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A report on the civil aviation  
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**A REPORT ON  
THE CIVIL AVIATION SECTOR IN INDIA**

**\* AIRPORTS \***

Canadian High Commission  
New Delhi  
July 7, 1993



## TABLE OF CONTENTS

	Page
Introduction	2
Airport Authorities	3
Domestic and International Traffic	3
Expected Policy Changes	4
Policy Direction	4
Rationalization of Airport Operations	5
Privatization of Airports	5
Budget	6
Major Projects	6
IAAI Projects	7
Bombay	7
Model Airports	7
New International Airports	8
Gateway Airport	9
Air Traffic Management and Navigation Systems	9
Other Development Projects	10
Airport Security	11
Doing Business with Indian Airports	11

## APPENDICES

- A. International Airports Authority of India
- B. Developments made at International Airports
- C. National Airports Authority
- D. Developments made at Domestic Airports
- E. Air Space Management
- F. The State of India's Airports
- G. Government Procurement and Tendering Practices
- H. Useful Contacts in India and Canada

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## INTRODUCTION

This report was commissioned and researched for the Canadian High Commission, New Delhi, by Fairwood Consultants Limited in March-June 1993. Concurrent reports have also been prepared on the civil and military aviation sectors in India. Together, the three reports provide a comprehensive overview of the Indian aviation sector. It is hoped that these reports will provide the Canadian aerospace industry with an introduction to the Indian aviation sector and an indication of the market potential that exists.

In July 1991, the government of Prime Minister Narasimha Rao introduced a dramatic program of economic, industrial and trade liberalization, which, with subsequent government budgets, has resulted in: the virtual dismantling of the famous industrial "license Raj"; the elimination of restrictive foreign exchange controls; the delicensing of import and export activities; and the full convertibility of the Indian rupee on the trade account.

Although the reform process is not yet complete, India has made dramatic strides that now offer tremendous opportunities for Canadian companies in India, both as an export destination and as a partner for industrial collaboration. Canadian business has already begun to take advantage of India's economic liberalization. In 1992, Canadian exports to India were up 75% (48% when a large wheat sale is discounted). Canadian companies also entered into 22 technology transfer or joint venture agreements in 1992.

The aviation sector has not been immune to this process of liberalization. In the past two years, 10 private airlines have commenced operations. In the next session of Parliament, the Government is likely to introduce legislation to merge the two airports authorities, as well as to enact a new Air Corporations Act. For India to take full advantage of its economic reforms and more closely integrate itself into the world economy, its airports must be able to handle increased passenger and cargo traffic. International and domestic passenger traffic are projected respectively to growth by 12% and 9% annually over the next decade. To handle this demand India plans to modernize and expand its current airports and build new ones, and to improve its air navigation system:

- \* By early next century, new airports are to be built in Bombay, Bangalore and Cochin;
- \* Another 12 regional airports are to be upgraded by 1995 under a Rs. 3.5 billion model airports plan<sup>1</sup>;
- \* Close to Rs. 5.0 billion has been earmarked to upgrade air traffic and navigation facilities;
- \* An ambitious Rs. 10 billion plan has been drawn up to upgrade India's air navigation system to meet FANS standards by 2010;
- \* The Government is considering developing the international airport at Delhi into a gateway airport for South Asia; and
- \* The Government is planning to upgrade the security systems at Indian airports.

Canadian consultants and airport developers will find increasing opportunities in India, but they may also be expected to arrange project financing. Canadian equipment manufacturers will also be able to benefit from the expansion and modernization of airports in India. In March 1993, Raytheon Canada secured a \$ 23 million contract to provide air traffic control radars for the Bombay and Delhi international airports. However, it must be mentioned that all but the most sophisticated airport equipment is manufactured locally, most of it through technology transfers, licensing agreements or joint ventures. Canadian aviation equipment manufacturers seriously interested in this market will likely have to consider this option to take full advantage of the opportunities available in India. The first real opportunity to get a first hand view of the Indian aviation sector is at the AVIA India Airshow, which will be held December 15-18, 1993 in Bangalore (see page 11 for contact details).

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<sup>1</sup> At the time of printing the exchange rate of the Indian Rupee to the Canadian Dollar was Rs. 24.03 = CAD 1.

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## AIRPORT AUTHORITIES

In a country the size of India, where major industrial and commercial centres are spread out and surface transport is inhibited by poor roads, rough terrain and severe climatic conditions, air transport assumes significant economic and social importance.

