

## Audit Findings

### 2.1 Induction of Strategic Missile System in 'S' Sector

**In view of the threat perception, Government of India approved the induction of Strategic missile in the 'S' sector to provide the necessary deterrence. The missile systems were to be installed at the six designated sites, between 2013 and 2015. But till date none of the missile systems has been installed. The main reason for the delay in installation of the missile systems procured at ₹3,619.25 crore from M/s Bharat Electronics Limited (BEL) was, delay in execution of civil works at the sites.**

Strategic missile system is a medium range, supersonic, surface to air missile system with capability to engage a wide variety of aerial threats within a range of 'X' km. It is therefore vital for the country's air defence and deterrence capability. Strategic missile system developed by DRDO<sup>1</sup> for the Indian Air force (IAF) was therefore planned to be inducted from 1994 to replace the vintage 'NN' missile system which was procured during 1974-90.

Initially, Cabinet Committee on Security (CCS), in December 2008, approved induction of two squadrons of Strategic missile system, one each at 'A' Command and 'B' Command to cover areas in 'T' and 'U' sectors. These were commissioned in October 2014 ('A' Command) and March 2015 ('B' Command) respectively.

Indian posture in 'S' sector was changed (2009) from 'Dissuasive' to 'Deterrence', due to build up of large scale military infrastructure by the adversary. Therefore, CCS approved (November 2010) the procurement and induction of six squadrons of Strategic missile system<sup>2</sup> from BEL to be located at six IAF stations in the 'C' Command, at a total cost of ₹3,619.25 crore (excluding taxes). Approval was also granted for creation of necessary infrastructure, like missile preparation and storage facility, ramp structure and workshop

<sup>1</sup> Defence Research & Development Organisation

<sup>2</sup> Including missiles, maintenance spares and test equipment.

buildings at these six locations. These were to be constructed by BEL, on turnkey basis, at a cost of ₹99.84 crore.

Ministry of Defence (MoD) accordingly concluded (December 2010) the contract with BEL for delivery of six squadrons of Strategic missile system with 'Y' missiles. These were to be delivered between June 2013 and December 2015, at an interval of six months each. The whole induction process was to be monitored by Project Management Group (PMG) of IAF.

Considering the operational importance of the induction of Strategic missile system in the 'S' sector, audit was conducted to examine whether the required deterrence capability could be created within the stipulated time and approved cost.

## **Audit Findings**

### **2.1.1 Missiles delivered had quality problems**

As per the contract (December 2010), Strategic missile system was to be delivered progressively within 60 months (i.e. during June 2013 to December 2015). These were received at six AF stations between April 2014 and June 2016, after delay of 06 to 18 months from the scheduled date. Meanwhile, IAF released 95 *per cent* of the payment i.e. ₹3,809 crore (including taxes) by March 2016 based on Factory Acceptance Test (FAT)<sup>3</sup>.

Audit found that the Strategic missile system delivered by BEL were deficient in quality. Out of 80 missiles received up to November 2014, 20 missiles were test fired during April-November 2014. Six of these missiles i.e., 30 *per cent*, failed the test. Preliminary failure analysis report revealed that the missiles fell short of the target, had lower than the required velocity, and also there was malfunctioning of critical units like Servo Control Unit and Connector. Two missiles had failed to take off because the booster nozzle had failed. These deficiencies posed an operational risk during hostilities.

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<sup>3</sup> FAT was conducted by Missile System Quality Assurance Agency (MSQAA) under Department of Defence Production, MoD.

Failure analysis of the first three failed missiles was completed in August 2014 while that of another three missiles was completed in May 2016.

IAF replied (March 2017) that action for replacement of the failed missiles was being undertaken. IAF also stated that BEL had replaced the three failed missiles in January 2016 and the remaining three missiles were yet to be replaced.

Audit is of the view that it is not just a matter of replacing the missiles that failed in the test. As the failure rate of the sample tested was as high as 30 *per cent*, action needs to be taken to establish the reliability of the balance 'Z' missiles. The larger issue is that 30 *per cent* failure rate of the sample tested puts question mark on the reliability of FAT, based on which 95 *per cent* of the payment due (₹3,809 crore) was already paid to BEL.

### **2.1.2 Delay in induction of Strategic missile system**

Though the need for creating deterrence capability in the 'S' sector was recognised in 2009 and a contract for procurement of Strategic missile system was signed in December 2010, the Strategic missile system were not yet inducted at any of the six locations as of March 2017. The reasons for the delay are analysed below:

#### **(a) Delay in creation of infrastructure at the site**

Various infrastructure facilities were to be created by BEL at the site before the delivery of Strategic missile system. These included buildings for storage of missiles which required suitable temperature and humidity conditions, building for preparation and testing, workshops, building for maintenance of vehicles, ramp for deployment of radar and other related civil works. This infrastructure could not be completed till October 2016 at any of the sites. At two stations although 98 *per cent* and 80 *per cent* of the work had been completed as of October 2016, however IAF had not taken over these buildings because of defects in the construction, which rendered them unsuitable for Strategic missile system storage. In other stations the progress was below 45 *per cent* as of October 2016.

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One of the reasons for the above delay was found to be the delay in signing of the infrastructure contract between IAF and BEL. The contract was signed in November 2012, about two years after the CCS approval. The main reason for this delay was that the contract proposal forwarded (December 2010) by BEL to IAF for signing, was inconsistent with CCS approval. CCS had approved a cost of ₹99.84 crore for creation of infrastructure, but BEL had quoted ₹104.66 crore. It took 20 months for both the parties to resolve this difference of about ₹5 crore and BEL finally agreed to complete the work at the CCS approved cost of ₹99.84 crore.

On Audit enquiry, IAF replied (March 2017) that the delay in signing of infrastructure contract was because of various clarifications sought by MoD.

The reply is not convincing because out of the 20 months delay, nine months were taken by Directorate of Air Force Works to ascertain the reasonability of the cost of works submitted by BEL. It would be pertinent to mention that, in December 2008 when the contract for two squadrons was signed, the infrastructure contract was signed within 11 months, while for the induction of six squadrons under repeat contract it took 23 months for signing of the infrastructure contract.

Further, the work on infrastructure could start only after handing over of the site by IAF to BEL. As per the infrastructure contract (November 2012), the sites were to be handed over within six months (i.e. May 2013) of its signing. But till October 2016 complete site was handed over only at four stations that too after a delay of two years or more (i.e. May 2015 to February 2016).

Project Management Group of IAF attributed (November 2016) the delay in handing over of the site to delay in granting of fire, environmental and explosive clearances by Centre for Fire, Explosive and Environment Safety (CFEES)<sup>4</sup> at five stations and non-cutting of tree at one station. Audit found this only partially true. The delay at one of the stations was largely due to IAF's failure in getting the identified land from Airports Authority of India (AAI). The alternate site which was allotted was submerged in water. At two stations there was delay in cutting of trees for more than three years. In one case audit found that the trees could not be auctioned at the reserve price even after four re-auctions.

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<sup>4</sup> CFEES is a DRDO agency

At five stations the delay could not be fully attributed to delay in CFEES clearance as the delay on account of this was only about one year as against the total delay of 24 to 32 months. Moreover, CFEES is a part of DRDO, which comes under MoD and therefore the process of clearance could have been expedited through better co-ordination.

IAF stated (March 2017) that the delay in commissioning of Strategic missile system was not attributable to non-availability of infrastructure, but the delay by BEL in supply of maintenance spares, completion of acceptance checks of missiles and clearance of Site Acceptance Test (SAT).

Reply is not convincing because the acceptance tests of missiles could not have been undertaken without the infrastructure in place i.e. missile preparation, testing and maintenance facility. Infrastructure was in turn delayed because of delay in signing of contract. Identification of site commenced only after signing of the infrastructure contract. Further, the delay in supply of maintenance spares and Site Acceptance Test activity could have been avoided with effective co-ordination between IAF and BEL, both being under MoD.

**(b) Delay in Site Acceptance Test**

Strategic missile system was to be commissioned only after successful completion of Site Acceptance Test (SAT)<sup>5</sup>. The SAT was to commence within 30 days after receipt of Strategic missile system at the site and completed within 60 days. SAT has not been completed at any of the six sites where Strategic missile system was to be commissioned. SAT was taken up at three sites with delay ranging from seven months to one year. SAT at the remaining three sites is yet to commence. Hence, performance of Strategic missile system supplied was yet to be fully tested and accepted for use.

IAF stated (March 2017) that the delay in commencement of SAT was due to delay in receipt of schedule for SAT activity from BEL.

