54
2007-08	80	67	16.25	1021	666	34.77
2008-09	80	63	21.25	1021	707	30.75

Thus, shortage of pilots was between 6.25 *per cent* and 23.75 *per cent* and that at airmen level were between 30.75 *per cent* and 37.62 *per cent* at the squadrons.

In reply to audit observation (December 2009), unit authorities stated (March 2010) that shortage of manpower had led to extended working hours so as to meet the required deadlines of the tasking and the situation had led to cumulative fatigue of both aircrew and technical manpower.

Accepting the facts, Ministry stated (November 2012) that in the recent past there had been instances where IAF had to induct new system/equipment without induction of manpower for the same due to ban imposed by the Government in 1984. Ministry further added that internal adjustments effected to operationalise these new systems/equipment had led to lowering of actual manning levels of existing units.

The current status regarding manpower was enquired (June 2014, September 2014 and January 2015) from Air HQ. Reply was awaited (September 2015).

2.4.2.6 Training- Delayed procurement and installation of APTT

The Avionic Part Task Trainer (APTT) of upgraded 'DD' aircraft is a training aid to provide training to pilots on the avionics systems of the aircraft. Although delivery of upgraded aircraft commenced in 2001-02, the Ministry concluded (March 2005) a contract with HAL Bengaluru for procurement of five APTTs at a cost of ₹22.50 crore. As per the terms of the contract, delivery, installation and commissioning of five APTTs were to be completed between June 2006 and March 2007 but these were actually commissioned between October 2008 and January 2009 due to delay in completion of Factory Acceptance Test (FAT) of the APTT by HAL.

In the interim period, training of pilots for familiarization before flying the actual aircraft was conducted on System Integration (SI) Rig procured (May 2002), as a part of 'D' aircraft upgrade programme, from OEM at a cost of ₹38.07 crore and installed/commissioned (May 2002) at the Software Development Institute (SDI), Bengaluru. Audit observed (December 2009) that SI Rig had become unserviceable in June 2005. To compensate the training on SI Rig, the training syllabus was amended (August 2005) by Air HQ and additional sorties had to be conducted on the fighter aircraft between August 2005 and January 2009 till installation of APTT at operating bases involving additional expenditure by way of flying cost besides risk of flight safety of pilot/aircraft.

The Air HQ while confirming the fact stated (January 2010) that training on SI Rig had continued till it became unserviceable and the syllabus was amended to compensate for training. Air HQ further stated (January 2010) that the availability of APTT could not coincide with the delivery of upgraded aircraft due to inherent delays in procurement action.

Audit further observed (November 2012) that spares worth ₹35.64 lakh had been procured by IAF between November 2005 and May 2006 on the basis of analysis of faults for making the Rig serviceable. However, the Rig was not made functional due to inadequate expertise, non-availability of trained manpower and qualitative discrepancies in certain spares supplied by the OEM. The Rig was made partially serviceable (May 2007) in respect of navigation function and 'KK' Bomb¹⁰⁰ firing using available expertise, however, ATP (Acceptance Test Procedure) of the Rig was held up as the Rig continued to be in unserviceable condition since June 2005.

Ministry stated (November 2012) that contract had been signed with M/s 'V-2' for the repair of SI Rig and repairs were expected to be completed by November 2012.

¹⁰⁰ 'KK' is a laser guided bomb

Present status of the repair of the SI Rig was sought from the Ministry (September 2014). Expenditure incurred on cat 'D' LRUs was further enquired (February 2015) from MoD; reply was awaited (September 2015).

2.4.2.7 Availability of repair and maintenance infrastructure

An aircraft comprises complex systems and its utilization and serviceability is critically dependent on the timely availability of supporting repair and maintenance infrastructure and services. All maintenance activities relating to I and II line servicing of 'DD' aircraft are carried out at operating bases. Third and fourth line servicing, viz. repair and overhaul of aircraft, is carried out at HAL. Shortcomings noticed in maintenance activities are discussed below:

(a) Non-Functioning of SK test bench and associated operation repair panels

The SK Rig is used for the 'I' level¹⁰¹ servicing of 'BB' monoblock and for identification of unserviceability, if any, of its component blocks, viz. antenna, transmitter, receiver, exciter, etc. The Operation Repair Panels (ORPs) are used to test these blocks for their independent performance before fitment on the monoblock. IAF procured SK Rigs and associated ORPs from M/s ROE, Moscow against a contract of July 1999 at a unit cost of ₹9.48 crore, which were received at three Air Force units¹⁰² between June 2003 and April 2004 and installed at these units between August 2003 and September 2008. These three SK Rigs were rendered unserviceable between 2006 and September 2008 for want of spares, General Purpose Instruments (GPIs) and unserviceability of associated ORPs. Due to unserviceability of SK Rigs and ORPs at these units, Cat 'D' LRUs of 'BB' radar were being sent to HAL/OEM for repair.

The Ministry stated (November 2012) that in absence of the indigenous solution, repair / annual maintenance contract (AMC) for the 'BB' radar test equipment was being pursued with the OEM and further added that proposal

¹⁰¹ 'I' level – Intermediate Level Servicing carried out at the Operating Base.

¹⁰² 'W-3' Wing, 'W-9' Wing and 'W-1' Wing

was sought (May 2012) from OEM in order to work out repair of unserviceable test equipment of all operating bases.

Present status of these test rigs was called for from the MoD (September 2014). Expenditure incurred on cat 'D' LRUs was further enquired (February 2015) from MoD; reply was awaited (September 2015).

(b) Delay in Setting of 'D' level facilities at HAL

As per the contract of March 1996, there was a provision for Transfer of Technology (ToT) for manufacture and repair/overhaul of 'DD' aircraft and its aggregates by HAL. However, ToT could not materialize in spite of efforts of IAF, MoD and HAL. Hence, Air HQ directed (May 2003) HAL not to pursue the ToT for manufacture of the aggregates and suggested to establish diagnostic and repair/overhaul facilities for 'BB' radar and system and aggregates of aircraft on fast track basis by January 2008.

Audit observed (April 2010) that though the repair facilities for 'BB' radar had been established (August 2008), these facilities needed (March 2009) further instrumentation for diagnosis and testing at an additional estimated cost of ₹4.50 crore by HAL. Further, the full complement of training on repair of 'BB' radar LRUs could not be imparted by the OEM specialist due to non-availability of sufficient population of Cat 'D' repairable since most of the repairable had been sent to OEM for repair. Hence, additional training was required to be imparted to HAL personnel by deputation of OEM specialist to India at an estimated cost of ₹1.80 crore. Audit also observed (April 2010) that repair and overhaul facilities for 'BB' radar set up at HAL strictly fell under the category of second line repair which was also being established as 'I' level facilities in all the operating units and full-fledged 'D' level facilities had not been set up at HAL.

Air HQ stated (April 2010) that setting up of 'D' level facilities had not been considered economically viable as the present facilities were being used only for 'DD' aircraft, and the same would not be useful after withdrawal of 'DD' aircraft from service.

