

MINISTRY OF CIVIL AVIATION

CHAPTER II

Air India Limited

Fleet Utilisation and Maintenance

Highlights

The Company did not purchase any new aircraft after 1996 and augmented its fleet with dry leased aircraft since the year 2000 in the absence of effective fleet replacement policy. The utilisation of the available fleet was satisfactory and was more than the industry average as well as the planned hours in most cases. The Company, however, cancelled/rescheduled the flights in 3.05 to 12.04 *per cent* cases and delayed it by more than 20 minutes in 17.35 to 21.87 *per cent* cases during the last three years ended 2004-05. It did not maintain the industry data in regard to adherence to flight schedules for evaluation of its own performance *vis a vis* the other airlines.

(Para 2.4.1 to 2.4.4)

The Company duly carried out various checks on the aircraft to meet the requirements of Director General of Civil Aviation. However, the actual time taken for completion of these checks far exceeded the norms that led to excess grounding of aircraft and consequential loss of potential contribution amounting Rs.93.04 crore based on the loss of flying hours. The Company also resorted to outside agencies, on various grounds, for carrying out the major checks though it had the facilities to do the same in-house. During the last three years ended 2004-05, the Company made meager investment of Rs.6.14 crore in creation of repair and maintenance facility as against the capital budget of Rs.99.98 crore. Due to non-implementation of the schemes as per the capital budget, it incurred an expenditure of Rs.8.21 crore on outside repairs in three cases.

(Para 2.5.1 and 2.5.3)

Gist of Recommendations

For optimal fleet utilisation and proper maintenance of aircraft the Company may consider taking the following measures:

- firm up its future fleet composition and deployment and formalise a policy for its systematic aircraft replacement in order to optimise on maintenance and operating expenditure;
- use specialised software for drawing the flying schedules instead of doing it manually and conduct market surveys periodically to assess/re-assess potential of various routes to improve the service;
- identify accountability centres to minimise flight cancellations, rescheduling and delays which were due to reasons of operational, in-flight and ground handling services;
- properly plan and implement its capital budget to augment its existing facilities for repair and maintenance in order to avoid outside repairs;

- improve upon online information system among its various departments for better planning and coordination in order to avoid excess grounding of aircraft;
- analyse and optimise the manpower requirements on a regular basis, fix man hour standards for all routine maintenance activities, reassess its inventory requirements and reduce its internal processing time in ordering of spares;
- coordinate and initiate joint action along with Airport Authority of India and other civil authorities to reduce the number of incidents; and
- acquire the industry data in regard to flight delays/cancellations/rescheduling and the aircraft incidents and evaluate its performance for necessary corrective action.

2.1 Introduction

2.1.1 Air India Limited (the Company) had a fleet of 36 aircraft as on 31 March 2005, out of which 18 were owned by the Company and remaining were on dry lease*. The Company utilised these aircraft mainly for international flights and a limited number for domestic flights. Fleet composition of the Company as on 31 March of 2003, 2004 and 2005 was as follows:

Table-1: Fleet composition

(In numbers)

Sl. No.	Aircraft type	Average age of aircraft as on 31 March 2005	Fleet Strength					
			As on 31 March 2003		As on 31 March 2004		As on 31 March 2005	
			Owne d	Dry leased	Owne d	Dry leased	Owne d	Dry leased
1.	Boeing 747-200	25	4	-	4	-	2	-
2	Boeing 747-300	16.3	2	-	2	-	2	-
3	Boeing 747-400	12.4	6	1	6	3	6	5
4	Boeing-777-222	6.7	-	-	-	-	-	2
5	Airbus 310-300	15	8	9	8	11	8	11
	Total		20	10	20	14	18	18

Over the last three years while the aircraft taken on dry lease increased from 10 to 18, the owned fleet came down from 20 to 18 on account of disposal of two Boeing 747-200 aircraft. Financial performance of the Company during the last three years ended 31 March 2005 was as highlighted in **Annexure-1**.

2.1.2 Organisational Set-up

* Dry lease means the aircraft taken on lease without the operational and cabin crew and maintenance to be undertaken by company itself.

Operations of the Company were organised and managed through 19 Departments located at Mumbai (Headquarters of the Company) and five Regional Offices located at New York (for USA and Canada), London (for UK and Europe), Tokyo (for Far East), Dubai (for the Middle East & Africa), and Mumbai (for India and Sri Lanka). The Commercial Department of the Company was responsible for drawing the flight schedules for operations, the Planning and International Department for planning especially for fleet acquisition and maintaining international relations and the Engineering and Engine Overhaul Departments carried out the maintenance of aircraft and ensured airworthiness and safety standards.

2.2. *Scope and Objective of Audit*

The purpose of this Performance Audit was to review the utilisation of the fleet and its maintenance by the Company during the period of three years from 2002-03 to 2004-05 with the primary objective of examining:

- (i) whether the available fleet was utilised optimally and
- (ii) whether the maintenance of fleet was carried out effectively and economically to ensure availability of the required fleet for planned operations.

2.3. *Audit Methodology and Acknowledgement*

2.3.1 The records of Commercial, Planning and International, Engineering and Engine Overhaul Departments for the last three years from 2002-03 to 2004-05 were examined in audit. Guidelines issued by Director General of Civil Aviation (DGCA) for maintenance checks, industry data and norms fixed by the Company as well as their compliance was also examined for evaluation of the Company's performance. The issues that emerged during the review process were discussed with the Management for clarification. List of records examined during the audit is given in **Annexure-2**.