The reply shows failure of BEL in complying with the contractual timelines.

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<sup>5</sup> During SAT, performance of individual equipment is tested with reference to desired performance levels. It does not include test firing of missiles which was already conducted.

### **2.1.3 Deterioration of missiles due to delay in creation of storage facilities**

Total service life (Life span) of missiles is 10 years from the manufacturing date, under recommended storage conditions (in AC environment  $23\pm 2^{\circ}\text{C}$  and Relative Humidity  $55\pm 5\%$ ). Due to delay in creation of prescribed storage rooms, all the 'Y' missiles received during April 2014 to May 2016 were kept at alternate facilities which lacked the required storage conditions. During periodical check of missiles, it was found that there was moisture ingress in 71 missiles.

IAF stated (March 2017) that wherever occurrence of high humidity was noticed, remedial actions were initiated for maintenance of specified storage conditions.

Audit is of the view that such conditions like moisture ingress should not have been allowed to occur in the first place.

### **2.1.4 Reduced life span of missiles and reduced warranty periods**

As pointed out in para 2.1.3, life span of the missiles is 10 years. Audit found that, out of 'Z' missiles held by IAF, more than three years life of 70 missiles, between two to three years of 150 missiles and one to two years life of 48 missiles, had already expired by March 2017. These assets acquired at a high cost would remain usable for significantly less period than their stipulated life.

IAF replied (March 2017) that the life of Strategic missile system is extendable by another five years. Audit is of the view that until the Strategic missile system are commissioned, a significant part of their serviceable life would have been over without contributing to operational readiness and its strategic purpose. Further, with the five years extension to the life of Strategic missile system the maximum serviceable life is 15 years out of which many years have already been lost for many missiles.

Further, as per the contract of December 2010, warranty period for Strategic missile system was 24 months from the date of successful commissioning whereas in respect of maintenance spares and test equipment (contract cost: ₹316 crore) it started from the date of their receipt. The requirement of spares during warranty period was to be provided by the vendor.

Warranty of Strategic missile system did not start at any of the station as they were yet to be commissioned. But warranty period of the maintenance spares and test equipment had already commenced and expired in respect of one station in December 2016. By the time the Strategic missile system would be commissioned, warranty of the maintenance spares and test equipment would expire in respect of other stations also.

### **2.1.5 Delay in external work services**

The provision of external services like approach roads for maneuvering specialist vehicles, drainage system, power supply and water supply were to be executed before induction of Strategic missile system.

Sixteen works at a cost of ₹297.43 crore for external services at six stations were sanctioned between March 2014 and March 2016. Probable date of completion of the sanctioned works is between two to four years. Of this, contract for only one work was concluded. The delay in conclusion of works contract would therefore affect timely induction and smooth operations of Strategic missile system.

### **2.1.6 Conclusion**

Based on the threat perception, Government of India in 2010 had envisaged induction of Strategic missile system for the IAF, in the 'S' sector to create deterrence. This deterrence capability was planned to be put in place between June 2013 and December 2015 in a phased manner. But till date, even after four years this urgently needed capability has not been created and the strategic objective remains unachieved. This was primarily due to the abnormal delay in creation of the infrastructure required for installation of the missile systems. About ₹4,000 crore has already been spent for the purpose.

### **2.1.7 Recommendations**

- MoD may review the quality of the Factory Acceptance Test of Strategic Missiles so as to enhance reliability of FAT. The quality of Strategic Missiles also needs improvement so as to bring down failure rate.
- MoD needs to ensure better synchronisation of the various activities and agencies involved in such strategically important projects to ensure their timely completion.

The matter was referred to the Ministry (March 2017); their reply was awaited (June 2017).

## **2.2 Installation of autopilots on Jaguar Aircraft**

**Against requirement of 108 autopilots projected by Indian Air Force (IAF) in 1997 for 108 Jaguar aircraft only 35 autopilots were procured between 2006 and 2008 through contract concluded in August 1999. Repeat contract for 95 autopilots could be concluded only by March 2014. Out of 35 autopilots procured earlier, only 18 autopilots could be integrated on the Jaguar aircraft as of March 2017. The integrated autopilots were also functioning sub optimally due to malfunctioning of their vital component i.e. Auto Pilot Electronic Unit (APEU). 30 autopilots received through the repeat contract are yet to be integrated. Thus, the flying aid capability envisaged by IAF for the Jaguar aircraft in 1997 remains largely unrealised even after 20 years.**

An autopilot is a flying aid which reduces pilot's workload, enhances safety of aircraft and reduces aircraft accidents. All modern fighter aircraft come equipped with autopilots but for aircraft of earlier vintage, autopilots are bought separately and integrated with these aircraft. The useful life of Jaguar autopilot should not be less than 25 years with mean time between failure (MTBF) of 5000 hours.

Statement of Case for procurement of 108 autopilots *vis-à-vis* 108<sup>6</sup> aircraft was placed before MoD in 1997. Due to resource crunch, 35 autopilots were contracted (August 1999) by the Ministry with M/s Thales, France at a cost of Euro 7.952 million (₹37.42 crore), to be fitted by M/s Hindustan Aeronautics Limited (HAL) on Jaguar aircraft. These autopilots were received between December 2006 and January 2008.

Mention was made in Para 3.1 of C&AG's Audit Report No. CA 18 of 2008-09 about non-installation of the autopilots on Jaguar aircraft of earlier vintage, failure to avail transfer of technology and continued dependence on the Original Equipment Manufacturer (OEM) i.e. M/s Thales for these autopilots. It was also reported in audit that during January 2000 to March 2008 four pilots and three Jaguar aircraft were lost due to pilot disorientation. In their Action Taken Note (ATN), the Ministry had stated (August 2010) that Repair

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<sup>6</sup> In 1997-98, IAF had 93 jaguar aircraft and 15 aircraft were under manufacture at HAL



Maintenance Supply Order (RMSO) for integration of autopilots under upgrade programme with M/s HAL was under process.

Further audit examination (September 2016) revealed that RMSO for integration of autopilots was placed (December 2009) on HAL, who could complete integration of only 18 out of 35 autopilots till March 2017. Even these autopilots installed on the aircraft were functioning sub-optimally as its vital component i.e. Auto Pilot Electronic Unit (APEU), which maintains the flight path of the aircraft required repairs at OEM's premises with turnaround time of 07 to 26 months. For these 18 autopilots, IAF had got 17 APEUs repaired through OEM between June 2010 and November 2016. Out of these 17 APEUs, 11 were repaired at an expenditure of ₹1.94 crore. Position in respect of remaining 6 APEUs could not be ascertained from records.

Further examination of the case by Audit revealed the following:

Indian Air Force (IAF) was holding (June 2012) 125 Jaguar aircraft including 20 Jaguar aircraft received (through contract concluded in 2006) from HAL with autopilots integrated on these aircraft. For 35 Jaguar aircraft, autopilots were procured through 1999 contract. Thus there was requirement of autopilots for remaining 70 aircraft. As on October 2016, IAF had a holding of 117<sup>7</sup> Jaguar aircraft.

To meet this requirement, a contract under repeat order clause to the earlier contract (August 1999) for procurement of 95 autopilots (for 70 aircraft and 25 reserves) for Jaguar aircraft was concluded with M/s Thales on 31 March 2014<sup>8</sup> at a total cost of 23.33 million Euros (₹163 crore) with deliveries scheduled during September 2015 to March 2020. Against this order, IAF received 30 autopilots (till November 2016<sup>9</sup>). These autopilots were to be integrated along with other components during upgradation of Jaguar aircraft of earlier vintage through contract concluded by MoD with M/s HAL on 21<sup>st</sup> December 2009. Audit noticed that these 30 autopilots were still to be integrated (November 2016). The performance of these autopilots remained non-verifiable in view of non-integration.

The Ministry stated (March 2017) that IAF had initiated the case in August 2007 for procurement of 96<sup>10</sup> autopilots under revenue route, however, the Ministry decided in

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<sup>7</sup> 11 aircraft met with accident during 1999-2016. (prior to 2008- 3 aircraft, after 2008- 8 aircraft)

<sup>8</sup> Defence Acquisition Council (DAC) accorded approval for this procurement in August 2010.

<sup>9</sup> Air HQ/S96081/2/25/Proj/Jag dated 21-11-2016.

<sup>10</sup> One aircraft crashed in August 2011 and was reduced in contract concluded.