Air HQ reply is not acceptable in view of the fact that the calendar life of 'DD' aircraft had been extended (March 2010) up to 40 years. Due to non-availability of complete repair/overhaul facilities, 297 'BB' LRUs and 564 non-'BB' LRUs were offloaded to OEM for repair/overhaul during the period from April 2007 to November 2009, against Long Term Repair Agreement (LTRA) concluded (April 2007) by HAL with OEM involving a total repair cost of USD 976,593.52 (₹4.33 crore)¹⁰³.

Ministry stated (November 2012) that efforts made to set up repair facilities for 'BB' radar aggregates had not been successful and instead of setting up full overhaul facilities, only diagnostic and repair facilities were proposed at HAL. Ministry further stated (November 2012 and March 2014) that in the absence of repair facilities, aggregates had to be sent to OEM for repairs resulting in continued dependency on OEM for major repair/overhaul.

Ministry's response to an audit query (May 2015) regarding completion of additional instrumentation for diagnosis and testing and details / cost of 'BB' LRUs offloaded to OEM for ROH between December 2009 and March 2015, was awaited (September 2015).

(c) Prolonged unserviceability of Moon Automatic Test Equipment (ATE)

'W-3' Wing AF, was holding two 'V-1' Self Protection Jammer (SPJ) Automatic Test Equipment (ATE) for providing 'I' level servicing facility to 'V-1' internal and 'V-1' Pod. Out of two, one ATE (Moon version)¹⁰⁴ costing ₹6.20 crore, which had been installed (March 2003) and commissioned (April 2003) at 'W-3' Wing became unserviceable (June 2005). As the rectification of ATE could not be undertaken at the unit level, cannibalization of some of the components was carried out by No. 'Y' BRD on another ATE (Jupiter Version) held by the Wing. Since ATE (Jupiter Version) was capable of 'I' level servicing of SPJ pods, the matter was taken (September 2009) up

¹⁰³ 1 USD = ₹ 44.42 (average rate for the period from April 2007 to November 2009)

¹⁰⁴ ATE Moon version is used to carry out Acceptance Test Procedure of SPJ POD in 'DD' Aircraft.

by 'W-3' Wing, AF with HQ WAC to allot the ATE to 'Y' BRD for proper utilization and maintenance. However, the ATE was not allotted (December 2009) with the result the ATE costing ₹6.20 crore continued to remain in unserviceable condition at 'W-3' Wing AF.

'W-3' Wing, AF in response to the audit query (December 2009) on prolonged unserviceability of the ATE stated (January 2010) that standard test equipment and custom made drawers of Moon version ATE had been allotted (September-October 2008) by Air HQ to 'Y' BRD, and 'W-14' Wing AF to repair ATEs at their base. Hence, the instant ATE could not be allotted out as a whole.

The Ministry stated (November 2012) that allotment out of the unserviceable ATE (with deficient sub system) from 'W-3' Wing, AF to 'Y' BRD would not solve any purpose. However, case for refurbishment and extended maintenance warranty for all the ATEs procured from M/s 'V-1' was still under process (October 2012).

The present status of refurbishment of ATE was asked from MoD (September 2014). Their reply was awaited (September 2015).

Fact remains that ATE costing ₹6.20 crore continued to be in unserviceable conditions (October 2012) and could not be put to use for intended purpose as a result IAF could not derive any benefit out of the investment of ₹6.20 crore since June 2005.

2.4.3 Conclusion

Audit of upgradation of 'DD' aircraft was initially taken up in 2009-10 and data pertaining to 2004-05 to 2008-09 was analysed, however it was not finalised due to certain security concerns raised by the Ministry. The summary of audit findings as a result of revised report is as under.

The upgradation programme undertaken was neither completely successful nor comprehensive due to various inadequacies. IAF selected unproven 'BB' radar

for use in Air Defence and ground attack role. Performance of radar had not been satisfactory due to various inadequacies in its air to ground range mode and Beyond Visual Range capability. Due to unsuitability /deficiency of critical airborne EW system the aircraft fleet was vulnerable to electronic warfare threats. There was low serviceability and high percentage of Aircraft on Ground (AOG) due to non availability of spares which resulted in shortfall in flying efforts. There was overall shortage of operational and technical manpower at operating units which affected operation and maintenance of aircraft. The 'D' level facility created at HAL was limited to diagnostic and repair and therefore, dependence on OEM continued for major repair/overhaul of upgraded system involving long duration of time for repairs which affected the fleet serviceability.

2.5 Inappropriate procurement of tent based medical shelter

Tent Based Medical Shelter (TBMS) which were planned to be light weight and meant for immediate and temporary deployment for medical relief in disaster area could not be utilized, as critical medical equipment were deleted and housing package including staff accommodation, flooring, hospital furniture, etc., were added to initial scope, which made it heavier. Resultantly user RAMT found it difficult to transport and deploy. Thus, even after spending ₹10 crore on procurement of TBMS for providing assistance during disasters, the nation was deprived of its intended benefits due to its heavy weight.

Three Rapid Action Medical Teams¹⁰⁵ (RAMTs) were set up (July 1999) in IAF to provide organized medical aid at a disaster area for a limited period of time (*i.e.* 72 hours). Thereafter, civil administration would take over the role.

In order to overcome difficulties such as lack of administrative support, communication system, sleeping bags, rations, drinking water, detachment of 3-4 men operating away from base camp and spending nights in open as tents

¹⁰⁵ No.1,2 and 3 RAMTs are co-located with three AF hospitals at Bengaluru, Jorhat and Hindon.

supplied by Ordnance Factory were heavy and cumbersome , *etc.*, encountered by relief medical teams during deployment (May 2008) in Myanmar after the cyclonic storm 'Nargis', Director General Armed Forces Medical Services (DGAFMS) suggested (July 2008) to three services that RAMTs were required to be equipped with Tent Based Medical Shelters (TBMS) with high quality, waterproof, foldable, easy to pitch and light weight tents as being used by international relief teams. Accordingly, Director General Medical Services (DGMS, Air) proposed (February 2009) to Air HQ to procure two sets of 25 bedded deployable TBMS from M/s Alaska Structure on Propriety Article Certificate (PAC) basis. The estimated cost of each TBMS was ₹4.5 crore including shelters, flooring, generators, HVAC¹⁰⁶ units, beds, electric wiring, staff accommodation and freight.

The procurement was proposed by DGMS) (Air) to be made under Schedule XII (J1A)¹⁰⁷ through Capital head (919/36) using revenue procedure. Acceptance of Necessity (AON) was accorded (February 2009) by Vice Chief of Air Staff (VCAS) and Air HQ decided (February 2009) to procure TBMS on PAC basis from M/s Alaska Structure. Air HQ issued (March 2009) Request for Proposal (RFP) to M/s Alaska Structure on PAC basis and the firm submitted its offer (April 2009) by quoting ₹33.46 crore for two sets of TBMS. However, Cost Negotiation Committee (CNC) decided (April 2009) to procure only one complete set of TBMS at a cost of USD 19,99,999.00 (₹10 crore¹⁰⁸) after making some changes in the requirement¹⁰⁹. It was also decided to procure the second set after the evaluation of the first set.