2.3.2 Audit takes this opportunity to thank the management and staff of the Company for their co-operation and assistance in the conduct of this performance audit.

2.4 *Audit findings on Fleet Utilisation*

2.4.1 *Fleet acquisition and replacement policy*

2.4.1.1 The Company periodically assessed/reviewed its fleet requirement but did not purchase aircraft to bring efficiency, economy and effectiveness in its operations. It was observed in audit that the last purchase of aircraft by the Company was in 1996. In February 1992, the Ministry of Civil Aviation conveyed its approval to the Company's adoption of 'Ten-Year-Roll Over Policy' in its future fleet planning. While recommending the adoption of this policy, the Company had pointed out that to implement this policy in practice, it would be necessary to (i) drastically overhaul the existing lengthy and cumbersome procedures for the purchase/sale of aircraft in order to exploit the opportunities for profitable aircraft purchases/sales and, (ii) develop requisite in-house expertise in trading of used aircraft. The Company further requested that Board of Directors be given blanket approval to buy/sell aircraft, without Government approval, provided the required investment could be met without any budgetary support from the Government, i.e., through own resources and commercial borrowings. As the two pre-requisites were not put in place, the Company could not implement the above policy and no aircraft was purchased after 1996.

2.4.1.2 In December 1996, the Company submitted a proposal for acquisition of three A310-300 aircraft, which was not cleared by the Ministry on account of availability of excess A320 aircraft with Indian Airlines Limited. Thereafter, even though acquisition of new aircraft was continued to be contemplated by the Company, the process was put on hold in view of the then on-going process of disinvestment. In January 2004, when the Company was finally taken off from the disinvestment list, it again sent a proposal to the Ministry for acquisition of ten Long Range aircraft and eighteen Short Range aircraft as phase-I of their acquisition plan. The Ministry directed (August 2004) the Company to revisit the proposal to offer competitive products with suitable aircraft as the introduction of low cost (low fare) carriers was decided to be carried out under the brand name “Air India Express” through Air India Charters Limited (a subsidiary of the Company) with dry leased aircraft. In April 2005, a proposal to acquire 50 aircraft from M/s Boeing Airplane Company based on competitive bidding was approved by the Board of Directors and forwarded to the Ministry for approval. The Government approved the above proposal in December 2005. Meanwhile, since 2000, the Company took aircraft on dry lease for specific durations and added 18 dry leased aircraft to its fleet. Thus, the Company did not have a clear vision of its long-term fleet composition. As discussed in the subsequent paras it needed to firm up its future fleet composition at the earliest and formalise an aircraft replacement policy in order to optimise its operating and maintenance arrangements.

2.4.2 Flight Scheduling

2.4.2.1 Process of drawing Schedules

The Company drew its schedules of operations twice a year viz., “Summer Schedule” and “Winter Schedule”. The Commercial Department prepared the draft schedules after considering the previous schedules and current market requirements. While drawing the draft flying schedules, the Commercial Department obtained inputs from the Engineering Department regarding various mandatory maintenance checks and from Operations, In-flight Services and Ground Services Departments regarding availability of cockpit crew, cabin crew and ground handling facilities at airports respectively. The draft schedules were discussed in the meeting of the Schedules Committee represented by all the concerned Departments before finalisation of the schedules by the Commercial Department. It was observed in Audit that this procedure was strictly followed and the final Schedules for Summer 2002 to Winter 2004 were drawn in time.

2.4.2.2 Manual Scheduling

Drawing of flight schedules depends on various factors like pattern of operations in previous schedules, market requirements, availability of aircraft, availability of slots at the destination airports, additions/deletions of frequencies depending upon competitors’ strategy, route profitability etc. Being a large Company and the national carrier, the Company had over 25000 flights per annum which were expected to increase further in view of proposed fleet acquisition. It was, however, noticed that the cumbersome process of schedule preparation and revisions was done manually. Taking into account the complexity of procedure, multiple agencies/departments involved and increase in activities, it would have been prudent for the Company to use specialised software for drawing the flight schedules, as was being done by most of the premier International Airlines. The Management while accepting the audit observation stated (November 2005) that the Company might consider acquiring an integrated Planning and Scheduling

Software, after evaluating the various available options, as with acquisition of additional aircraft the scheduling would become too complex to handle manually.

2.4.2.3 Review of routes and market survey

Financial performance of each route was periodically reviewed through discussion with the executives of Scheduling and Marketing Sections of Commercial Department. However, the Company did not conduct any market survey periodically to assess or re-assess the market (route) potential. It considered only performance reports given by Regional Directors/Station Managers for addition or deletions of frequencies. The Company prepared Market Survey Report only before starting any new route, based on the inputs from the Regional Director/Station Manager concerned. During the period from April 2002 to March 2005, the Company prepared such Market Survey Reports in respect of only five new routes, which were added subsequently. The Management agreed (November 2005) with the audit observations and stated that it should conduct market surveys periodically to reassess potential of various routes and also for assessing and improving the service.

2.4.3 Schedule adherence

On time performance is a key indicator of operational performance of an airline. Frequent delays not only harm goodwill of the airline but are also a financial burden.