December 2009 that the case needs to be processed through capital route under the Defence Procurement Procedure (DPP) {repeat order<sup>11</sup> - commercial request for proposal (RFP)}. Further, M/s HAL could not install 35 autopilots procured under the contract of August 1999 onto Jaguar aircraft due to manpower crunch. Ministry also stated (March 2017) that based on the experience gained during integration of 18 autopilots, the vendor had developed and incorporated moderation on the autopilot systems procured under the contract of 2014.

Thus, as on October 2016, IAF had a holding of 117 Jaguar Aircraft, but only 18 aircraft could be upgraded with autopilot capability. Even these autopilots were working sub-optimally due to malfunctioning of their APEUs. Ministry took 43 months (August 2010-March 2014) as against 16 months prescribed in the DPP-2008 for contracting the items involving only commercial bids. Meanwhile, IAF had lost three Jaguar aircraft and one pilot since April 2008 due to pilot disorientation/human error whereas loss of another four Jaguar aircraft was under investigation as of October 2016.

### **2.3 Premature procurement of mini Crash Fire Tenders**

**IAF procured mini Crash Fire Tenders (CFTs) at a cost of ₹31.34 crore much before completion of infrastructure works at eight Advance Landing Grounds (ALGs) in 'C' command. This resulted in under utilization of these CFTs for more than three years since their delivery and only five CFTs were deployed at the respective ALGs in 2016.**

As per Defence Procurement Manual (Para 2.2.1) the purchase of stores must be made in accordance with the definite requirements of the Defence Services and care should also be taken not to purchase stores much in advance of actual requirements, if such purchase is likely to prove unprofitable to the Government. Thus, locking up of capital in stock should be minimized.

In order to strengthen infrastructure for operations in Eastern 'C' command, IAF had mooted setting up of eight Advance Landing Grounds<sup>12</sup> (ALGs). Improvement in

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<sup>11</sup> Repeat Order- the instant procurement was a repeat of contract concluded for auto pilots in August 1999 and only commercial RFP is issued for such procurement instead of a single stage two bids (technical & commercial) system thereby reducing the procurement time by 18 months.

<sup>12</sup> ALG is a type of military aerodrome, located in the vicinity of frontiers and used for assault, close support or transport of airborne formations and supplies.

crash fire fighting capabilities in these airfields was one aspect to be achieved through ALGs.

There are nine ALGs in 'C' Command. Ministry of Defence (MoD) accorded (June 2009) sanction for infrastructure at eight ALGs in 'C' Command as the necessary infrastructure was already in place at 'I' ALG. Administrative Approval (AAs) for six ALGs were issued in October/ November 2012 and that for 'G' ALG in June 2014. However, approval for 'H' ALG was not accorded due to its non-connectivity by road. Infrastructure works in respect of five ALGs were completed during the period from February to November 2016. Progress of works at 'R' and 'G' ALG were 78 *per cent* and 40 *per cent* respectively as of November 2016.

In view of infrastructure development of ALGs in 'C' Command for regular air transport operations and subsequent requirement of proper firefighting facilities for ensuring aviation safety, Air HQ proposed (January 2012) to procure mini Crash Fire Tenders (CFTs)<sup>13</sup> capable of being transported by aircraft and heavy lift helicopters to high altitude battlefield in extreme temperature at the time of actual operations and exercises at short notice.

Air HQ expected (January 2012) completion of infrastructure in five ALGs by 2013 and hence concluded a contract (April 2012) with M/s Rosenbauer International AG, Austria for supply of five mini CFTs at a total cost of Euro 2,800,000 (₹18.76 crore @ ₹67 per Euro) with scheduled delivery by October 2013. Subsequently, Air HQ, in March 2013, placed another supply order on the same vendor for supply of four Light Duty Mobile Fire Fighting Units (another name for mini CFTs) for ALGs at a cost of Euro 2,240,000.00 (₹16.33 crore @ ₹76.9 per Euro) which were to be delivered by September 2014. The vendor delivered five mini CFTs in September 2013 and another set of four mini CFTs in February 2014. Shelf life of these mini CFTs is nine years.

One mini CFT was deployed at 'I' ALG (October 2013). As infrastructure works at eight ALGs were not completed, balance eight mini CFTs valuing ₹31.34 crore were issued to

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<sup>13</sup> Mini CFTs are required at ALGs for rescue and fire fighting in case of accidents at aerodromes for regular air transport operations and to ensure aviation safety. These mini CFTs are also called as Light Duty Mobile Fire Fighting Units

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parent units of the ALGs/other units. As of November 2016, out of these, five mini CFTs were deployed in the ALGs where works had been completed and remaining three were still with parent/ other units.

Audit observed that Air HQ had placed supply orders for procurement of mini CFTs (April 2012/March 2013) even before issuance (October/November 2012 and June 2014) of AA for infrastructure works by MoD. Even out of five ALGs, works of which were envisaged to be completed by 2013, AA in respect of 'H' ALG had not been issued till November 2016. This indicated lack of coordination among the respective directorates<sup>14</sup> of Air HQ with regard to assessment of commencement/completion of infrastructure development and procurement of mini CFTs.

As a result, mini CFTs had been delivered by the vendor in September 2013/ February 2014, however, developmental works in respect of six ALGs commenced in October 2013 and in respect of 'G' ALG in January 2014 only. Early procurement of mini CFTs resulted in its deployment at parent units of ALGs/other units for more than three years since their delivery. As the parent units already had adequate firefighting facilities, eight mini CFTs deployed at parent units of ALGs/other units hardly served any significant purpose and in the meantime these mini CFTs lost one third of their shelf life. As a result, their guarantee and defect liability period (up to September 2014 for five mini CFTs and February 2015 for four mini CFTs) lapsed without serving the intended purpose.

In response to audit observation, MoD stated (January 2017) that the respective directorates were in complete sync since initiation of procurement of mini CFTs. However, deployment of mini CFTs have been behind schedule, as completion of work services at these ALGs were delayed due to remote location, poor connectivity, labour issues, inclement weather and frequent bandhs. It was also stated that due to non-completion of infrastructure at ALGs, the mini CFTs were utilized effectively during guarantee and defect liability period at parent units in the event of unserviceability/overhaul of main CFTs and one mini CFT was repaired under warranty.

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<sup>14</sup> Directorate (Dte) of Ops (Air Traffic Service) is responsible for assessment and proposal of mini CFTs, Dte of AF Works for monitoring the infrastructure works and Dte of Mechanical Transport for placement of supply order.

Reply of MoD is not convincing as first order for five mini CFTs was placed even before administrative approval for infrastructure works and by the time mini CFTs were delivered, the works had not commenced. Further, the parent units where these mini CFTs were temporarily allotted, were already equipped with main CFTs.

## 2.4 Delay in overhaul of aero-engines

**Non-dispatch of contracted quantity of aero-engines abroad for overhaul and life extension during 2013 and 2014 led to non-utilisation of the aero-engines for grounded helicopters. Besides, there was an additional expenditure of ₹3.86 crore due to higher rates of the overhaul in succeeding years.**

MI<sup>15</sup> series helicopters of Indian Air Force (IAF) have three<sup>16</sup> variants of engine. IAF has repair and overhaul (ROH) facility for only one variant<sup>17</sup> with annual capacity of 60 aero-engines. The aero-engines have total technical life (TTL) of 3000 hours. IAF did not have authorisation from Original Equipment Manufacturer (OEM)<sup>18</sup> for the overhaul and TTL extension of aero-engines beyond 3000 hours.

Ministry of Defence (MoD) concluded (March 2013) a Long Term Maintenance Agreement (LTMA) for five years commencing from 2013, with OEM in Ukraine for overhaul and supply of spares including TTL extension of that variant which had completed 3000 engine hours and for which overhaul facility is available with IAF.

The unit rates under LTMA were fixed for each of five years with annual escalation ranging between five and six *per cent*. Details of year-wise quantity of aero-engines to be sent to OEM under LTMA, the aero-engines due for overhaul and the aero-engines sent to OEM during 2013 to 2015 along with the year-wise rates are given below:

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<sup>15</sup> MI-17, MI-17 IV and MI-25/35 helicopters

<sup>16</sup> TV3-117MT, TV3-117VM, TV3-117V

<sup>17</sup> TV-3117MT

<sup>18</sup> M/s Motor Sich JSC, Ukraine

Table: Overhaul of TV-3 variant engine

Year	Quantity contracted for ROH	Due for ROH	Actually sent for ROH	Rate of ROH per engine (USD)
2013	64±16= 80	76	44	259925
2014	31±8 = 39	72	23	274481
2015	31±8 = 39	53	39	289303

All the aero-engines which are due for overhaul and TTL extension are received at 3 Base Repair Depot (BRD) from where they are dispatched to the OEM after getting approval from Air HQ.