As in most countries, civil aviation in India is a federal responsibility. The Central Government, through the Ministry of Civil Aviation and Tourism, frames policy guidelines and exercises executive control. The management of airports and air space in India is carried out by two government bodies: the International Airports Authority of India and the National Airports Authority.

The International Airports Authority of India (IAAI), established in 1971, is responsible for the development and operation of India's five international airports at Bombay, Calcutta, Delhi, Madras and Trivandrum. An IATA Working Group, which closely examined the airport facilities (most of which were built in the 1960s) has suggested that the capacity of the international terminals could be increased by 35 % if facilitation procedures for passengers and cargo were improved. There is also scope for making technological improvements in other areas of airport operations as well. The IAAI also has a mandate to provide consultancy services for airport developments in India and abroad. The areas of jurisdiction of the IAAI are outlined in Appendix A, and a short note on the developments made by the IAAI at the international airports is given in Appendix B.

In 1985, the National Airports Authority (NAA) was created out of the Directorate General of Civil Aviation (DGCA). The NAA manages a vast network of 88 domestic airports and civil enclaves at 28 defence airports. India's airport network is the sixth largest in the world in terms of airports with scheduled airline services. The NAA is also responsible for air space management, provision of air traffic services, aeronautical communication, navigation aids and meteorological services at airports under its jurisdiction, as well as those under the jurisdiction of the IAAI. The areas of jurisdiction of the NAA are outlined in Appendix C and a short note on the developments made in the last six years by the NAA at domestic airports is given at Appendix D.

## DOMESTIC AND INTERNATIONAL TRAFFIC

In 1988, a Working Group appointed by the Government of India Planning Commission categorized India's airports as follows:

- a) 5 International Airports: Bombay, Calcutta, Delhi, Madras and Trivandrum.
- b) 7 Restricted International Airports: Amritsar, Bangalore, Goa, Hyderabad, Patna, Tiruchirapalli and Varanasi.
- c) 7 Major Domestic Airports: Agartala, Ahmedabad, Cochin, Guwahati, Jaipur, Lucknow and Srinagar.
- d) Minor Domestic Airports: Agra, Aurangabad, Belgaum, Bhubaneswar, Coimbatore, Imphal, Jabalpur, Khajuraho, Mangalore, Nagpur, Port Blair, Raipur, Rajkot, Ranchi, Tirupati and Udaipur.

Foreign carriers operate scheduled services from all five international airports. In addition, Air India and Indian Airlines operate limited international flights to neighbouring countries from the seven restricted international airports. Foreign charter flights are permitted to land at any of the international or restricted international airports. It is worth noting that airports listed in a), b) and c) above handle 100% of India's international and 80% of its domestic traffic, while a number of other airports only receive one flight per day, and some others only 2 or 3 flights per week.

All five international airports have comparatively good traffic density. The restricted international and the major domestic airports have good traffic density, and the 16 minor domestic airports have sufficient density to justify additional development.

Out of 116 airports wholly or partly managed by the NAA, 57 receive Indian Airlines flights and 43 receive Vayudoot flights (In May 1993, Vayudoot was merged into Indian Airlines). The NAA assesses that only 25% to 30% of the airports receiving Indian Airlines flights have adequate traffic density to make them financially viable. In 1992, domestic passenger traffic was approximately 18.6 million. This was down from a peak of 21 million in 1989. In 1992, 98% of domestic traffic was handled by Indian Airlines. This percentage has now dropped to 90%, as private air taxi operators have made their presence felt.

Forty international airlines operate scheduled passenger service to India. Approximately 56% of domestic traffic is handled at IAAI airports. In 1992, the five international airports handled 18.7 million passengers, of which 8.2 million were international passengers. Another 180,000 international passengers were handled at airports under NAA jurisdiction. These traffic figures are down from the peaks of 19.9 million total passengers in 1989 and 8.22 million international passengers in 1988.

The above traffic figures, however, must take into account disruptions to domestic and international traffic from 1990 to 1992. In the wake of the Gulf War and global economic recession, international travel suffered dramatically and is only now starting to rebound. In India, strikes by pilots and engineers at Indian Airlines and Air India, and communal unrest have contributed to fewer travellers, especially in the tourist segment.

In a recently-completed detailed analysis of traffic trends, the IAAI has projected an annual growth rate of 11-12% for domestic traffic and approximately 9% for international traffic over the next decade. By 2000, total domestic and international traffic is projected to be 60 and 28 million passengers respectively.