2.4.3.1 Cancellation and rescheduling

The Company could not adhere to its flying schedules in 3.05 to 12.04 *per cent* cases during the period from Summer 2002 to Winter 2004. It had to cancel the flights in 0.029 to 1.95 *per cent* cases and reschedule the flights in 3.02 to 10.19 *per cent* cases. The cases of cancellation and rescheduling were mainly on account of commercial reasons like poor passenger load factor or closure of airport due to repairs/re-carpeting of runway, etc., engineering factors such as technical snag developed in the aircraft, operational reasons like non-availability of cockpit or cabin crew, VVIP factors like aircraft being used for VVIP movement and miscellaneous factors such as weather problem, restrictions by Air Traffic Controller, etc. as shown in **Annexure-3**. It was observed in audit that the Company had a system of taking corrective action by drawing succeeding schedules in such a way that the number of flight cancellation/rescheduling was reduced considerably. The percentage of cancellation and the rescheduling of flights came down from 1.85 and 10.19 *per cent* respectively in Summer 2003 to 0.029 and 3.02 *per cent* respectively in the Winter 2004.

The Management stated (August 2005) that in Summer 2003, the Company was forced to withdraw its flights for a considerable time due to outbreak of Severe Acute Respiratory Syndrome in South East Asia. It was observed in audit that proper planning and effective accountability system could reduce the flight cancellations/rescheduling, which were due to operational reasons.

2.4.3.2 Flight Delays

Flights were delayed by more than *20 minutes in a large number of cases ranging from 17.35 to 21.87 *per cent* of total flights during the period under review. The reasons for the delays were mainly commercial (delay in identification of baggage, passenger manifest reconciliation etc.), ground services (aircraft handling at airport), operational (delayed arrival of crew), engineering (last minute technical snags developed in the aircraft) and miscellaneous (delay in clearance from Air Traffic Control, Immigration/Custom related issues, weather conditions etc.) as shown in **Annexure-4**.

The Company did not maintain the industry data in regard to the adhering to flight schedules, for evaluation of its own performance *vis a vis* the other airlines. While the delays falling under categories like Commercial, Engineering and Miscellaneous categories were largely unavoidable, the delays due to non-availability of operating crew or cabin crew at the last moment and non availability of ground services could be avoided to some extent by proper planning and effective control system.

2.4.4 Utilisation of Aircraft

The schedule wise planned and actual utilisation of different types of aircraft *vis a vis* the industry average are given below:

Table-2

Average utilisation of aircraft

(in hours per day)

Schedules	Types of Aircraft			
	B747-400	B747-300	B747-200#	A310-300
Summer 2002				
Planned	11.62	9.88	3.04	9.37
Actual	11.10	5.62	4.82	9.35
Excess/(shortage)	(0.52)	(4.26)	1.78	(0.02)
Winter 2002				
Planned	11.60	11.52	3.00	9.50
Actual	12.75	8.36	5.68	9.67
Excess/(shortage)	1.15	(3.16)	2.68	0.17
For the year 2002-03				
Planned	11.61	10.70	3.02	9.44
Actual	11.93	6.99	5.25	9.51
Excess/(shortage)	0.32	(3.71)	2.23	0.07
Industry average	11.70	7.40	7.20	7.20
Summer 2003				
Planned	12.28	10.52	3.25	9.13
Actual	12.36	8.94	5.28	8.92
Excess/(shortage)	0.08	(1.58)	2.03	(0.21)
Winter 2003				

*The '20 minutes' criterion in respect of delays is the practice followed by the Company for past several years. Delayed departure upto '20 minutes' on various accounts is considered as normal and hence not counted against actual delays.

Planned	12.39	10.59	4.06	9.80
Actual	13.09	7.87	6.94	9.96
Excess/(shortage)	0.70	(2.72)	1.88	0.16
For the year 2003-04				
Planned	12.34	10.56	3.66	9.47
Actual	12.73	8.41	6.11	9.44
Excess/(shortage)	0.39	(2.15)	2.45	(0.03)
Industry average	11.20	6.90	7.20	7.30
Summer 2004				
Planned	12.93	10.44	-	9.60
Actual	13.54	7.91	-	9.66
Excess/(shortage)	0.61	(2.53)	-	0.06
Winter 2004				
Planned	13.21	10.58	-	9.54
Actual	13.80	9.38	-	10.04
Excess/(shortage)	0.59	(1.20)	-	0.50
For the year 2004-05				
Planned	12.84	10.50	-	9.94
Actual	13.74	8.61	-	9.80
Excess/(shortage)	0.90	(1.89)	-	(0.14)
Industry average	11.90	7.50	-	7.70

B747-200 aircraft being very old was not considered for operations from Summer 2004 schedule.

It may be observed that the Company achieved the planned utilisation in respect of all aircraft and schedules except in respect of B747-300 aircraft. However, even for B747-300 aircraft, the actual utilisation was more than the industry average, except for the year 2002-03.

The Management stated (August 2005) that the actual utilisation of B747-300 aircraft was lower than the planned hours due to its grounding for maintenance as per the maintenance cycle and on account of sudden technical snags and operational reasons.

Thus, the performance of the Company in planning and utilisation of the available fleet was satisfactory. However, there was scope for the increase in the fleet availability for operations by carrying out the maintenance activity efficiently as highlighted in the succeeding paragraphs.