While the contract permitted 80 aero-engines to be overhauled during 2013 and 76 helicopter engines were due for overhaul in IAF, only 44 aero-engines were sent to OEM for the overhaul leaving a shortfall of 32 aero-engines. Similarly, in 2014, 16 aero-engines with IAF were not sent to OEM for the overhaul though permissible under the LTMA. These aero-engines were sent to OEM during succeeding years. There were 23 and 28 aircraft on ground (AOG) demands pending in IAF for want of these aero-engines in January 2014 and January 2015 respectively. Also, the unit rate of overhaul was higher in the succeeding years, which resulted in an additional expenditure of ₹3.86 crore (**Annexure-II**).

In reply to the draft paragraph issued (November 2016), MoD stated (April 2017) that the total contract value approved for a period of five years was 105 MUSD equivalent to ₹575 crore and projection of requirement of spares and ROH of engines was planned so that total expenditure did not cross the prescribed limit of LTMA. It was further stated that the number of aero-engines finalized to be sent for overhaul abroad was arrived at, after rational and optimal planning to meet the requirement of aero-engines for the fleet for the year.

The reply is not convincing because the expenditure angle approval was an estimated cost for five years, whereas aero-engines specified in the LTMA were to be paid for at actuals. Against the approved amount of 105 MUSD for five years, only an expenditure of 72 MUSD had been incurred in four years i.e. upto 2016. Further, such rational and optimal planning is not evident from the fact that 32 engines and 16 engines were not sent for overhaul during 2013 and 2014 respectively, when they could have been overhauled

under the existing contract. The delays impacted the operational readiness of the helicopters besides an extra expenditure of ₹3.86 crore.

## 2.5 Limitation of Recce capability in 'S' Sector

**Reconnaissance (Recce) and Surveillance capability in 'S' sector was affected due to delay in construction of support and maintenance facilities at Air Force Station 'BB'. Besides, there was an additional expenditure of ₹34.40 crore during 2011-16, as Recce missions in 'S' sector had to be undertaken from Air Force Station, 'CC'.**

Aerial surveillance and reconnaissance (Recce) of the border areas is a critical activity undertaken by Indian Air Force (IAF) as it provides knowledge about the enemy movement and helps in our defence preparedness. Audit in its Report<sup>19</sup> had commented on procurement of three aerial Recce systems at a cost of ₹640 crore, besides delay in creation of infrastructure and integration of Recce pods onboard the 'DD' aircraft.

Operator Level Maintenance (OLM) support facilities were to be created for the Recce systems. This included facility for nitrogen charging/purging of sensor pods and storage of Recce equipment which required stringent temperature and humid conditions. Recce pods require air-conditioned storage for 24 hours and humidity controlled temperature at 23±2°C. Each of these sensors costed between ₹45 crore to ₹75 crore.

The three Recce systems were to be deployed at Air Force Station (AFS) 'BB', 'CC' and 'EE' to cover the surveillance of their respective jurisdictions. While the support facilities for Recce systems were set up at 'CC' and 'EE' by 2008 and 2012 respectively, the system could not be installed at AFS 'BB' in the 'S' sector till date (April 2017) due to delay in construction of support facility at AFS 'BB'.

A 'DD' squadron was raised (September 2009) at AFS 'BB' for tasks including Recce mission in the 'S' sector. The administrative approval (AA) for construction of support facilities at AFS 'BB' was accorded by 'C' Command in February 2008 at a cost of ₹3.60 crore, which was to be completed by January 2010. However, the work could not

<sup>19</sup> Report No. 16 of 2010-11 (Air Force and Navy)

be executed by Military Engineer Services (MES) because of frequent revisions in the scope of work by the Air Force as they failed to incorporate important specifications in the original plan which was approved. Therefore, subsequent AA for the work was accorded (September 2013) at a revised cost of ₹4.03 crore to be completed by August 2015. But work commenced only in June 2016. The delay was unjustified especially since similar work was already executed at AFS 'EE' and AFS 'CC' by the MES and the inputs from these stations could have been obtained.

As the support facility for Recce system could not be created, the Recce missions in 'S' sector were undertaken from AFS 'CC' since 2009. Average distance between AFS 'CC' and the 'S' sector is 1630 km. 'DD' can cover a maximum distance of 1500 km with its maximum fuel load. Therefore, air to air refuelling by utilising IL-78 refueller aircraft became essential for Recce missions in 'S' sector. Since an IL-78 had to accompany the 'DD' on its Recce missions, the operations were constrained and expensive. The additional operational cost of flying IL-78 and the additional fuel consumption for flying additional distance of about 2260 km<sup>20</sup> by 'DD' in each sortie to 'S' sector from AFS 'CC', worked out to ₹81.9 lakh.

Therefore, due to delay in civil works valuing about ₹4 crore, IAF had to incur additional expenditure of ₹34.40 crore for the 42 sorties flown during 2011-16.

In response to an audit query, Air HQ accepted (June 2016) that there was delay in processing of information gathered by the Recce because of the distance and time taken to operate from 'CC'. It however contended that, in peace time, there was no adverse operational impact on the Recce.

The reply is not convincing because the Recce system was acquired to keep IAF ready for any eventuality. The importance of Recce was reaffirmed by the fact that, in August 2016, Air HQ allotted 120 hours (equivalent to 30 sorties<sup>21</sup>) *per annum* to HQ 'C' Command for the Recce in the 'S' sector. During war time, frequent Recce missions are required for providing timely the imagery of targets and enemy's response to the damage. This is possible only when the Recce system is installed nearby.

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<sup>20</sup> Average additional distance (3260-1000 Km) covered by the fighter aircraft in each sortie

<sup>21</sup> Each sortie from 'CC' to 'S' sector takes about four hours.



While in peace time, there was no adverse operational impact, Recce missions in 'S' sector undertaken from 'CC' were not only expensive and logistic conundrum, readiness of IAF to meet any unexpected eventuality remained limited and constrained.

The matter was referred to the Ministry (April 2017); their response was awaited (June 2017).

## **2.6 Non-functioning of under vehicle scanning systems at Air Force Bases**

**Indian Air Force procured 57 under vehicle scanning (UVS) systems during March 2012 to November 2012 at a cost of ₹17.09 crore to strengthen the security at the entry gates of 50 Air Bases. Only 17 UVS systems are functioning as on date.**

In view of the increased threat to defence installations, Air Force recognised the need for strengthening the security of its air bases. Security of Indian Air Force (IAF) is the responsibility of Air Force Police headed by the Provost Marshal. Scanning of vehicles entering the premises was one of the critical security measures.

IAF used to check the underbelly of the vehicles entering the air force stations and installations using tilt mirrors, which did not give adequate view of the large underbelly of the vehicles. IAF therefore wanted to procure modern state-of-the-art 'Under Vehicle Scanning (UVS)' systems which can quickly scan the underbelly of vehicles and the images can be viewed live on the monitor and stored for future reference.

IAF Headquarters issued (March 2012 to November 2012) three<sup>22</sup> supply orders on M/s Turbo Consultancy Services Pvt. Ltd. and M/s Infosolutions India Pvt. Ltd. for procurement of 57 UVS systems for ₹17.09 crore which were to be installed at 50 airbases across India. These systems were received between July 2012 and April 2013. Audit found that as of April 2016, only 45 systems were installed and 12 UVS systems were yet to be installed. Out of 45 systems installed, 43 (95 per cent) systems became non-functional

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<sup>22</sup> First supply order was for 30 UVS System by Air HQ. Second supply order was for 15 nos. under option clause of first order. Third supply order was placed on another vendor for 12 UVS systems.

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within the warranty period<sup>23</sup>. These were neither repaired nor replaced by the vendors as stipulated in the Warranty<sup>24</sup> clauses of the supply orders. IAF did not initiate any action against the vendors, like, outsourcing the repair or replacement at the cost of vendors, invocation of performance bank guarantee etc. Air HQrs stated (May 2016) that due to excessive malfunctioning of the components and downtime of the systems, vendors had extended the warranty period but did not repair or replace the systems.

Further, IAF in February 2017 stated that out of the 57 systems, 52 had been installed and only five were yet to be installed. However, 35 systems still remained in unserviceable condition. IAF further stated that fresh quotations had been invited for repair of these UVS systems, entailing further expenditure. Therefore, even as of February 2017, 70 per cent of the procured UVS systems were not functioning/installed.