Integrated Financial Advisor (IFA) while concurring with the proposal under Schedule XII (J1A)¹¹⁰ recorded (May 2009) that main reason for increase in price from ₹4.5 crore to ₹9.99 crore per shelter was primarily due to addition of several items in basic shelter such as staff accommodation with toilet

¹⁰⁶ HVAC – Heating, ventilation and air-conditioning.

¹⁰⁷ Schedule XII (J1 A) of the Delegation of Financial Powers (DPFs) is related to Procurement of Maintenance Store and also describes the financial powers of competent authorities accorded by GoI.

¹⁰⁸ 1USD = ₹50.00 (May 2009).

¹⁰⁹ Additions of staff accommodation with toilet facility and dining area, oxygen dispensing system with portable oxygen plant and forklift and deletions of pre/post/CSS PKG, Radiology PKG, supply/Adm PKG and spares kit and routine maintenance PKG.

¹¹⁰ Meant for Procurement of Maintenance Stores.

facility and dining area, oxygen dispensing system with portable oxygen plant, forklift, *etc.* VCAS approved the proposal in May 2009. Thereafter, Air HQ placed (May 2009) a supply order on M/s Alaska Structures, USA for supply of one TBMS at a cost of USD 19,99,999.00 (₹10 crore) with a delivery period of 3 months from the receipt of supply order. The firm supplied the TBMS in September 2009.

In April 2010, Air HQ again proposed to procure second set of TBMS under Schedule XII (J 1A). However, Principal Integrated Financial Advisor (PIFA), commented that no financial powers had been laid down in schedule XXII¹¹¹ and XII (J 1 A) for the procurement of TBMS.

Further, following deployment (September 2009 to February 2011) of the TBMS for exercise purpose at Agra, Bengaluru and Hindon. 3 RAMT submitted (August 2011) a performance report to DGMS (Air) indicating that AN-32 aircraft and MI-17 helicopter were unsuitable for transporting TBMS which requires three sorties of 'A' or seven sorties of C 130-J aircraft. Further, transportation of TBMS by rail requires one full rake or at least nine wagons besides trucks and manpower for the containers, whereas road transportation involves 10 flat top trailers (30 feet). It was also stated that setting up of TBMS takes 4 to 5 hours with adequate trained manpower.

Audit observed that use of financial powers of the VCAS under maintenance stores {Schedule XII (J1A)} for procurement of TBMS *i.e.* a Medical/Dental store, was irregular and thus it needed sanction of the Ministry of Defence (MoD). Further, inclusion of additional requirements made the TBMS heavier *vis-à-vis* the basic shelter (light weight) recommended by the DGAFMS.

In reply to observation, DGMS (Air) stated that TBMS was not a medical equipment but temporarily deployable accommodation. Therefore delegated financial powers of VCAS under XII (J1 A) were proposed to be utilized, which was also concurred by PIFA. Accepting procurement of heavy TBMS,

¹¹¹ Schedule XXII stipulates the financial power of competent authorities in respect of Medical/Dental Stores.

Air HQ stated that the isolated procurement of light weight tent would not have improved the capability for delivering quality medical care and TBMS was likely to be deployed at remote/isolated locations for many days; for which the appropriate staff housing package was planned and procured along with TBMS.

Audit does not agree with the argument of the DGMS (Air) as Schedule XII is meant for procurement of Maintenance Stores, which was also confirmed by IFA during second procurement of TBMS. Further, while accommodation/housing elements of TBMS were upgraded, the most critical medical equipment pre/post/CSS PKG, Radiology PKG, Pharmacy PKG, portable patient oxygen concentrators, *etc.*, which had been included in the original proposal of IAF, were deleted. Further, the difficulties in transporting TBMS had also been explained in the performance report regarding TBMS submitted (August 2011) by 3 RAMT to DGMS (Air).

Audit further noticed (May 2014) that due to non-availability of aircraft/non requirement by the civil authorities, No. 3 RAMT with TBMS was not deployed during the three disasters namely Operation Rahat at Uttarakhand, Typhoon Haiyan at Philippines and Super Cyclone Phalin in Odisha occurred between August 2009 and January 2014.

Air HQ stated (October-November 2014) that No. 3 RAMT with TBMS was used during Commonwealth Games-2010 (CWG) in New Delhi, Aero India show and Uttarakhand post floods. Air HQ also stated that RAMT was deployed at Port Blair for exercise (2-10 February 2014), for Flood Reliefs in Purnea, Bihar (4-8 August 2014) and Jammu & Kashmir (J&K) (7-29 September 2014) respectively.

Audit differs on the purpose as none of these deployments were for disaster relief at isolated spots. Deployment of TBMS at Port Blair was for exercise purpose. In J&K, TBMS was not deployed in flood areas but at AF Station, Awantipur which already had medical facility and in Purnea, Bihar, TBMS was used as a normal health camp for school children, teachers, *etc.* During CWG-2010, TBMS was actually kept in readiness at AF Station Hindon which

was 27 kilometers away from the main venue of CWG. Thus, TBMS could not be used as envisaged by IAF for providing quick medical aid at a disaster area. In response to the draft paragraph, MoD stated (July 2015) that light weight TBMS had been procured with equipment which had improved the capability for delivering quality medical care.

Ministry's contention relating to procurement of light weight TBMS with equipment is not acceptable as critical medical equipment were deleted from the scope of TBMS being procured, whereas housing package containing staff accommodation with toilets, flooring, HVAC units, hospital furniture, generators, *etc.*, were added subsequently. Addition of housing package which made TBMS heavier was also contrary to the recommendation of the DGAFMS for the basic shelter (light weight TBMS). The user *i.e.* 3 RAMT found heavier TBMS difficult to transport and its deployment was possible only with trained manpower. The alterations in scope of TBMS were not in line with purpose of RAMT, which was meant for immediate relief in disaster area for a maximum period of 72 hrs.

Therefore, TBMS procured by IAF at a cost of ₹10 crore with a view to provide immediate organized medical aid at disaster area, could not be utilized in natural calamities. Deletion of critical medical equipment defeated the primary objective of providing immediate quality medical care in disaster areas. Further utilization of TBMS also seems remote due to attendant constraints in its deployment as reported by user RAMT. The financial powers were also exceeded in the procurement.

2.6 Excess procurement of Speech Secrecy equipment

Excess procurement of 127 speech secrecy equipment by IAF, resulted in avoidable expenditure of ₹4 crore.

Speech secrecy equipment is used as an add-on device to telephone, FAX and data communication equipment so that voice, fax and data network remain secured. Air Force Stations are connected through static voice and data

communication lines which are secured by speech secrecy equipment. Besides this, Indian Air Force (IAF) also uses a dedicated Air Force Network (AFNET) which is capable of secure voice/data/video communication on real time basis within IAF. AFNET has already been implemented in 161 locations, covering almost all static locations of IAF. IAF also has secured Satellite Based Wide Area Network (SATCOM) as standby link of AFNET to cater for operational communication.