For international cargo, IAAI projects that growth will be in the range of 14% per annum. There is currently five times as much air cargo being shipped out of India as is being imported. This trend is likely to become more pronounced over the short term as India expands its exports of products such as electronics, fresh fruit and flowers, and garments. To meet the rising demand, the Government has implemented a policy of granting operating licences for cargo carriers on an almost automatic basis.

As the Indian economy continues to expand, there is likely to be a decentralization of industry outside of the major commercial centres. These cities are served by smaller airports and have infrequent flights. While the runways and air space are adequate to meet increased flights, there is a need to upgrade the passenger, baggage and cargo handling facilities. It is probably accurate to say that the inverse is true for the major airports.

## EXPECTED POLICY CHANGES

### Policy Direction

In 1988, the Planning Commission of the Government of India constituted a Working Group to prepare a report on "Upgradation of Infrastructure at Airports". In a note dated 29th April, 1988 appointing the Group, one gets a glimpse of the Government's thinking on the subject:

- a) There ought to be greater involvement of the private sector in airport development.
- b) There is need for long term planning beyond the five year period; the time horizon suggested 10 to 15 years.
- c) Airports require technological upgradation.
- d) Some airports should be selected and developed to relieve the pressure on the present international airports.
- e) Airport management should strive toward financial self-sufficiency."



### Rationalization of Airport Operations

Over the years, the development of major airports like Bombay and Delhi has been lopsided. While the terminal facilities have improved, navigation, communication and landing aids have not been upgraded to the same degree. These two airports should be able to handle 40 aircraft movements per hour instead of 20 at present. It is in this context that a merger of IAAI and NAA has been suggested. The protagonists of the merger maintain that a unified authority would be more accountable, it could put limited funds to more judicious use and the expertise gained by IAAI in planning, designing and constructing airports could be made available to domestic airports.

There is a bill pending in the Indian Parliament - The Airports Authority Act, 1993 - that would see the merger of the two airport authorities. Indications are that the proposed Airports Authority Act would apply to all civil airports in the country. The assets of both the IAAI and the NAA would be vested in a new Airports Authority, which would be formed by a merger of two. The rationale for the merger is that it would provide for a better balance of the high revenues earned from international flights with the large expense outlays necessary to maintain India's aviation infrastructure.

The merger proposal has recently been approved by Cabinet. As such, with the resignation of the IAAI Chairman on June 25, a new Chairman was not appointed, but rather the current NAA Chairman was given additional responsibility for the IAAI. The Government is now finalizing the legislation and appears to be keen on introducing the Bill in the monsoon session of Parliament (mid-July to mid-August).

There may be, however, some stumbling blocks to merging the two organizations. The IAAI Employees Union is not in favour of the bill as it may affect the career prospects of its members. There would also be difficulties in introducing uniform pay scales and allowances in the two organizations and in determining the relative seniority of staff. Another option may be to form a holding company. This would allow a better utilization of resources without having to merge the two organizations, and avoid the difficult issues of personnel management and corporate culture differences.

### Privatisation of Airports

No study has been carried out in India to determine how much cities stand to gain by the development of airports. It may, therefore, be difficult to persuade business and commercial interests to share the cost of airport development. Furthermore, the NAA's financial results have not been good enough for its shares to command a good price on the market. In February 1993, the Civil Aviation Minister stated that an interdepartmental committee had been constituted to identify areas where private sector participation could be enlisted to supplement the development plans of the NAA and the IAAI. While there has been a lot of discussion, there is little likelihood of the Government privatising airports at this stage. However, with a resource shortage and increasing demand, there is going to be pressure on the Government to find alternative financing arrangements. The inevitable result may be some form of privatization. It has been suggested that the IAAI's budget shortfall to carry out planned projects may be as much as two-thirds, i.e. Rs 21 billion as opposed a budget allocation of Rs 7.31 billion. In this context, the IAAI and the NAA may opt for privately developed and operated facilities, such as Terminal III at Pearson International Airport in Toronto.