Further analysis revealed that while approving the initial procurement of 30 UVS systems in March 2012, Air HQrs had envisaged that additional quantities would be procured only after evaluating the efficacy of the systems. Contrary to this, Air HQrs placed order for another 15 UVS systems in November 2012. By this time only 3 UVS systems were supplied, installed and used for less than a month. At the same time HQrs Central Air Command placed order for another 12 UVS systems of identical specifications. Thus Air Force procured additional quantities of UVS systems without adequately evaluating their efficacy. It also showed lack of coordination between the security establishment at the Air HQrs and Command level.

Thus the security systems procured at a cost of ₹17.09 crore could not be utilised fully for the security of the air bases even after about five years. Besides, the security of the air bases could not be enhanced as envisaged.

The matter was referred to the Ministry (February 2017); their response was awaited (June 2017).

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<sup>23</sup> 12 to 24 months

<sup>24</sup> Rectify or replace the system free of charge within maximum period of 15 days/45 days.

## 2.7 Serviceability and Maintenance of IL series Aircraft

**Serviceability of the IL fleet of the Indian Air Force (IAF) was low because of delay in servicing and repair. This was in turn largely attributable to poor availability of spares and delay by IAF in signing maintenance support contract with Original Equipment Manufacturers (OEM). The avionics of IL fleet has not been upgraded, as a result they continued to fly with 1985 vintage avionics. There was delay in carrying out first and second overhaul of IL-76 aircraft which meant that aircraft were flown without overhaul, well past the due date for overhaul. Air to Air refuelling (AAR) is a crucial capability both during combat as well as peace time operations. IL-78 aircraft are dedicated for this purpose. However, due to inadequate infrastructure and support facilities the Air to Air refuelling capability was hampered.**

### 2.7.1 Introduction

Ilyushin series of aircraft, namely IL-76 and IL-78 are heavy lift tactical transport aircraft and are important assets of the transport wing of the Indian Air Force (IAF). They provide the following services.

- a. Logistic support to the defence forces during war as well as peace time by transporting men and material.
- b. Provide air maintenance through transport of men and material to forces located in remote and inaccessible areas.
- c. Evacuation of personnel during emergencies like natural calamities, casualty or conflict.
- d. In addition to the above roles IL-76 also serves as a platform for AA-1 system, whereas IL-78 is specialised for Air to Air Refuelling (AAR).

Indian Air Force (IAF) has 14 IL-76 aircraft, procured during 1985 to 1989 from M/s Aviaexport at a cost of about ₹46 crore per aircraft including spares. Three IL-76

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were later procured during March 2004 which are being used as platform for AA-1 system. Maximum payload of IL-76 aircraft is 47 tons with All Up Weight (AUW)<sup>25</sup> of 190 tons and maximum carrying capacity of 225 passengers.

IAF has six IL-78 aircraft procured during 2003-04 at a cost about ₹132 crore per aircraft including spares, which are used primarily for air to air refuelling. Maximum payload of IL-78 aircraft is 155 tons with AUW of 210 tons.

***Organisational Set Up***

The operation and maintenance of all aircraft is the responsibility of Directorate of Ops (Transport & Helicopter) at Air HQs, which functions under Chief of the Air Staff. All procurement relating to the aircraft are undertaken by the Deputy Chief of Air Staff. Maintenance of the aircraft is the responsibility of Air Officer-in-charge-Maintenance (AOM).

At present there is one Squadron for IL-76 based at AFS-E under Headquarters Western Air Command (HQ WAC) and one Squadron for IL-78 based at AFS-A under Headquarters Central Air Command (HQ CAC). Spares for both the fleet are stocked at 45 Equipment Depot (ED), at AFS 'A'. First and second line repair and maintenance of the fleet which involves basic repair and servicing is carried out at their respective bases, while major repair and overhaul are carried out by the Original Equipment Manufacturers (OEMs) at their premises. There is a Technical Type Training School (TETTRA) at AFS-A which provides basic operational and maintenance training on both IL series aircraft.

***Audit Objectives***

The objectives of the Audit were to examine whether:

- a) the IAF was able to get the desired capabilities envisaged from the IL fleet.
- b) adequate infrastructure and ground support services were available for their efficient utilization.
- c) there were adequate facilities for maintenance and overhaul of IL fleet.

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<sup>25</sup> All-Up-Weight-is the total aircraft weight at any moment during the flight or ground operation

### ***Audit Scope***

Audit covered the period from 2010-11 to 2015-16.

### ***Audit criteria***

Criteria for audit of serviceability and maintenance of IL series of aircraft were derived from:

- a) Cabinet Committee on Security (CCS) Notes, approvals and contract documents relating to procurement and TTL extension of IL series aircraft;
- b) Policy pages of operating Squadron issued by Ministry of Defence (MoD), annual flying tasks and flying roles assigned by Air HQ and other directives issued by MoD/Air HQ;
- c) Statement of Cases for sanctions, Schedules of maintenance for first and second line servicing, Scales of Tools, Testers and Ground Equipment (TTGE) and Recovery Plan of aircraft from Aircraft on Ground (AOG); and
- d) Defence Works Procedure, Defence Financial Regulations, Defence Procurement Procedure, Store Accounting Instructions and Indian Air Force Publications (IAP) 1501, 1502 and 1541.

### ***Audit Methodology***

An Entry Conference was held with concerned officers from the MoD and Air HQ on 17 June 2015 wherein audit objectives and scope were explained. The audit scope was to cover five-year period between 2010-11 and 2014-15. Relevant records of audited units were test checked during July 2015 and January 2016. Performance data for the year 2015-16 were also analysed and included in the report.

Their replies to initial audit observations wherever received were considered and incorporated in draft Report, which was issued to the Ministry on 19th February 2016.

Exit conference to discuss audit findings was held with MoD and Air HQs on 18th July 2016. MoD furnished the reply to draft report on 21st October 2016, which has been suitably incorporated in this report.

## **Audit findings**

### ***2.7.2 Under reporting of two IL-76 aircraft***

As against the Policy Page, which is the document approved by Government of India, and which *inter alia* authorizes the number of aircraft, equipment and manpower to be held by a unit of the IAF, authorises 12 IL-76 aircraft, the IAF was actually holding and operating 14 aircraft. The Squadron which operated these aircraft had been reporting the availability and operations of only 12 aircraft to Air HQ. At any point of time, only 12 aircraft were reflected in the documents of the operating Squadron. The remaining two aircraft were held at a different base as float or spare, which were used as replacement, whenever any of the 12 aircraft were grounded or sent for servicing or repair.

Audit considers this as improper reporting of the air assets held by the IAF. The additional two aircraft should be duly reflected as a float, spare or reserve in the Policy page. The authorization of the IL-76 squadron needs to be revised to 14 aircraft.

### ***2.7.3 Inadequate infrastructure and support systems***

#### ***(a) Inadequate Hangers***

Hangers are required not only for parking of aircraft, but also to facilitate their maintenance. Audit found that, though IL-76 aircraft were procured in 1985, till 2016 there were no hangers to accommodate the aircraft. For the 14 IL-76 aircraft, there was only one hanger, that too was completed only in 2016 at a cost of ₹21.48 crore. Another hanger which was taken up for construction by altering the existing hanger, at a cost of ₹8.79 crore, is not yet completed.

Similarly, six IL-78 aircraft were procured during 2003-04, but only one hanger is available, which was created in 2011.

Due to non-availability of hangers, the costly air assets remained in the open which adversely affected their serviceability and life. Moreover, servicing and maintenance activities had to be carried out in the open tarmac area, which resulted in delays due to weather conditions.

**(b) *Inadequate runway length***

IL-78 are used for refuelling of fighter aircraft like 'DD', 'GG' and 'HH', in mid-air so as to enhance their endurance. This is crucial for combat as well as recce missions. Larger the weight to be carried by the aircraft, longer is the length of runway required. For effective and efficient air to air refuelling IL-78 aircraft should be able to carry optimum quantity of fuel in its tanks. The length of the runway required for the carrying of optimum quantity of fuel is between 11480 feet and 15022 feet.

IAF in December 2007 had identified ten airfields for air to air refuelling operations. Suitable infrastructure were to be created at these airfields, which included extension of runway length, provision of Hydrant Refuelling System (HRS), adequate parking and deployment of ground equipment.

Audit found that against this requirement, the runway length at these ten airfields were below 10,000, feet. It was observed that only runway at AFS-A was extended partially up to 10,500 feet.

In response, the Ministry while agreeing with facts stated that IL-78 aircraft were due for overhaul in 2018-19; and that during their overhaul it is proposed to upgrade their engines, which will in turn enable them to take off even from shorter runways.

Audit is of the view that while the up gradation of engines will take several years to fructify, in the meantime the air to air capability of the IL-78 fleet will remain constrained, affecting overall operational readiness.