IAF was authorized (May 1992) to use 168 speech secrecy equipment on static civil telephone lines by Raksha Mantri. Accordingly, IAF procured 168 Subscriber End Secrecy Device (SECTEL) equipment from M/s Bharat Electronics Limited (M/s BEL), between 1996 and 2002. As SECTEL was getting obsolete, Air HQ concluded (March 2014) a contract for procurement of 168 MSD-SEED¹¹² equipment from M/s BEL, at a total cost of ₹5.29 crore for replacement of SECTEL equipment, on one-to-one basis.

While auditing records of Air HQ, it was noticed (September 2014) that IAF had also procured (January 2008, August 2008 and May 2011) 127 MSD-SEED of the identical technical specifications under three different supply orders placed on M/s BEL. Further, while working out the replacement of 168 SECTEL equipment in 2014, the 127 MSD-SEED equipment procured earlier (between January 2008 and May 2011) were not taken into account by IAF.

As a result, against authorized 168 speech secrecy equipment, IAF had, procured 295 (168 + 127) equipment. The speech secrecy equipment were not scaled since it's authorization in 1992, although as per IAP-1503¹¹³, IAF was required to review its requirement and fix the scale accordingly for all types of equipment.

In reply Air HQ stated (February 2015) that the formal scaling action of MSD-SEED would be initiated shortly. The Ministry in response to the draft

¹¹² Media Secrecy Device Subscriber End Encryption Device

¹¹³ Indian Air Publication-1503 – Manual for fixation of scales

paragraph issued (January 2015) stated (April 2015) that 27 MSD-SEED equipment were procured (January to August 2008) to provide secured communication on FAX deployed between Air HQ and command HQ, while 100 MSD SEED equipment were procured for AFNET due to increased operational requirement of IAF in addition to civil lines. It further stated that AFNET and SATCOM have media encryption device which secure voice, fax and data traffic at exit point of IAF campus whereas SECTEL secures communication up to subscriber device. The Ministry further stated that AFNET provides secrecy beyond IAF campus and does not cater for communication security within campus.

Ministry's reply may be viewed in light of the fact that AFNET connectivity is based on dedicated and secured optical fiber networking. AFNET has already been graded by SAG¹¹⁴ for Bulk Encryption Units (BEUs) with complete encryption of voice and data. Further it has been implemented (September 2010) in IAF 161 locations covering almost all static locations. AFNET is based on next generation technology under which telecommunication devices are security graded. Also, AFNET is totally controlled and accessed by IAF personnel only. Moreover, IAF also has Satellite Based Wide Area Network (SATCOM) as a standby link.

Hence, keeping in view that the AFNET and SATCOM contain enough security measures to cater for IAF operational requirement, Air HQ decision for deployment of MSD-SEED as standby to AFNET was injudicious. Further, IAF should have reviewed its actual requirements in the light of extant authorization (168) and procured only balance 41 (168 -127) speech secrecy equipment in March 2014.

Thus, the procurement of 127 MSD-SEED speech secrecy equipment by IAF in excess of their authorization for 168 equipment resulted in avoidable expenditure of ₹4 crore. Also, despite lapse of 22 years since its initial

¹¹⁴ Scientific Advisory Group gives clearance for security grading for encryption devices.

authorization in May 1992, IAF has not reviewed and scaled their actual requirement.

2.7 Procurement of Intelligence System

Incorrect identification/delayed evaluation of the identified aircraft platform by IAF resulted in delay in installation of state-of-the-art intelligence system. Further, the system acquired after twelve years of ‘in principle approval’ and after incurring expenditure of ₹88.70 crore remained afflicted with software issues, raising concerns on its performance as envisaged. Annual Maintenance Contract (AMC) for the system was yet (May 2015) to be concluded post expiry of warranty (December 2014).

‘JJ’ system is used for gathering intelligence about capability and state of mobilization/ preparedness of adversary forces. Air Headquarters (Air HQ), projected (January 2001) to the Ministry the requirement for installation of three ‘JJ’ system for augmenting intelligence capability, two for ‘F’ aircraft and one as reserve. The proposal was ‘in principle’ approved (July 2002) by Raksha Mantri.

The Operational Requirements (ORs) for ‘JJ’ system and specification of ‘F’ aircraft were defined by Air HQ in the Request for Proposal (RFP) issued (October 2003) to 11 vendors, of which M/s BEL, India and M/s ‘V-1’, Israel responded. After following due process, a contract was concluded by the Ministry in February 2007 with M/s ‘V-1’, at a total cost of USD 19097135 (₹88.70 crore). As per the contract, delivery and installation of all three ‘JJ’ system were to be completed by February 2009.

Audit noticed (September 2014) that M/s ‘V-1’ conducted preliminary survey (December 2003) of ‘F’ aircraft and based on the information relating to electric power, cooling capacity and payload capability of the ‘F’ aircraft indicated in the RFP (October 2003), accepted (December 2003) installation of ‘JJ’ system on ‘F’ aircraft. The Technical Evaluation Committee (TEC) also carried out evaluation (December 2004) of the system and held that the ‘JJ’ system proposed by M/s ‘V-1’ complied with all the ORs. The TEC further

recommended that the compliance to ORs indicated by M/s 'V-1' was only on paper and therefore there was need to assess the claims on site. Thereafter, IAF carried out 'on site' [*i.e.* Field Evaluation Trial (FET)] evaluation of the 'JJ' system in Israel on the offered aircraft *i.e.* 'H', and accepted the system for 'F' aircraft. This was despite the fact that crucial elements of any aircraft, like electrical power, cooling capacity and all up weight carrying capacity differ from aircraft to aircraft. On the basis of acceptance by TEC as well as on Field Evaluation Trial, the Ministry (February 2007) concluded a contract for procurement of 'JJ' system for 'F' aircraft.

The contract required IAF to provide detailed information relating to performance of aircraft namely 'F'. While providing (May 2007) detailed information of aircraft, IAF found that electrical power, cooling capacity and all up weight carrying capacity of the 'F' aircraft were not suitable for installation of 'JJ' system, due to its ageing. Air HQ opined (July 2007) to the Ministry that the advanced capabilities of the 'JJ' system would not be fully exploited on 'F' aircraft due to its limitations.

Air HQ proposed (September 2007) to the Ministry the change of platform from 'F' aircraft to 'G' aircraft so as to exploit the advanced capabilities of the proposed AISIS. Resultantly, an amendment to contract was signed by IAF with M/s 'V-1' in January 2009 without any financial implication, for installation of 'JJ' system on 'G' aircraft instead of 'F' aircraft with revised installation schedule as January 2012.

Audit observed (September 2014) that incorrect identification of 'F' aircraft as suitable aircraft platform and subsequent change of the same to 'G' aircraft resulted in delay in installation of 'JJ' system (April 2012) which was originally planned to be installed in February 2009. Further, performance of the 'JJ' systems was not found (July 2014) satisfactory on both the 'G' aircraft by IAF since its installation due to large number of faults relating to hardware as well as software. Three Time Serve Units¹¹⁵ (TSU) became critically unserviceable since April 2014 which had reduced the availability of operational aircraft to one.

¹¹⁵ Time Server Unit – It is crucial component required for booting of 'JJ' system.