2.5 Audit findings on Maintenance

2.5.1 Capital expenditure on fleet maintenance

The capital budget *vis a vis* actual expenditure on creation of repair and maintenance facilities during the period from 2002-03 to 2004-05 was as under:

Table-3: Capital Expenditure

(Rs. in crore)

Year	New Schemes	Continuing Schemes
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	Budget	Actual	Budget	Actual
Engineering Department:				
2002-03	5.02	0.05	13.70	1.90
2003-04	4.56	0.19	11.36	1.80
2004-05	3.88	0.04	17.59	0.28
Engine Overhaul Department:				
2002-03	0.46	0.08	14.01	0.72
2003-04	2.85	0.14	13.74	0.33
2004-05	2.00	0.01	10.81	0.60
TOTAL	18.77	0.51	81.21	5.63

It may be seen from the above table that against the budgeted capital expenditure of Rs.99.98 crore for repairs and maintenance facilities during the last three years ended 2004-05, the actual capital expenditure incurred for Engineering Department and Engine Overhaul Department was Rs.6.14 crore only.

The Management stated (November 2005) that the balance budgeted amount for all the three years was deferred mainly due to financial constraints. The reply is not tenable because the above schemes were intended to bring economy and effectiveness in repair and maintenance activities and by deferring the implementation of these schemes, the Company had to incur avoidable expenditure on outside repair as highlighted in the following cases.

(i) Non-procurement of Air Cycle Machines

The Company used to send Air Cycle Machines (ACMs) of B747-300, B747-400 and A-310 types of aircraft for overseas repairs, as the existing ACM Stand was capable of house repair of only B747-200 type of aircraft. In order to reduce the expenditure on overseas repair, an amount of Rs.3.47 crore was sanctioned in the capital budget of the Engineering Department for the year 2000-01 for procurement of Universal Cycle Machine stand. The payback period estimated by the Engineering Department in February 2000 was 2.5 years. However, the Company did not procure the equipment till date on grounds of space constraint. The Company incurred an expenditure of USD 1.50 million (Rs.6.76 crore) on overseas repairs during the period 2002-03 to 2004-05, which could have been avoided had the scheme been implemented as per Plan.

The Management stated (October 2005) that on receipt of details of the equipment it was found that the equipment required a vertical expansion in order to accommodate a part of it but suitable space was not available and, therefore, the proposal was put on hold. The Management's reply reflects lack of proper planning and co-ordination among different units.

(ii) Non-procurement of fuel test rig

Due to limitations of the existing fuel test rig, the refuel/defuel of valves of B-747 and A-310 aircraft were sent outside for testing and repair. In the capital budget for the year 2001-02, an amount of Rs.20 lakh was sanctioned for the procurement of a new fuel test

rig for testing refuel/defuel valves of B-747 and A-310 aircraft. However, Engineering Department did not pursue the matter further for the next two years. Only in the capital budget for the 2004-05 an amount of Rs.68 lakh was again sanctioned towards the cost of the rig of increased capacity. Meanwhile the Company continued to incur expenditure on outside testing/repairs and incurred an expenditure of Rs.1.22 crore during the last three years ended 31 March 2005.

The Management stated (November 2005) that considering the cost of spares and the manpower involved, there was an extra expenditure of only about 10 to 15 *per cent* of the actual cost incurred on outside repair. The fact, however, remains that by not procuring the fuel test rig as per the plan, avoidable expenditure on outside repair was incurred.

(iii) Non- procurement of special tool for overhauling of compressor

In December 2003, Accessories Overhaul Division (AOD) sent a proposal for procurement of special tool used in overhauling of compressors of chiller in A-310 and B-747-200 aircraft at an estimated cost of only Rs.6.83 lakh. The tool was intended to be procured for saving the expenditure being incurred on sending the compressors overseas for repairs. However, till date, the Company did not procure the special tool on the grounds of space constraint and incurred an expenditure of USD 51,696 (Rs.23.26 lakh) during the last three years ended 2004-05 on the overseas repairs in 11 cases in respect of which data was made available to audit.

The Management stated (November 2005) that the equipment could not be procured due to non-availability of the required space for its installation. The Management's reply reflects lack of proper planning and co-ordination among different units.

Recommendation

The Company should properly plan and implement its capital budget to augment its infrastructure maintenance facilities to minimise recurring expenditure on outside repairs.

2.5.2 Revenue expenditure on fleet maintenance

The details of revenue expenditure incurred on repairs and maintenance during the last three years ended March 2005 are given below:

Table –4
Total Revenue Expenditure on Maintenance
(Rs. in crore)

Year	Size of Fleet	Operating Expenditure	Expenditure on fleet maintenance					Percentage of outside repairs to Total (6/8)	Percentage of Exp on fleet maint. to Operating exp. (8/3)
			Pay & Allow.	Material	Out-side repairs	Other exp.	Total		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2002-03	30	5465.63	206.37	282.57	135.94	32.66	657.54	20.67	12.03
2003-04	34	6104.24	217.68	279.16	144.47	34.70	676.01	21.37	11.07
2004-05	36	7538.88	217.50	394.01	118.56	42.24	772.31	15.35	10.24

It may be seen that the expenditure on fleet repair and maintenance in proportion to operating expenditure had been decreasing. The decrease in in-house maintenance expenditure was due to the following reasons:

- (i) Grounding of old B-747-200 aircraft during the last three years and sale of old A-300 aircraft which had incurred higher maintenance expenditure in the past;
- (ii) Induction of more new leased aircraft in the fleet and consequent reduction in in-house maintenance expenditure and,
- (iii) No proportionate increase in the technical staff against retirement/resignation *vis-à-vis* increase in the fleet size.