**(c) *Inadequate Hydrant Refuelling System***

Loading the fuel tanks of IL-78 aircraft using vehicle based refuellers (bowsers) is very time consuming. The refueller has to first refuel itself and then fill up the aircraft tanks, which may take several trips. To save time and enhance refuelling efficiency hydrant refuelling system are used. These are underground fuel tanks with hydrants located at several points from where hose pipes can be connected directly to the aircraft fuel tank.

IAF in December 2007 had planned to create HRS at the ten airfields designated for air to air refuelling. Audit found that hydrant system was only available at AFS-A and AFS-B airfields.

In response, Ministry while reiterating the need for the HRS at earmarked runways from where air to air refuelling operations are envisaged, stated that construction of hydrant system at AFS-C and AFS-D would be taken up in 2016-17. In addition, Air HQ was in process of liasioning with oil companies for fitment of HRS as and where feasible.

Thus even after almost nine years, the HRS facility was available only in two out of ten airbases identified in year 2007.

***(d) Limitations of computerised system to assist air to air refuelling***

Airborne Integrated Command Air Tasking System (ICATS) is used to facilitate mission planning for combat and support operations. The use of ICATS also facilitates air to air refuelling which involves complex operations requiring high degree of coordination between the fuel supplying and fuel receiving aircraft in mid air. ICATS enables the calculation of fuel requirements, time and distance of refuelling, etc, in a more accurate manner. Presently, the IL-78 Squadron has two ICATS machines which are ground based and not airborne.

Though, the squadron had projected the need for airborne ICATS in July 2013, Air HQ is yet to process the procurement.

***(e) Non availability of dedicated Refuelling Corridors***

According to the International Civil Aviation Organisations (ICAO) requirement, air to air refuelling has to be carried out only within dedicated air corridors, so that there is no disturbance to the civil air traffic. Audit found that though the Squadron proposed the creation of 12 dedicated Air corridors for air to air refuelling to be approved by the Director General of Civil Aviation (DGCA), Air HQ is yet to obtain the approval.

Audit is of the view that the absence of dedicated air corridors would adversely impact the training as well as operation of air to air refuelling.



**(f) *Serviceability of Aerial Refuelling Pods***

Aerial Refuelling Pods (ARPs) are hoses which connect the IL-78 fuel tank with the fuel tank of the fuel receiving aircraft. Each aircraft has three sets of Pods - one in centre and one each on left and right side of aircraft.

Audit observed that serviceability of these pods was poor and ranged between 43.25 *per cent* and 66.67 *per cent* during 2010 to 2016. This was due to frequent failure of the Pods, limitation in repair of pods at the air base and poor maintenance support from OEM.

In response, the Ministry stated that availability of ARPs did not affect fleet utilization as adequate pods were available to cater for the need of two-three pods per aircraft. However, non-availability of certain pods was due to delay in supply of spares at OEM end because of contractual problems, which have now been solved.

Audit is of the view that if the present state of repair and maintenance is not improved, the serviceability and availability of the Pods may further deteriorate, adversely impacting the operations.

***2.7.4 Poor Serviceability and Maintenance of the IL fleet***

Serviceability denotes that the aircraft are airworthy, which is the ability of airborne systems to operate without significant hazard to aircrew, ground crew, passengers or the general public over which such systems are flown. When a problem is serious enough to prevent an aircraft from flying, the aircraft is grounded.

The serviceability level of IL-76 and IL-78 desired by IAF is 70 *per cent*, which means at any point of time at least 70 *per cent* of the available aircraft should be in flying condition.

Audit found that serviceability of IL-76 during 2010-11 and 2015-16 on an average was only 38 *per cent* and that of IL-78 was only 49 *per cent*.

**Table 1: Serviceability status of IL fleet**

Year	IL-76 fleet (figures in percentage)		IL-78 fleet (figures in percentage)	
	Serviceability	Aircraft grounded	Serviceability	Aircraft grounded
2010-11	32.16	52.45	59.39	21.31
2011-12	34.84	43.50	49.09	23.80
2012-13	32.64	41.65	52.02	29.34
2013-14	34.41	46.46	43.07	43.67
2014-15	37.80	43.23	38.30	42.30
2015-16	56.13	21.10	49.20	31.00
Average	37.99	41.39	48.51	31.90

Due to poor serviceability significant number of aircraft remained grounded for a long time. On an average 41 *per cent* of IL-76 aircraft and 32 *per cent* of IL-78 remained grounded. It is also pertinent to mention that significant portion of the useful life of these air assets was wasted by remaining grounded for prolonged period.

Audit found that primary reason for low serviceability was poor availability of spares from the OEM. After disintegration of erstwhile USSR and closing of IL manufacturing facility of the original OEM, M/s Tashkent Aircraft Production Corporation at Tashkent, the spares were being obtained directly from various vendors of Russian and Ukrainian origin. Signing of contracts with these vendors and materialization of supplies took a long time.

**(a) Delay in repair of grounded aircraft**

Spares required for repairing the grounded aircraft and bringing them to flying condition was given top priority, which had to be supplied as soon as possible. If the spares were available in stock they should be issued within 24 hours.

Test check of timeliness in meeting of demands for spares for grounded aircraft showed that less than 11 *per cent* demands were met within 15 days in respect of IL-76 during 2010-11 to 2014-15. The corresponding figure for IL-78 was less than three *per cent*. 22.49 *per cent* of such demands for IL-76 fleet and 32.72 *per cent* of these demands for IL-78 fleet, were met after six months or later as shown in the table below: -

Table 2: Meeting Aircraft on Ground (AOG) demands of IL-76 aircraft

Year	Number of demands raised	Number of demands met			
		Within 1st day to 15th day	Within 16th day to one month	One month to six month	More than six months
2010-11	309	76	07	28	114
2011-12	658	171	06	142	118
2012-13	629	20	45	183	231
2013-14	729	27	25	237	95
2014-15	574	20	16	140	94
<b>Total</b>	2899	314	99	730	652
<i>Per cent</i>	100	10.83	3.41	25.18	22.49

Table 3: Meeting AOG demands of IL-78 aircraft

Year	Number of demands raised	Number of demands met			
		Within 1 day to 15th day	Within 16th day to one month	One to six month	More than six months
2010-11	149	9	9	24	89
2011-12	161	1	2	71	57
2012-13	163	1	2	55	33
2013-14	187	7	2	73	24
2014-15	110	2	Nil	41	49
<b>Total</b>	770	20	15	264	252
<i>Per cent</i>	100	2.59	1.94	34.28	32.72

Thus it may be seen that spares could not be made available in a timely manner even to repair the grounded aircraft.

**(b) Delay in servicing of aircraft**

Audit found poor availability of spares also severely affected the servicing of the aircraft at the air bases (second line servicing).

Three types of servicing are carried out, one type of service is undertaken every 300 hours of flying, another more rigorous type of servicing is carried out after every 900 hours of flying, while another type of servicing is due after every 1800 hours of flying. Delays in carrying out servicing during 2012-13 to 2014-15 are shown in the Table below:

**Table 4: Time taken in second line servicing of IL-76 aircraft**

Type of servicing (cycle)	Time Prescribed (days)	Number of servicing carried out	Number of servicing carried out within prescribed period	Per cent of services carried out in prescribed days
300 hours	22	36	19	52.77
900 hours	35	17	01	5.88
1800 hours	50	04	01	25
<b>Total</b>		<b>57</b>	<b>21</b>	<b>36.84</b>

**Table 5: Time taken in second line servicing of IL-78 aircraft**

Type of servicing	Time Prescribed (days)	Number of servicing carried out	Number of servicing carried out within prescribed period	Per cent of services carried out in prescribed days
300 hours	21	15	04	26.66
900 hours	39	01	-	0
1800 hours	61	04	02	50
<b>Total</b>		<b>20</b>	<b>06</b>	<b>30</b>

Thus, 63 per cent and 70 per cent of servicing for IL-76 and IL-78 fleet respectively were not done within their prescribed timeframe.

IAF may take suitable measures to put in place necessary monitoring mechanism to control delays in servicing.

**(c) Non conclusion of Long Term Maintenance Agreement for IL fleet**

Another reason for the poor availability of spares and maintenance support was the non conclusion of Long Term Maintenance Agreement (LTMA) with the OEM. IAF mooted the proposal for LTMA in April 2011 with M/s Ilyushin Aviation Complex (IAC), Russia to sustain 70 per cent serviceability of the fleet at any given time. MoD in January 2014 reviewed the proposal and in view of the change in requirement and circumstances, directed the Air HQ to put up a fresh proposal to be processed by the Ministry for approval (Acceptance of Necessity). Till date, Air HQ had not processed the proposal (April 2017).