Air HQ stated (December 2014) that during the preliminary survey (December 2003) at TEC stage the 'JJ' system was found suitable for mounting on 'F' aircraft. However, during the post-contract survey electrical power, cooling capacity and all up weight carrying capability of 'F' aircraft were not found suitable due to ageing and continuous operational exploitation of the aircraft.

Air HQ reply is not acceptable in view of the fact that the Operational Requirements (ORs) for the 'JJ' system were framed by IAF and evaluation of the system was also carried out by them. Moreover, the specifications for installation of 'JJ' system on 'F' aircraft were decided by IAF prior to placement of RFP in October 2003 and the 'F' platform was found suitable after technical as well as field evaluation of the system which was also carried out (September 2005) by IAF team before entering into the contract with M/s 'V-1'.

In response to draft paragraph issued (March 2015), Air HQ stated (May 2015) that preliminary survey of the 'F' platform was jointly carried out by IAF, HAL and M/s 'V-1' based on the inputs on the 'F' aircraft provided by HAL and specifications given in aircraft manuals. Further, Field Evaluation Trial (FET) was carried out on the assumption that OEM *i.e.* M/s 'V-1' who had participated in the aircraft survey prior to submission of their techno-commercial proposal had confirmed that their system could be installed on the aircraft. Air HQ also stated that IAF's findings relating to the performance of the aircraft (July 2007) were based on actual performance of the aircraft which were found significantly reduced from the specifications given in the aircraft manuals and information provided by HAL. Accepting the audit observation regarding unsatisfactory performance of 'JJ' system installed on 'G' aircraft, Air HQ stated (May 2015) that the situation had improved during the last six months and faults of Time Serve Units (TSUs) imposed only temporary limitation as new TSUs had been supplied by M/s 'V-1' which were also being tested.

Ministry reiterated (September 2015) the Air HQ reply and further stated that an interim solution has been provided by M/s 'V-1' and TSU has been bypassed. It also stated that testing of new version TSU was incomplete and it would take approximately three months to provide a viable solution. Ministry

also stated that the case for Annual Maintenance Contract (AMC) was at final stage of contract signing and specialists from M/s 'V-1' were available even after the expiry of warranty which had ensured that system was in fully operational status.

Ministry's reply was in nature of providing a temporary solution to the problem. The fact remains that Air HQ acceptance of field evaluation (September 2005) of the 'JJ' system on a different aircraft platform (*i.e.* 'H' aircraft) and post contract assessment (July 2007) of actual performance of the identified 'F' aircraft, necessitated contract amendment (February 2009) and caused a delay of two to three years in installation of state-of-the-art intelligence system on the changed aircraft platform ('G' aircraft). Moreover, Ministry's reply (September 2015) that 'JJ' system has been facing frequent software and hardware faults since installation raises question mark on the envisaged utilization of the system procured at an expenditure of ₹88.70 crore.

2.8 Arbitrary planning in the resurfacing of extended portion of runways

Resurfacing of newly extended portion of runways within three years of previous resurfacing without identifying any defect /deterioration was arbitrary which indicated lack of due diligence in taking up the work and therefore resulted in injudicious expenditure of ₹1.48 crore. It was also done without getting the approval from Competent Financial Authority *i.e.* MoD.

Air Force Station (AFS), Bidar has two Runways¹¹⁶ numbered 02/20 and 08/26¹¹⁷ constructed in 1942. As per layout the two runways cross each other. Both the runways are used throughout the year due to the peculiar wind pattern of Bidar airfield. To cater to the needs of Advanced Jet Trainer (AJT) during induction (November 2007), both these runways were extended¹¹⁸ in November 2007 and March 2008 respectively at a cost of ₹32.10 crore.

¹¹⁶ Runways are numbered between 01 and 36. The number indicates the runway's heading. Since runways are normally used into two directions, it will have a second number.

¹¹⁷ 08/26 is main runway and 2/20 is second runway.

¹¹⁸ 02/20 by 2687.90 m and 08/26 by 663.24 m

Audit noticed (July 2014) that the last resurfacing of runways 02/20 and 08/26 was done in 1999-2000 and 2010-11 respectively. Further, based on the report (July 2007) of Soil Engineering and Material Testing and recommendations of a Board of Officers (BOO) (August 2008), Ministry of Defence (MoD) had sanctioned (June 2010) resurfacing of runway 02/20 at an estimated cost of ₹41.68 crore with Probable Date of Completion (PDC) of 104 weeks (June 2012). However, scope of work did not include resurfacing of the extended portion of any of the runways. Tender for the work was accepted (September 2011) and Chief Engineer (AF) Bengaluru concluded (September 2011) a contract agreement (CA) for a sum of ₹35.75 crore. As per CA, the work was required to be commenced in November 2011 and to be completed by December 2013.

Audit also noticed (July 2014) that after commencement (November 2011) of the runway 02/20 resurfacing work, AFS, 'S-25' proposed (January 2012) to resurface the extended portions of both runways 08/26 and 02/20 at cost of ₹1.55 crore as a deviation¹¹⁹ to the contract by justifying that the extended portions of the runways, if left unattended now, had to be resurfaced at a different point of time which would involve relocation of aircraft thereby affecting the flying operation and causing infructuous expenditure. Chief Engineer accorded (March 2012) in principle approval for the deviation work. The resurfacing of the extended portion of both the runways was completed (April 2012) by Military Engineer Service (MES) by incurring expenditure of ₹1.48 crore against the estimated cost of ₹1.55 crore.

Audit observed (July 2014) that resurfacing of the extended portion of the runways was inappropriate in view of the following:

- (a) Requirement of additional scope of work for the extended portion of both runways was neither deliberated by the Board of Officers¹²⁰ (August 2008) convened for assessing the work of resurfacing Runway 02/20 at the time of recommendation (March 2009), nor approved (June 2010) by the CFA

¹¹⁹ During the performance of works under a contract, deviations may be taken for material improvement as per Para 435 of RMES.

¹²⁰ Constituting of representatives from MES and Air Force.

i.e. MoD while sanctioning the resurfacing work of runway 2/20. Thus, the initial planning for resurfacing of the runway 2/20 was made on ad hoc basis and not comprehensive.

- (b) Resurfacing of the extended portion of the other runway *i.e.* 08/26 was also justified by AFS, Bidar and approved even though the runway of 8/26 had not been taken up for resurfacing.
- (c) As per Air Field Pavement Management System (AFPMS) issued by E-in-Cs Branch, Army HQ, the existing design analysis caters for a structural pavement life of 20 years. Both the runways had been extended during 2007-08 and runway 08/26 was resurfaced in 2010-11; and no defects/deterioration was noticed in the extended portions of runway till January 2012¹²¹ when the proposal was made for their resurfacing.
- (d) No opinion of Soil Engineering and Material Testing Wing (SEMT) on performance & soundness of the extended portion was obtained before executing the work as required under Annexure 'C' to para 20 Chapter V of IAP – 2501.
- (e) While forwarding (February 2012) the proposal to CWE & CE, Garrison Engineer (GE) indicated that his office was going ahead with the work assuming the AIP (Acceptance in Principle) for the additional work would be granted by the Competent Engineer Authority. MES proceeded (January 2012) with resurfacing of the extended portion of runways (addition to the sanctioned work) without even preparing supplementary estimates and obtaining approval from Competent Financial Authority (CFA) as required under Para 140 of MES Regulations which stipulates that if changes or additions become necessary through revision of scales or establishments or for other administrative reasons, a supplementary estimate will be prepared and administrative approval to the entire work (including both original and supplementary estimates) will be accorded by the CFA. While according administrative approval in such cases, the CFA

¹²¹ AFS, Bidar proposed resurfacing of the extended portions of runway in January 2012.

will certify that the supplementary estimate has been necessitated by purely administrative reasons.