2.5.3 Utilisation of maintenance facility

Fleet maintenance carried out by Engineering Departments and Engine Overhaul Department was a key factor in determining the reliability and safety of fleet/passengers. Any inefficiency in the maintenance of the fleet also resulted in delays/cancellations of flights and consequent loss of goodwill, besides financial loss to the Company on account of operating revenue and maintenance cost. All the maintenance and overhaul facilities were located around Chhatrapati Shivaji International Airport, Mumbai and the maintenance of aircraft was carried out as per DGCA's prescribed maintenance schedule.

Engineering Department and Engine Overhaul Department comprised eight shops, *viz.*, Major Maintenance Division (MMD), Accessories Overhaul Division (AOD), Components Overhaul Division (COD), Instruments Overhaul Division (IOD), Electronics Overhaul Division (EOD), Line Maintenance Division (LMD) Equipments Facilities Division (EFD) and JET shop. These shops carried out all the repair work and necessary periodic checks on the aircraft.

2.5.3.1 Shop performance

The number of items of work which were awaiting completion or pending for want of spares in the various shops, at the end of the last three years ended March 2005, was as under:

Table-5

Shop performance (No. of pending work orders)

Shop	Year	Opening Balance	Receipts	Completion	Backlog* (Closing Stock)	Withdrawn
AOD	2002-03	1126	12393	11954	1565	677
	2003-04	1565	13144	13111	1598	329
	2004-05	1598	12692	13462	828	305
IOD	2002-03	569	6875	6900	544	127
	2003-04	544	6321	6389	476	166
	2004-05	476	5958	6002	432	73
EOD	2002-03	328	6147	6179	296	179
	2003-04	296	7348	7392	252	106
	2004-05	252	7524	7470	306	126
COD	2002-03	1626	12670	13284	1012	602
	2003-04	1012	12374	12394	992	435
	2004-05	992	12504	12500	996	293

It is evident from above that every year all the shops showed considerable backlog as well as withdrawn (*i.e.*, pending for want of spares) work orders. The Management stated (November 2005) that there would always be a backlog of unserviceable components in the pipeline awaiting repair for completion and certification, which could be around 3-4 weeks of production including around 30 *per cent* for want of spares. The Management added that shortage of manpower also contributed to some backlog. The reply, however, indicated a need to improve upon manpower planning and inventory control.

Recommendation

The Company should fix the productivity norms for routine maintenance activities, reassess its inventory requirements and reduce its internal processing time in ordering of spares.

2.5.3.2 Loss of contribution due to delay in completion of checks

Production Planning Division (PPD) of Engineering Department was responsible for planning and implementing the scheduled maintenance/checks of the aircraft to meet the requirements of DGCA. This included major jobs like landing gear change, thrust reverse replacement, aircraft painting, weighing, cabin refurbishment, corporate modification etc. Days planned (norms) for grounding of aircraft were decided on the basis of statistical data of actual time taken for various checks/major repair jobs in the past and the proposed workload.

It was observed in audit that during the years 2002-03 to 2004-05 the actual days of grounding of aircraft for the scheduled maintenance/checks far exceeded the planned

* Backlog includes withdrawn and withdrawn means pending for want of spares.

grounding days due to shortage of spares (31 cases), limited manpower (6 cases), work starting late (32 cases) and multiple aircraft on the ground for checks (4 cases). The following table shows the cases where excess time of more than 20 days was taken over the planned days during last three years ended 2004-05.

Table-6

Excess time taken for aircraft maintenance work

Sr. No.	Aircraft	Check type	Plan Days	Actual Days	Excess Days	Reasons as per internal report
2002-03						
1.	VT-EJG	C	47	97	50	Shortage of spares
2.	VT-EPW	W+C	55	81	26	Delay in issue of transmission Assemblies – Non-availability of Engine
3.	VT-EJH	W+C	58	102	44	Transfer of spares to other aircraft and diversion of manpower
4.	VT-EJJ	C	67	90	23	Shortage of spares
5.	VT-EPX	C	38	66	28	Not mentioned in Report
6.	VT-EJI	C	32	62	30	Not mentioned in Report
7.	VT-EJK	C	40	69	29	Delay at Major Maintenance Shop
8.	VT-EVH	C	44	65	21	Shortage of spares.
2003-04						
1.	VT-EJK	C	40	97	57	Shortage of spares and manpower.
2.	VT-ESN	C	37	64	27	Shortage of spares.
3.	VT-EJL	C	27	104	77	Shortage of spares.
4.	VT-EVU	A	3	41	38	Shortage of spares.
5.	VT-EVF	A	3	23	20	Shortage of spares.
6.	VT-EGB	4A	13	46	33	Unplanned additional workload
2004-05						
1.	VT-EPX	C	34	54	20	Multiple aircraft on ground and shortages of spares
2.	VT-EJI	C	31	94	63	Unplanned additional work load and fuel leak
3.	VT-EGA	4A	13	36	23	Unplanned additional work load
4.	VT-EJL	C	63	90	27	Shortage of spares and fuel leak.