**(d) *Non-compliance to regulations prescribed for servicing***

In the IAF, servicing of aircraft and equipment is carried out strictly according to prescribed instructions issued from time to time in the form of Servicing Schedules, Test Schedules and Technical Staff Instructions. Further, Bulletins detailing instructions for servicing and maintenance are issued by the OEM from time to time. Unavoidable deviations from these instructions due to reasons like non availability of spares, test equipment or tools should be duly authorized by the competent authority.

During the period from 2010-11 to 2014-15, Audit found 10 cases where servicing and repair was carried out in deviation of the prescribed instructions, without due authorization by the competent authority. These cases are cited below:

- (i) There were seven cases where the Bulletins issued by the OEM could not be adhered to by the IAF during servicing and maintenance of engines of IL aircraft. The reasons for deviations were non availability of checking devices and tools. Also training was not provided to the air force personnel to carry out servicing.
- (ii) There were various anomalies in two Maintenance Manuals received from the OEM in 1989 and 2002 and these manuals were not updated. Maintenance was carried out using outdated Manuals, which constitutes a deviation from the prescribed procedure. However, the deviation was not yet authorized.
- (iii) According to the OEM, IL-76 engines are to be overhauled after 2000 flying hours or 1500 Flight Cycles<sup>26</sup> or 10 calendar years, whichever is earlier. Audit found that IL-76 engines were being used for flying without overhauling them, even after they had exceeded the prescribed limit of flying hours and flight cycles. Approval of the competent authority was not obtained for flying these engines without overhaul beyond the prescribed overhaul limit.
- (iv) In case of engines sent to OEM for overhaul, it was found that the OEM did not fill up the engine log books. With such incomplete documentation, it was difficult to ascertain whether the OEM had completed all the prescribed activities in adherence to the instructions (Bulletins).

In response, the Ministry stated that OEM is approached for training to IAF personnel. OEM also assured that bulletins would be adhered during course of repair and overhaul of engines.

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<sup>26</sup> One instance of starting and shutting down of engine, constitutes one flight cycle.

Audit is of the view that though such deviations were allowed only in cases where in flight safety was not affected, frequency of such deviations and more so the failure to obtain timely authorization of such deviations, denotes weak internal control over the servicing and maintenance activity.

### **2.7.5 Overhaul of aircraft and engines**

#### **(a) Aircraft flown without prescribed Overhaul**

According to OEM, the first overhaul of IL-76 aircraft is to be carried out after five years, which was later extended by the OEM to 10 years. Audit found that nine aircraft were flying without first overhaul even beyond 10 years. They were flown from 30 hours to 400 hours after the limit of 10 years. Details of contract and delays are shown in **Annexure-III**.

The time prescribed for second overhaul was seven years. Audit found that there was delay in second overhaul of aircraft which ranged from 14 to 88 months after the limit of seven years. Further, only during second overhaul it is assessed whether the life of the aircraft needs to be further extended beyond the initially prescribed 20 years. Due to delay in second overhaul it was found that nine out of 14 aircraft were flown after expiry of their prescribed life. On an average these aircraft flew 107 hours without second overhaul even when their prescribed life had expired and extension of life was yet to be duly approved. By doing so, the IAF had taken an operational risk, besides risk to the air assets and human life.

In its reply, the Ministry replied that the delay in the contract (2009) was because of the delay in signing one of the overhaul contracts due to conduct of vigilance inquiry into the contract. The Ministry, however, was silent regarding delay in other two overhaul contracts.

#### **(b) Delay in carrying out overhaul by the OEM**

According to the contract signed in 2005 with the OEM, for overhaul of six IL-76 aircraft, the time prescribed for completion of second overhaul by the OEM was 150 days. Audit found that there was delay of 72 to 546 days in completion of overhaul of six aircraft. In case of two aircraft, the delay was more than six months.

Similarly, the time prescribed for completion of second overhaul under the second contract concluded in 2009 was 182 days, where delay was between 98 and 1245 days in

overhauling of six aircraft. There was delay of more than three years in the overhaul of one aircraft under the contract.

Further, the contract provides recovery of liquidated damages from the OEM for the delay on their part in completion of the overhaul. In addition, the OEM also had to reimburse additional cost incurred by the IAF personnel accompanying the aircraft, for overstaying for the period of delay. However, no recovery was made for the delay by the IAF.

In response, the Ministry stated that there had been certain cases wherein delay was due to snags encountered during Joint Air Test of the aircraft (post overhaul) and the time involved in associated rectification performed by the OEM. Notwithstanding the above, M/s IAC would be asked to reimburse cost of Liquidated Damages (LD) (due to delay in overhauling aircraft) and the expenditure incurred due to overstay of the taking over team.

***(c) Delay in avionics up gradation***

In May 2013, Air HQ decided to go for up gradation of the avionics of IL-76 and IL-78 aircraft, because existing avionics fitted in the aircraft did not provide the required accuracy and were not compliant with current aviation standards, because of which they were not permitted to fly in international flying corridors. Further, due to their obsolescence, the product support from OEM was becoming increasingly difficult, which resulted in an increase in un-serviceability of the aircraft due to non-availability of spares.

However, no avionics upgrade was carried out so far (January 2016) and aircraft continued to fly with 1985 vintage avionics.

***(d) No contract for overhaul of IL-78 aero-engines***

The OEM had prescribed that engines of IL-76 will be overhauled after 2000 hours or 1500 Flight Cycles or 10 years, whichever is earlier. Similarly, OEM prescribed that the engines of IL-78 will be overhauled after 3000 hours or 1500 Flight Cycles or 10 years, whichever is earlier. IAF signed a contract with the OEM in 2006 for overhaul of IL-76 engines.

Audit found that no separate contract for overhaul of IL-78 engines was signed and IAF was sending the IL-78 engines for overhaul under the contract for the overhaul of IL-76 engines. Considering the significant difference between the two aircraft, different overhaul efforts/procedure would be required for the two aircraft with different cost implications. Sending IL-78 engines for overhaul under the IL-76 contract created

problems. After the overhaul of IL-78 engines, the OEM prescribed the next overhaul to be due after 2000 hours instead of 3000 hours actually applicable to IL-78 engines. The OEM prescribed the same limit of 2000 hours applicable to IL-76 on IL-78 engines, because according to the contract the OEM applied the same process for overhaul of IL-76 as well as IL-78.

Audit is of the view that had IAF signed separate contract for overhaul of IL-78 engines, the due diligence required for overhaul of IL-78 engines would have been applied by the OEM and the time for next overhaul would have been correctly prescribed as 3000 hours. By not doing so the IL-78 engines would have to be sent to the OEM for overhaul, 1000 hours before its actual limit. This was operationally as well as financially imprudent.

### **2.7.6 Conclusion**

IL-76 and IL-78 aircraft are important air assets with IAF and provide vital transport support to IAF. While the IAF had acquired the envisaged heavy lift capability by complementing the existing IL fleet with Globe master, there were several deficiencies in infrastructure facilities and maintenance and repair of the existing IL fleet.

Serviceability of IL fleet was low because of delay in servicing and repair. This was in turn largely attributable to poor availability of spares and delay by IAF in signing maintenance support contract with OEM. The avionics of IL fleet has not been upgraded, as a result they continued to fly with 1985 vintage avionics.

There was delay in carrying out first and second overhaul of IL-76 aircraft which meant that aircraft were flown without overhaul, well past the due date for overhaul. This was an undue risk taken by IAF.

Air to Air refuelling is a crucial capability both during combat as well as peace time operations. IL-78 aircraft are dedicated for this purpose. However, due to inadequate infrastructure and support facilities the air to air refuelling capability was hampered.

### **2.7.7 Recommendations**

- The authorisation (policy page) of IL-76 should be revised from 12 to 14 aircraft by Ministry of Defence.



- Air corridors for air to air refuelling should be designated at the earliest to ensure smooth air to air refuelling operations and training.
- IAF needs to finalise the Long Term Maintenance Agreement for IL fleet to sustain the envisaged 70 *per cent* serviceability.
- Since the IL fleet is going to be operational for the next 20 years or more, MoD may consider upgrading its avionics to remove constraints in its operations and to comply with current aviation standards, so as to allow for flying in international air space since there may be such a requirement in case of eventualities.
- MoD may consider concluding a separate contract for overhaul of aero-engines of IL-78 aircraft in order to get full benefits of overhaul, instead of getting the overhaul under the same contract for overhaul of IL-76 aero-engines.