In response to audit observation (July 2014), Assistant Garrison Engineer (AF), Bidar had, while confirming (August 2014) that no defects had been noticed on the extended portion of runways at the time of proposal (January 2012), clarified that opinion of SEMT was not found necessary as work of the same specifications had earlier been done at the main stretch of runway. It was further stated that the resurfacing of the extended portion of the runways was due to operational requirement of IAF as proposed (January 2012) by Air Force authorities to HQTC/MES and the work, being a deviation, was approved (March 2012) by the Chief Engineer, Air Force (CE, AF) Bengaluru. With regard to resurfacing of the extended portions of runways within three years, Headquarters Training Command, IAF, stated (February 2015) that deviation in the scope of work had been necessitated so that the flying operations might not be affected for prolonged duration at a later stage and also due to high intensity flying operations and functional distress. The Command further stated that prior sanction of CFA would require in the event of quantity being exceeded by 25 *per cent* in single item and overall amount by 10 *per cent*. As such prior sanction of CFA in the present case was not required.

The reply is not tenable in view of the following:

- (i) The justification by the Air Force regarding simultaneous resurfacing of the extended portions of runways 08/26 and 02/20 is fallacious since both the runways cross each other as they are in 'X' formation. Therefore resurfacing of second runway, whenever it takes place would impact operations of first runway also. In such a situation proposal to resurface extension of second runway much ahead of schedule on the logic of it impacting operations subsequently is not logical and this indicates the planning was ad hoc.
- (ii) The resurfacing of newly extended portion of runways within three years of its completion in 2010-11 without any defect/deterioration being noticed was improper and also against the structural pavement life of twenty years.

- (iii) Para 435 of Regulations for the Military Engineer Service (RMES) clearly defines 'deviations' and states that material improvement is authorised only for 'works under a contract'. As CE AF, Bengaluru concluded the contract (September 2011) for 'resurfacing of the runway 02/20,' taking up 'resurfacing of the extended portions of runways 08/26 (a different runway) and 02/20' under the scope of present work of the contract was not a deviation but execution of additional / new work without approval of the original sanctioning authority *i.e.* MoD as required under Para 140 of MES Regulations (Referred at sub-para (e) above).

Thus, resurfacing of newly extended portion of runways within three years of previous resurfacing without noticing any defect / deterioration was arbitrary which indicated lack of due diligence in taking up the work and therefore resulted in injudicious expenditure of ₹1.48 crore. It was also done without getting the approval from Competent Financial Authority *i.e.* MoD.

2.9 Incorrect procurement of compressor working fluid

Failure on the part of Air HQ in not ordering staggered supply of compressor working fluid worth ₹2.52 crore led to expiry of its shelf life.

Indian Air Force Manual of Provisioning stipulates that in the case of items of perishable nature and those having limited shelf-life, deliveries indicated on indents should be so staggered as to ensure that the quantities supplied are likely to be utilised before the expiry of their life and usefulness.

The Compressor Working Fluid (CWF) is used in the booster compressor of Russian make ground based oxygen vehicles, which is mostly used by Russian origin fighter/transport aircraft.

Directorate of Stores, Air Headquarter (Air HQ) placed an indent in July 2008 for procurement of 390 liters (equivalent to 720 Kg.) of fluid for meeting the requirement of 57 months in respect of ground based oxygen vehicles used for 'C' aircraft. Based on the indent, Directorate of Procurement (Foreign Procurement Wing) Air HQ issued tenders (August 2008) to three foreign

firms¹²² of which M/s 'V-4', Russia quoted (October 2008) USD 577029 (₹2.52 crore¹²³) and was found to be the lowest (L1). At the time of submitting quote, the firm mentioned that guaranteed storage life of the fluid was one year from the date of manufacture.

Air HQ concluded a contract (April 2009) with the firm for supply of 390 liters fluid at a cost of USD 577029 (₹2.52 crore). Despite knowing the fact that shelf life of the fluid was only one year from the date of manufacture, Air HQ overlooked the stipulated provisions and did not impose the condition in the contract to supply the fluid in a staggered manner as per IAF requirements. The entire quantity of fluid (390 liters) supplied by the firm in November 2009, was reported to be manufactured during July 2009. Thus the supplied fluid had remaining shelf life of only eight months (up to July 2010).

The samples of CWF was sent (April 2010) to a laboratory M/s AVI OIL India, Faridabad for testing and subsequently (March 2011) to another laboratory namely Controllerate of Quality Assurance (Petroleum Products), Kanpur by 'Y' Equipment Depot (ED) AF which is their stockholding depot, for determination of shelf life. As both these laboratories did not have testing facilities to carryout full specification tests, their test results (received in February 2011 and May 2011 respectively) remained inconclusive.

In reply to draft para issued (June 2013) to the Ministry, Air HQ stated (September 2013) that 379 liters fluid lying in stock as Category 'C'¹²⁴ had been upgraded (July 2013) to Category 'B' and issued (July 2013) to units to sustain existing oxygen generating vehicles procured from Russia.

It was also seen (September 2013) from the reply of Air HQ that the sample of CWF was again tested (June 2013) by M/s Avi Oil India (P) Ltd. Though the firm confirmed the product specification standard to the Unit ('Y' Equipment Depot¹²⁵, AF) but the test report of the firm did not indicate revised storage life of the CWF. However, Air HQ granted (July 2013) provisional life of 12 months (*i.e.*, up to July 2014). Audit further enquired (November 2014) as to how IAF entrusted the task of testing CWF to M/s Avi Oil India (P) in absence

¹²² M/s 'V-4', Russia, M/s 'V-8', UK and M/s 'V-9', Russia

¹²³ 1USD = ₹43.75

¹²⁴ The condition of fuel is categorised as 'Category 'A' New and unused, Category 'B' Usable for immediate re-issue, and Category 'C' Usable subject to functional test.

¹²⁵ 'Y' Equipment Depot is Stock Holding Depot for Fuel, Oil and Lubricant items of Indian Air Force.

of full test facility at their laboratory. In response to the audit query, Air HQ stated (January 2015) that M/s Avi Oil, though not the supplier of the CWF, tested the sample on personal liaison basis and the product was cleared for usage with a provisional life of one year based on verdict rendered by the firm.

Audit approached (March 2015) the DGAQA¹²⁶ to ascertain the competency of the M/s Avi Oil India (P) Ltd in extending the life of CWF. In reply, DGAQA stated (April 2015) that M/s Avi Oil (P) Ltd is not authorized to extend the shelf life of imported CWF or any other store meant for military application. It was also stated that the mandate for defining the shelf life of CWF and its life extension rests with OEM only. DGAQA further stated that extension of shelf life can be done from the date of expiry of defined shelf life and not from the date of retest.