It may be seen that the excess time was taken in carrying out the ‘C’ checks[♥] in maximum cases. Out of 48 ‘C’ checks carried out during the last three years ended March 2005, there was delay of more than 20 days in 14 cases. This led to excess grounding of aircraft and adversely affected the fleet availability as well as adherence to the flight schedules. The loss of contribution due to the excess grounding of aircraft during years

[♥]The checks were required to be statutorily carried out by the Company after completion of the flying hours as prescribed by DGCA for each type of aircraft.

2002-03 and 2003-04 was estimated at Rs.93.04 crore based on the loss of flying hours as shown in **Annexure-5**.

The Management stated (November 2005) that the planning of maintenance work was done on the basis of certain assumptions, but the maintenance as per the plan could not be carried out due to extensive unplanned work, non-availability of spares, diversion of manpower to other works and induction of more leased aircraft. The reply, however, reflected lack of proper coordination and inadequate online information flow among various divisions of the Company.

The Management further stated that there was no significant disturbance to flight schedules as a result of the excess grounding because its revenue services were adjusted among the remaining A310 and B747 aircraft, which was a normal airline practice. The Management's reply is not tenable as the excess grounding affected the overall fleet availability for operations and the Company required to take adequate measures to tide over the bottlenecks in maintenance work for optimal availability and utilisation of the fleet.

2.5.3.3 Major maintenance of aircraft carried out outside India

The outside repair and maintenance was generally resorted to only if there did not exist in-house facility or if the operation was not economical. During the last three years ended March 2005, the Company sent 13 aircraft for overseas repairs and spent US\$12.75 million (Rs.57.37 crore) on major maintenance such as 'C' and 'D' checks. It was observed in audit that the Company had the capacity to carry out simultaneously two 'C' checks and one '4A' check, besides carrying out minor checks. The Company carried out the following in-house 'C' checks during last three years:

Table-7

Number of major checks ('C' checks)

Year	In house	External	Reasons for external check
2002-03	14	5	Two leased aircraft as per lessor's requirement. One leased aircraft and two owned aircraft on grounds of capacity constraints.
2003-04	15	3	Two leased aircraft and one owned aircraft on grounds of capacity constraints.
2004-05	9	2	As per lessor's requirement in the agreement.

It may be seen from above that against 14 and 15 'C' checks carried out in-house during 2002-03 and 2003-04 respectively, only nine were carried out during 2004-05. The under-utilisation of the major maintenance facilities during 2004-05 was mainly due to phasing out of four owned aircraft and introduction of four new leased aircraft that reduced the requirement of 'C' checks. In some cases the lessor required the various checks to be carried out only by approved external parties as per agreement and thus in spite of having sufficient in-house capacity to carry out major checks, the Company had to send the aircraft to overseas parties for the checks. Also, one 'C' check was postponed during 2004-05 due to utilisation of the aircraft for Haj operations. Further, in April 2005, the Board of Directors of the Company approved a proposal for sending nine aircraft for

major repairs to overseas parties at an estimated cost of US\$18 million (Rs.81 crore) mainly on the grounds of in-house capacity constraints.

The Management stated (November 2005) that the aircraft were sent for outside repairs due to (i) multiple aircraft falling due for major check during a shorter period, (ii) rapid induction of additional dry lease aircraft and no proportionate induction of additional and adequately qualified manpower, (iii) increased Haj operations by own fleet and manpower instead of outsourcing of the fleet, (iv) shifting of manpower from major maintenance to on-line maintenance on account of increase in number of stations and flight frequency and (v) shortage of spares in case of leased aircraft.

The reply is not tenable as these are managerial problems and should have been resolved with proper planning and coordination among its various departments. In order to meet the depletion in manpower of trained and qualified technical personnel due to superannuation, retirement, resignations etc., the Company recruited 53 graduate engineering trainees and 306 trainee service engineers during the year 2004-05. Other than this, the Management had not undertaken any scientific study for reassessing the requirement of technical personnel and no concerted study was conducted on utilisation and additional requirement of maintenance facilities.

2.5.4 Repeated repairs carried out at external facilities

A scrutiny of records revealed that the Company sent the following items several times to overseas parties for repairs during the years 2003-04 and 2004-05 as detailed below:

Table-8:

Repeated repair orders

Part No. and Purchase order No.	2003-04		2004-05	
	No. of occasions parts were sent to overseas repairs	Total cost (USD)	No. of occasions parts were sent to overseas repairs	Total cost (USD)
Nozzles				
9373M80 G25/35	6	305,500	7	385,900
1881M20G27/39/15	12	1,188,000	21	1,567,800
2080M19G27/19/07/01/25	6	488,800	16	1,319,100
1646M18G13	1	28,800	-	-
1713M88G19/15	4	381,600	-	-
9212M86G13/17/29/15	4	124,800	-	-
Diffuser case				
50J779	7	229,000	5	170,000
50J036	1	34,000	1	34,000
Flight augmentation computer				
B352AAMI	13	709,787	-	-

The Management stated (November 2005) that the Engineering Department did not have the capacity to carry out these modifications and hence outside repair was resorted to.

The reply indicated that the Company neither explored the alternative repair facility within the country nor carried out any cost benefit analysis for creation of the in-house facility for these repeated repairs.

2.5.5 Excess grounding due to cannibalisation of spares

Removal of items to satisfy the need of another aircraft or items is known as cannibalisation of spares. During cannibalisation, spares are transferred from an aircraft undergoing maintenance check to another aircraft scheduled for operation. This is generally done in the absence of spares in stores. A scrutiny of transfer listing record showed the following during the years 2003-04 and 2004-05.