## 2.8 Non-operationalisation of 'D' level facility

**Lack of due diligence on part of the Ministry/Indian Air Force in ensuring the availability of transfer of technology (ToT) for re-equipment/avionics (RE) systems of AN-32 aircraft prior to conclusion of the Contract/ Addendum for 'D' level facility, resulted in dependency on multiple original equipment manufacturers and accumulation of repairables with serviceability and financial concerns.**

Mention was made in para 2.2 of Report No. 4 of 2014 regarding delay in setting up of 'Depot (D)' level facility<sup>27</sup> for AN-32 RE<sup>28</sup> aircraft. Ministry in their Action Taken Note (ATN) stated that the delay was because there was requirement of change in equipment to be supplied for setting up of 'D' level facility at 1 Base Repair Depot (BRD) because of change from Russian origin to Western origin equipment of the aircraft. A supplementary Agreement (SA) to the contract was concluded (June 2012), pursuant to which the original equipment manufacturers (OEM) had supplied equipment costing USD 2,123,850 (₹10.51 crore) for setting up of 'D' level repairs facility to India.

<sup>27</sup> D level facility- a depot level repair/overhaul facility, which allows user to perform diagnosis and repair according to Overhaul Manual for an equipment/aircraft.

<sup>28</sup> A contract (June 2009) between the Ministry of Defence and M/s Spets Techno Export (STE), Ukraine for overhauling, total technical life extension (TTLE), re-equipping with 18 avionics systems/equipment (RE systems) of AN-32 aircraft, envisaged setting up of 'D' level facilities for repair of rotables/line replaceable units (LRUs) of RE systems at 1 BRD by July 2012. The re-equipped AN-32 Aircraft was rechristened as AN-32 RE aircraft.

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Audit further observed (February 2016) that the facility had not been operationalised since its installation (April 2013), as the test equipment were not able to diagnose the rotables/Line Replaceable Units (LRUs) up to component level and repair the 17<sup>29</sup> RE systems supplied by the OEM. As a result, 150 warranty expired Cat 'D'<sup>30</sup> rotables/LRUs of AN-32 RE aircraft had accumulated (April 2015) at the BRD. Air HQ entered (May 2015 to January 2016) into four contracts for repair and overhaul (ROH) of nine out of 17 RE systems with the respective OEMs and bore a cost of ₹10.59<sup>31</sup> crore on repair of Cat 'D' rotables/LRUs.

The issue of non-operationalization of 'D' level repair facility was referred to the Ministry in February 2016. The Ministry explained (March 2016) the finalization/shift from the initial three to 10/11<sup>32</sup> western origin equipment, stating that while OEMs of western origin equipment as a norm do not part with technology, the Ukrainian/Russian origin OEMs too refused to part with the technology. The Ministry also stated that the OEM had finally communicated (February 2016) its inability to operationalise the 'D' level facility at the BRD and the case was being taken up for undertaking amendments to the main contract to reduce the cost of associated equipment related to the facility.

As accumulation and downtime of RE systems increases with ageing, besides the cost, keeping AN-32 RE aircraft in operation-worthy state would remain a challenge. Ministry's reply also does not clarify about the conclusion of four ROH contracts between May 2015 and January 2016 for nine out of 17 RE equipment prior to confirmation in February 2016 from the OEM about its inability to establish the 'D' level facility.

Thus the Ministry while signing (June 2012) addendum to the contract of June 2009 was well aware that the OEMs of Western origin do not as a norm part with the technology and that OEMs of Ukrainian/Russian origin had also refused to part with the technology. Yet the Ministry went ahead and concluded SA with the OEM of AN-32 RE aircraft for setting up 'D' level repair facility. The 'D' level repair facility though set up is still non-operational and on account of expression of inability by the OEM of the facility to operationalise the facility, Air force would remain perpetually dependent on several OEMs of 17 RE systems of AN-32 RE aircraft.

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<sup>29</sup> One of 18 RE systems of Western origin was not supplied by the vendor.

<sup>30</sup> Cat 'D' stored are the ones which can be used only after repairs.

<sup>31</sup> Information received by Audit under 29 Equipment Depot's letter No. 29ED/S-IV/365/19/Lgs (TTCLE) dated 15 June 2016.

<sup>32</sup> Out of 11 western origin equipment nine were from USA (one was not delivered) and one each were from France and Switzerland.

## 2.9 Irregular availing of LTC by Officers in Indian Air Force during their private visits to foreign countries

**Officers in Indian Air Force (IAF) were taking approvals from competent authority to proceed abroad on leave on personal grounds. However, though they visited foreign destinations during the sanctioned leave, they were allowed claim for Leave Travel Concession (LTC) for cities in India, which they did not visit. Permissions of LTC for journeys to foreign destination and payments of ₹82.58 lakhs by the respective authorities were irregular and in gross violation of provision of LTC contained in Defence Travel Regulations.**

Under Rule 177 of Defence Travel Regulations, in regard to Leave Travel Concessions (LTC) a service officer proceeding on any authorized leave irrespective of its duration, within Indian limits, is eligible to free conveyance by entitled mode/class by direct/main route to and from the nearest railway station/airport to his home town/selected place of residence once in a year in the second year of his service for the first time and thereafter once in a year and every alternate year to any place in India (all India LTC) in lieu of hometown/selected place of residence.

We noticed cases where officers of Indian Air Force (IAF) visited foreign countries on leave on personal grounds but claimed LTC for the journey from origin to Indian stations and back and the same were admitted by the authorities despite the fact that journey performed between origin to foreign destination did not even touch the Indian station. The case is discussed below:

We examined the records<sup>33</sup> pertaining to the period from 2010-15 and found that in 49 cases, AF officers availed of LTC while visiting a foreign country. The officers obtained permission/NOC from competent authorities to proceed on leave to foreign countries on personal ground with the condition that expenditure of foreign visit would be borne by the respective officers and under their own arrangements. Subsequently, the officers were applying for all India LTC under Travel Regulations for the period of sanctioned leave. The Station Adjutant of the respective units was authorising the requested LTC through promulgating Personnel Occurrence Report (POR) which also indicated the foreign destination. After the journey to the foreign destinations, the bills

<sup>33</sup> Maintained by Air HQ (Vayu Bhawan, R.K. Puram and Pt. Deen Dayal Antyodaya Bhawan), Air Force Station (AFS) New Delhi, AFS Palam and PCDA (AF) Dehradun.

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submitted by respective officers were admitted by Senior Accounts Officer of the concerned unit by restricting the same to Air India LTC-80 fare (an Air India scheme for LTC) from origins in India to Indian Embarkation/ stations and back even though the Indian destination stations were not visited. These bills were also not objected by Principal Controller of Defence Accounts (PCDA) (AF) Dehradun during post audit.

Audit thus observed that:

- a) The concerned Station adjutants authorised the LTC of the officers despite knowing about the foreign destination of the journey which were not admissible as per the Travel Regulations.
- b) Though the bill along with other documents submitted by the claimant clearly indicated the journey was direct from origin in India to a foreign destination even without touching the Indian Station, the concerned Accounts Officers passed the bills and the same were paid by the Payment authorities, which was grossly irregular.
- c) While the permissions to visit abroad, granted by Competent authority (of the rank of Air Marshal) clearly stipulated that visit abroad would be at his own expenses and under own arrangement, the same was being violated by lower CFA (Competent Financial Authority) i.e. Air Officer Commanding/ Commanding Officer of the respective units.

Thus permissions for LTC for foreign destinations and payments of the claims up to embarkation/border stations by the respective competent authorities were irregular and in gross violation of provisions of LTC contained in Defence Travel Regulations.

Ministry (Department of Defence) in their reply stated (January 2017) that an internal enquiry on the issue was conducted, wherein it was brought out that there had been ambiguity in the interpretation/ applicability of the rules<sup>34</sup> on the subject. It was further stated that the matter had been taken up for clarification with Controller General of Defence Accounts (CGDA) and MoD (Finance) and directions have been issued by Air HQ to stop payment of such LTC claims till receipt of clarification. It was also stated that a review was carried out to ascertain the quantum of expenditure incurred by IAF during 2010-15 which brought out total 99 cases involving payment of ₹82.58 lakh. MoD further

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<sup>34</sup> Air Force Order (AFO) 318 dated 29 May 1976 based on CGDA clarification on the subject dated 25 September 1963 and 11 February 1965 and subsequent clarification in Para 71 & 72 in CDA (O) 'Pune' Handbook of Travelling Allowances issued in 2009.