Out of 390 liters, only 11 liters of CWF could be utilized till July 2013, *i.e.* within four years of its manufacture and 379 liters (equivalent to 700 Kg) fluid valuing ₹2.45 crore was lying in stock.

Audit also analysed the consumption pattern from Integrated Material Management Online System (IMMOLS) and observed (May 2015) that after the audit observations IAF had over utilised the CWF in 2014 as given in the Table below:

Table 2.11 : Year-wise consumption of CWF

Sl. No.	Year	Total CWF consumed (in liters)
1.	2009	Nil
2.	2010	19*
3.	2011	14*
4.	2012	Nil
5.	2013	34*
6.	2014	291

*Possibility of consumption from earlier stock

Audit examined (June 2015) records / documents to ascertain the actual utilization of CWF at three Air Force Station (AFS) (out of eight AFS) to whom CWF was issued by Air HQ and results are as under:

¹²⁶ Directorate General of Aeronautical Quality Assurance

1. 'W-15' Wing, AF: - Total quantity of 109.105 liters (30 liters in April 2013 and 79.105 liters in July 2013) of CWF was received from 'Y' ED, AF. The entire quantity of 109.105 liters was used (June 2014 to February 2015) by AFS on indigenized Air Compressor Trolley (ACT) in lieu of 'Compressor Oil Servo 68'.

Audit observed that entire quantity of 109.105 liters was utilized by AFS after a lapse of one year of its receipt which indicates that CWF was not urgently required by the unit and its consumption was made after audit observations. Further 'Compressor Oil Servo 68' in lieu of which CWF was being used was available indigenously at far cheaper price (₹152.46 per liter as against ₹64,615 per liter for CWF).

2. 'W-16' Wing, AF: - The entire quantity of 190 liters of CWF had been issued during the period November 2009 to June 2015 by 'Y' ED AF to 'W-16' Wing AFS.

Audit however noticed (June 2015) that 52 out of 190 liters of CWF was issued¹²⁷ by 'W-16' Wing to its lodger units¹²⁸ which did not have the Russian make ASVs.

3. 'W-17' Wing AF: - AFS informed (June 2015) that even though no demand for CWF was placed by them, 25 liters of CWF was issued (July 2013) by 'Y' ED AF. Out of which 2.5 liters dispatched (April 2015) to M/s AVI Oil Faridabad for sample test and remaining 22.5 liters issued (June 2015) to TACDE¹²⁹, AF. AFS further stated (June 2015) that unit was exploring the possibility to utilize CWF as no vehicle held at their end on which CWF could be utilized.

Thus, IAF failed to exercise due diligence in working out the staggered requirement of 390 liters of CWF, with shelf life of one year. Consequently, only 11 liters was used by July 2013, *i.e.* four years of manufacture. The balance 379 liters of CWF valuing ₹2.45 crore remained in stock since November 2009 and its issue/overutilization to the extent of 291 liters (*i.e.* 76.78 per cent) in year 2014 were afterthought and for purposes other than that for which it was imported.

¹²⁷ 'W' Transportable Radar Unit, Power Plant, flight Store, 7 Tactics and Air Combat Development Establishment (7 Tetra RSBN), 24025 /Akash/Missile Squadrons *etc.*

¹²⁸ Lodger Units are independent units for operational task, however these lodger units depend on respective Wings for Administrative support.

¹²⁹ Tactics and Air Combat Development Establishment.

2.10 Inordinate delay in commissioning of Low Level Transportable Radar

The critical requirement of Air Defence Surveillance envisaged (1998) to be met by IAF through 37 Low Level Transportable Radars (LLTR) remains unmet for past 17 years due to inordinate delay in supply of 19 LLTRs despite incurring expenditure of ₹454.48 crore. None of the first LLTR has been commissioned so far (June 2015), thereby compromising the Air Defence surveillance capability to detect hostile low level ingress.

While reviewing requirement of surveillance radars in 1982, it was assessed by IAF that majority of future air strikes will be at low level to retain an element of surprise. Low Level Transportable Radars (LLTR) provides cover against aerial threats operating at low levels and also provide 'early warning' to controlling Air Defence Detection Centre (ADDC).

Raksha Mantri had accorded 'in principle' approval in January 1998 for procurement of 37 LLTRs in two phases *i.e.* 19 LLTR to be procured in 9th Plan (1997-2002) and the remaining 18 LLTRs in 10th Plan (2002-2007). The Defence Acquisition Council (DAC) in October 2005 accorded Acceptance of Necessity (AON) for procurement of 37 LLTRs with 19 under 'Buy and Make'¹³⁰ category with Transfer of Technology (ToT) and another 18 under 'Make' category. The Department of Defence Production (DDP) nominated M/s Bharat Electronics Limited, (M/s BEL) as the Production Agency to absorb the ToT.

Ministry of Defence (Ministry) concluded two contracts in July 2009 for procurement of 19 LLTRs at a total cost of ₹1272 crore. The 'Buy' part of 'Buy and Make' contract was concluded with M/s Thales, France (Original Equipment Manufacturer, (OEM)) for procurement of six Fully Furnished (FF) LLTRs along with communication and associated equipment; and breakdown kits¹³¹ for 13 radars along with Transfer of Technology (ToT) at a

¹³⁰ Purchase from a foreign vendor followed by licensed production/indigenous manufacture in India.

¹³¹ 2 SKD (Semi Knocked Down), 2 CKD (Completely Knocked Down) and 9 IM (Indigenous Manufacture)

total cost of ₹572.20 crore with delivery schedule of February 2012 to March 2013. Advance payment of ₹85.82 crore was also released to OEM in November 2009.

The 'Make' part of 'Buy and Make' contract was concluded with M/s Bharat Electronics Limited, Ghaziabad (M/s BEL) at a total cost of ₹699.54 crore for manufacture and supply of the 13 LLTRs from breakdown kits supplied by the OEM with delivery schedule between March 2013 and March 2015. An advance of ₹160.97 crore was also paid to M/s BEL in November 2009.

Paragraph No. 2.2 of the C&AG's Audit Report No. 20 of 2011-12 (Air Force and Navy), mentioned about inordinate delay in procurement of 19 LLTRs. In their Action Taken Note (ATN), the Ministry had stated (January 2012) that the contract concluded with M/s Thales was progressing on schedule and the Site Acceptance Test (SAT)¹³² of the first LLTR was to be conducted in May 2012 and the last of total 19 LLTR, was expected to be received by March 2015.

Scrutiny of records relating to post contract management of LLTR, as a follow up audit exercise of the issue, revealed the following:

1. Delay in supply of fully furnished radar

As per Article 14 of the 'Buy' contract (July 2009) with OEM, though SAT was to be conducted in India in May 2012, the same had not been carried out till April 2015 due to the following reasons as seen in audit:

- (i) As per Article 8 of the 'Buy' contract (July 2009) with OEM, the Factory Acceptance Test (FAT)¹³³ of first Fully Furnished LLTR, which was scheduled to be conducted in December 2011, was conducted from 24 June 2013 to 19 July 2013.