Table- 9
Number of cannibalisation

Particulars	2003-04	2004-05
Transfer for maintenance convenience	292	521
Total transfers	1299	1602
Percentage of transfer for maintenance convenience to total transfers	22.48	32.52

It may be seen that the instances of transfer including those made for maintenance convenience (i.e despite availability of spares in stores) increased considerably in the year 2004-05. Cannibalisation of spares required extra manpower as spares had to be removed from one aircraft by authorised engineers and fitted to another aircraft. In some cases instead of speeding up the work, the transfer of spares resulted in deviation/delay from planned grounding days for maintenance. A few such instances are listed below:

Table- 10
Impact of cannibalisation of spares

Name of aircraft	Particulars
VT-EPW	4A check done from 7-9-2003 to 25-9-2003 was delayed by 10 days as LH I/B midflap was transferred to VT-EGC
VT-EVG	3 A+ CDM check done from 2-10-2003 to 23-10-2003 was delayed by 11 days due to transfer of spares to VT-EQS
VT-EVH	3A+CDM check from 15-10-2003 to 4-11-2003 was delayed by 7 days due to transfer of spares to VT-EVG

The Management stated (November 2005) that cannibalisation was done to avoid delay in meeting the urgent requirement of the operating aircraft and the same was as per the industry practice. This practice also helped keeping the high cost spares inventory to an optimum level. However, the reply did not explain the justification for cannibalisations in the above three cases.

2.5.6 Man power analysis

The position of standard force as against actual strength in Engineering Department and Engine Overhaul Departments for the last three years ended March 2005 is shown below:

Table-11

Manpower position

Category of staff	Year	Vacancy (Sanctioned strength)*			Percentage of vacancy to sanctioned strength
		Engineering Department	Engine Overhaul Department	Total	
Aircraft Maintenance Engineers	2002-03	33 (475)	11 (87)	44 (562)	7.83
	2003-04	35 (475)	11 (87)	46 (562)	8.18
	2004-05	-3 (475)	8 (87)	5 (562)	0.89
Service Engineers	2002-03	170 (1455)	51 (303)	221 (1758)	12.57
	2003-04	280 (1455)	69 (303)	349 (1758)	19.85
	2004-05	4 (1455)	81 (303)	85 (1758)	4.84
Technical Assistants	2002-03	59 (373)	15 (87)	74 (460)	16.08
	2003-04	65 (373)	19 (87)	84 (460)	18.26
	2004-05	75 (373)	21 (87)	96 (460)	20.86

* Sanctioned strength was fixed in 1997.

It may be seen that there was shortage of technical manpower during the last three years ended March 2005. Human Resource Department (HRD) of the Company had fixed the standard force way back in 1997, which had not been revised till date (November 2005) as no comprehensive study was conducted to assess the long-term requirements of manpower. The Engineering Department and Engine Overhaul Departments had conducted only a limited review of the manpower requirement considering the expansion, change in fleet composition and depletion of trained manpower due to retirements and it submitted a proposal for induction of additional manpower in July 2001, which was sanctioned only partially.

The Management stated (November 2005) that manpower issue was taken up with HRD regularly at the highest level but detailed exercise of manpower requirement was not carried out, as the fleet composition changed frequently in the recent past and future composition was not clear. Hence, the recruitment was done on an interim basis to meet the flight operational requirements only.

The lack of adequate manpower study and consequent shortage of technical manpower thus adversely affected the aircraft maintenance work time and again. With the process of acquisition of 50 aircraft under way, the future composition of the fleet was expected to be clearer and the Company would be required to take corrective action to address the imbalance.

2.5.7 Air Safety

2.5.7.1 An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft and disembarks, in which any person suffers death or serious injury or the aircraft incurs damage or failure which adversely affects the structural strength performance or flight characteristics of the aircraft and which would normally require major repair or replacement of the affected component is called accident. No accidents took place during the review period.

2.5.7.2 An incident is an occurrence other than an accident associated with the operation of an aircraft or could affect the safety of operations. Aircraft Rules, 1937 require notification of incidents such as damage to an aircraft, injury to a person etc. to DGCA by the airlines within 48 hours of the occurrence. During the period 2002 to 2004, 439

incidents occurred and the Company incurred an expenditure of Rs.62.29 crore on rectification as a result of the incidents as shown in the table below. In addition, the higher number of incidents led to higher rate of premium for insurance of aircraft. The Company was required to investigate all cases of incidents, which was done by its Air Safety Department. Number of incidents occurred during the last three years ended December 2004 are given below:

Table-12
Number of Incidents

	2002	2003	2004
1. Ground Incidents	10	14	15
2. Incidents (e.g., Precautionary landing/abandoned take off etc.)	8	8	5
3. Tyre capping coming of incidents	---	1	---
4. Tyre burst incidents	--	4	2
5. Bird hit including bird ingestion	24	30	27
6. Others (fuel spillage, windshield problem etc.)	93	105	93
Total	135	162	142
7. Expenditure incurred on rectification (Rs. in crore)	3.74	23.19	35.36

The position of incidents per 10000 hours of flight for the last three years ending December 2004 is indicated below:

Table-13:

Aircraft-wise incidents (in number of per 10000 hours of flight)

Type of Aircraft	2002	2003	2004	Average
B-747-300	24.35	30.95	28.01	27.77
B-747-400	9.48	15.27	14.17	12.97
A-310	16.5	13.2	13.26	14.32

From the above, it is seen that the incidents per 10000 hrs of flight were highest for B747-300 type of aircraft. Further scrutiny of the incidents to B747-300 aircraft revealed that incidents of fuel spillage while fuelling/refuelling from vent scoop / surge tank were frequent.

The Management stated (November 2005) that incidents due to bird hit and most of the ground incidents were beyond the control of the Company and the rectifications carried out by the Engineering wing were mainly due to these incidents. However, the Management did not explain the high incidence of incident in B747-300 aircraft. Due to non-availability of comparable industry data with the Company, its performance *vis a vis* the industry average in regard to the incidents could not be evaluated in Audit.

2.5.7.3 Action taken after Incidents

Air Safety measures in an airline company could be analysed through review of action taken on incidents/accidents. Test scrutiny of investigation reports of the Company on the incidents for the year 2003 revealed as under:

Date of incident/ Type of aircraft	Incident details	Investigation findings
31.10.2003 A-310	Fillet panel '471AL' located at forward end of out board side of LH pylon was ripped off and new panel had to be installed.	Most probable cause for the incident was improper installation of panel. The fillet panel P/N- A545152750040 was removed for inspection during "3A" check on 29.10.03
18.08.2003/ A-310	During take off engine throttle malfunctioned. Take off was abandoned and aircraft returned to bay.	Most probable cause for the engine throttle malfunction was interference by some foreign object lodged inside throttle control drum during installation in "C" check. A/c VT-EQT had undergone "C" check just prior to the incident flight. The said incident occurred on the second sector operated after "C" check.
25.02.2003/ B747-200	During take off roll, side clews from number 2 engine departed and the cowlings dropped on the runway. Another aircraft that landed on the same runway sustained substantial damages due to presence of side cowl pieces on runway.	Most probable cause for the departure of cowlings was improper latching of the cowls.

Investigation findings revealed that better maintenance could have prevented the occurrence of certain incidents, indicating scope for further improvement in safety standards and eventual reduction in maintenance costs.

The Management while accepting the above facts stated (November 2005) that in the above three cases appropriate punishment/warning letters were issued to the errant personnel. The Management also accepted that there was a scope for improvement to reduce the number of incidents, which were due to human error or deficiency in the system. It was observed in audit that there was also a need for vigorous efforts to coordinate with other agencies (such as airport authorities, civil authorities etc) to reduce number of incidents due to bird hit and ground incidents.

2.6 Conclusions

- (i) For the last several years, the Company did not have a clear vision of its long-term fleet composition due to infirmity till January 2004 in regard to its disinvestments by the Government and the non-implementation of 'Ten Year Roll Over Policy' for future fleet planning. As a result of the unclear vision of the future fleet composition, the requirements of manpower and inventory for repair and maintenance could not be ascertained in a systematic way and impacted the fleet maintenance and availability. However, with the proposed acquisition of 50

aircraft in phases under way, the fleet composition on long-term basis was expected to be clearer.

- (ii) The flight schedules were drawn in time and finalised as per the prescribed system. However, despite being a large airline carrier, the Company continued to draw/finalise the flight schedules manually and market surveys were not conducted to periodically assess/reassess the market potential on various routes.
- (iii) The utilisation of the aircraft in terms of flown hours per day was more than the industry average as well as planned hours in most cases and the Company had appropriate system for taking corrective action for non-adherence to flight schedules. The performance in regard to the flight cancellation/rescheduling and delays could not be evaluated due to non-availability of industry data with the Company. However, there was scope for improvement by proper planning and effective control where the delays were due to operational, in-flight or ground handling services reasons.
- (iv) Non-procurement of certain equipment despite fund availability in the capital budget resulted in avoidable expenditure of Rs.8.21 crore on outside repairs in three cases during the last three years ended March 2005. There was consistent backlog in various internal maintenance shops due to shortage of manpower and spares. The Company also did not explore new areas for creation of in-house repair and maintenance facilities despite cases of repeated repairs at external facilities.
- (v) Though the Company had fixed norms for completion of various checks and carried out all the checks as per DGCA's requirements, the actual time taken for completion of the checks far exceeded the planned days and resulted in loss of flying hours valued at Rs.93.04 crore based on loss of contribution per flying hour.
- (vi) Despite having in-house capabilities, a number of major checks were carried out outside at a cost of Rs.57.37 crore during the last three years ended March 2005 due to lack of proper planning and coordination among various departments.
- (vii) Manpower analysis was not done regularly despite increase in the number aircraft deployed by the Company. Cannibalisation of spares for maintenance convenience led to excess grounding of aircraft in three cases.
- (viii) In regard to air safety performance, no case of accident was noticed during the last three years. However, there was scope for reduction in number of incidents. The Company did not have industry data for evaluating its performance on the safety aspects.

2.7 Auditee's response

The Company stated (November 2005) that the Audit recommendations had been noted and it would take suitable and necessary action wherever possible after carrying out due process of laid down procedures, necessary cost benefit analysis, improving productivity through use of information technology systems and using industry practice and benchmarks wherever available for further improvement.

The review was issued to the Ministry in January 2006; its reply was awaited (February 2006).