¹³² Performance test conducted at buyer's site to verify that the system installed on a site meets the performance specifications.

¹³³ Performance test conducted at seller's site to verify compliance of equipment subassemblies in accordance with the specifications.

- (ii) Due to failure in the antenna drive system¹³⁴ and non-compliance of contractual and critical operational observations, the FAT was finally cleared in May 2014 by IAF with nine critical operational observations¹³⁵ affecting detection and tracking capability of the radar which were to be complied by M/s 'V-3' during SAT of first LLTR.
- (iii) ₹293.51 crore had been released to OEM till December 2014.

The Ministry accepted the delay pointed out in audit and stated (April 2015) that the revised delivery schedule (February 2016) and extension of the validity of Letter of Credit up to January 2017 had been approved with imposition of Liquidated Damages (as per Article 13) for the delayed delivery and the inked signed copy of amended contract was awaited from M/s V-3.

In reply to audit queries (May/June 2015) Air HQ stated (June 2015) that SAT was completed in June 2015 and eight out of nine critical observations linked with SAT had been resolved.

The fact remains that due to delay in completion of FAT, the SAT could actually be completed in June 2015 as against contracted schedule of May 2012. The delay in turn resulted in non-commissioning of first LLTR even after a delay of over 37 months (May 2012 to June 2015).

2. Delay in manufacture of 13 radars by M/s BEL from breakdown kits

As stated earlier, M/s BEL was given the contract (July 2009) as per Defence Procurement Procedure (DPP-2006) for 'Make' part of 'Buy and Make' category for manufacture and supply of 13 LLTR from breakdown kits received from M/s V-3. An advance of ₹160.97 crore was released (November 2009) to M/s BEL as per contract.

¹³⁴ The antenna drive system was a critical sub system of the LLTR and its failure would have bearing on the reliability and operational capability of LLTR.

¹³⁵ Observations relating to radar performance *w.r.t.* graceful degradation, Identification Friend or Foe (IFF), detection capability, resolution and accuracy, tracking capability, analysis document for environmental test, *etc.*

M/s V-3. could not deliver breakdown kits consisting of Technical Data Package (TDP), Semi Knocked Down (SKD), Completely Knocked Down (CKD) and Indigenous Manufacture (IM) kits as per contracted delivery schedule (April 2012 to November 2012) so far (April 2015) on account of delay in FAT for first fully furnished LLTR. This consequently delayed the production programme of M/s BEL which was scheduled to commence from July 2013.

While accepting the delay in production by M/s BEL, the Ministry stated (April 2015) that as per the contract, IAF was to provide these breakdown kits after receipt from M/s V-3 to M/s BEL along with the Technical Data Package; but the same had been delayed by more than two years due to delay in completion of FAT of first LLTR. Ministry added (April 2015) that the CKD and SKD kits could not be delivered by M/s V-3 to IAF so far due to expiry of Letter of Credit (LC) on 15 December 2014 and the contract amendment for extension in the validity of LC till 15 January 2017 had been approved by the Competent Financial Authority (CFA). Ministry also stated that the CKD/SKD were now scheduled to be delivered by M/s Thales by April 2015 and August 2015 respectively as per the revised delivery schedule and the delivery of radars manufactured under 'Make' category by M/s BEL from these kits was expected to commence from March 2016.

Regarding delay in induction of LLTRs impacting Air Defence capabilities of IAF, Ministry stated (April 2015) that considering the large volume of Indian airspace, complete low level coverage would require radars in large numbers. In view of this, 34 Rohini radars¹³⁶ which perform role of LLTR, were being deployed and the legacy¹³⁷ LLTRs were being maintained and sustained for low level coverage. The down gradation¹³⁸ of the legacy LLTRs were being done in phased manner to meet the air coverage requirement.

The Ministry's reply regarding legacy LLTRs is not justified as these were either obsolete or had very low detection range.

¹³⁶ It is a Low Level Radar developed by DARE, Bengaluru and produced by M/s BEL for using the LLTR role to detect low level aerial threats.

¹³⁷ The term has been used by the Ministry for old radars *i.e.* ST-68, Indira-I and Indra-II radars.

¹³⁸ The term has been used by the Ministry for Phasing out.

Thus, the critical requirement of Air Defence Surveillance envisaged (1998) to be met by IAF through 37 LLTRs, of which 19 LLTRs were to be inducted during 9th plan (1997-2002) and remaining 18 LLTRs were to be inducted during 10th plan (2002-2007), remains unfruitful for the past 17 years. This is due to inordinate delay in supply of 19 LLTRs despite incurring an expenditure of ₹454.48 crore. Even the first LLTR has not been commissioned so far (June 2015) and manufacturing by BEL had not commenced. Further, the contract for remaining 18 LLTRs, which were planned to be inducted during 2002-2007, was yet to be concluded even though the 'in principle' approval was obtained in January 1998. Thus, the Air Defence surveillance capability to detect hostile low level ingress remains compromised.

2.11 Savings at the instance of Audit

Air HQ/ Ministry reduced the requirements at the instance of Audit which resulted in corresponding reduction of one set of ordered equipment/spares for the crashed 'E' aircraft leading to savings of ₹11.45 crore.

The Ministry of Defence (Ministry) concluded (June 2009) a contract with M/s 'V-6'(OEM)¹³⁹ for extension of life of the entire fleet of 105 'E' transport aircraft of Indian Air Force (IAF) at a cost of 397.70 MUSD (₹1964.64 crore). Under the contract, TTLE¹⁴⁰, re-equipment and overhauling of 40 aircraft was to be carried out in Ukraine and similar process for balance 65 aircraft in India for which the contract included procurement of 65 sets of equipment/ spares at a cost of ₹11.45 crore per set.

We observed (August 2012) that out of 65 aircraft, which were to undergo overhaul and re-equipment in India, one aircraft had crashed on 9 June 2009 at Machuka, Arunachal Pradesh before the contract was concluded. However the number of aircraft to be overhauled / re-equipped in India for which equipment / spares were to be procured was not reduced to 64 at the time of conclusion (15 June 2009) of the contract by the Ministry.

¹³⁹ Original Equipment Manufacturer

¹⁴⁰ Total technical life extension

On the matter being pointed out in audit Air HQ agreed (November 2012) for cancellation of order for one set of TTLE spares. In April 2014, Air HQ informed that 'In Principle Approval' for cancellation of one set of TTLE spares had been obtained (March 2014) and the matter was being taken up further with the Ministry for cancellation of one set of equipment/ spares, costing ₹11.45 crore.

Ministry stated (April 2015) in response to the draft paragraph issued in February 2015, that the firm had confirmed (March 2015) that the spares for the 65th aircraft would not be supplied and the corresponding amount would not be claimed. Ministry also intimated (April 2015) that the firm was being approached to forward the draft Supplementary Agreement at the earliest.

Thus, Air HQ/ Ministry reduced the requirements at the instance of Audit which resulted in corresponding reduction of one set of ordered equipment / spares for the crashed 'E' aircraft leading to savings of ₹11.45 crore.