## BUDGET

With limited budgetary support provided under the Government of India's Eighth Five Year Plan (Fiscal Year 1992-93 to 1997-98), both the NAA and the IAAI must generate their own resources for operations and capital investment. Of a total planned expenditure of Rs. 40 billion for civil aviation under the 8th Five Year Plan, only Rs. 1.07 billion is budgetary support from the Government. The NAA derives 70% of its revenue from route navigational facility charges, which are paid by any aircraft using en route or landing aids over Indian air space. The Defence Forces, Paramilitary Forces, Customs and Coast Guard are major users of NAA facilities, but do not pay for them. The NAA is considering demanding payment from these users. Another 11% of revenue comes from landing and parking fees, and 3% from terminal navigation landing charges.

The NAA made a profit of Rs. 210 million during April-December 1992 against Rs. 80 million in the corresponding period of the previous year. The NAA has estimated capital investment of Rs. 8.35 billion for the Eighth Five Year Plan. It is confident of being able to mobilise Rs. 4.52 billion, leaving a gap of Rs. 3.83 billion.

In May 1993, the Chairman announced that the NAA would spend in excess of Rs. 7.5 billion over the next three years to modernize the Delhi and Bombay airports, as well as the 12 Model Airports.

Under the Eighth Five Year Plan, the IAAI's budgeted investment for international airports is Rs. 7.31 billion, out of which Rs. 3.5 billion is for passenger terminals and Rs. 0.29 billion for cargo terminals. For the Ninth Five Year Plan, the financial outlay is Rs. 8.94 billion (Rs. 6.29 billion for passenger and Rs. 0.37 billion for cargo facilities). After internal revenue generation there is an uncovered gap of Rs. 1.25 billion in the Eighth Plan and Rs. 1.75 billion in the Ninth Plan.

## MAJOR PROJECTS

Ground facilities and infrastructure at most of India's airports are inadequate. There is not enough hangars, aircraft parking space or reservation counter space. Facilities have not been improved for years. Most airports do not have basic navigation equipment such as Instrument Landing Systems (only 20% of airports have ILS), Very High Frequency Omni Range, and Distance Measuring Equipment, and runway lights, strobe lights for runway approach and navigation aids are either absent or non-functional. Ground firefighting and safety equipment also need improvement. All airports are supposed to have Uninterrupted Power Supply (UPS), but there have been serious occurrences of power failures blanking out navigation systems. The lack of hangar and parking facilities is particularly acute for air taxis. The air traffic control (ATC) facilities and related equipment are archaic. At Bombay, which has the highest density of international traffic, the saturation point is likely to be reached in the next few years.

About a dozen airports which Indian Airlines' pilots refused to land at, have yet to be upgraded. According to the pilots, the worst airports are at Calicut, Cochin, Udaipur, Jaipur, Mangalore and Bhuj. For example, the runway at Cochin is unidirectional, forcing pilots to land and take off in the same direction, even if there is a tailwind. Upgrading of these airports has become critical as private air taxis have increased their operations to these airports.

While resource shortages have been part of the problem, there was also a lack of recognition of the importance of air transport to India's economic prosperity. With economic liberalization, the inadequacies have been highlighted as the Government has recognized that improved facilities are necessary to support increased business and tourist travel. In the last year, two major contracts to improve India's air traffic navigation system have been awarded. Many more projects are in the process of being implemented, or are in the planning stages. The major projects being considered and implemented are outlined below. These projects will need to be speedily implemented if India's airport infrastructure is going to be able to keep up with growing demand.

## IAAI Projects

For the Eighth Five Year Plan, IAAI identified the following as major projects:

<u>Project</u>	<u>Estimated Cost</u> (Rs. million)	<u>Time Frame</u>
Bombay International Terminal - Phase III	490	1990-1994
Madras Domestic Terminal - Phase II	200	1991-1994
Delhi International Terminal - Phase II	1,200	1991-1994
Delhi Domestic Airport - Taxiways & Aprons	2,260	1991-1996
Calcutta Domestic Terminal - Phase I	250	1994-1997
Madras International Terminal - Phase II	220	1995-1998
Bombay Domestic Terminal - Phase II	250	1995-1998
Calcutta International Terminal - Phase II	350	1998-2001
Bombay Domestic Terminal - Phase III	230	1998-2002
Delhi Domestic Terminal - Phase II	600	1998-2002
Ahmedabad and Nagpur Alternate International Airports	600	1998-2002

Speaking in mid-1993, the Chairman outlined that IAAI's priorities were to: complete the Bombay International Terminal - Phase III (Terminal 2-C), which the Government has approved and is now estimated to cost Rs. 850 million; finalize the workplans for a new domestic terminal at Delhi, expansion of the international terminal at Madras, and improve the domestic facilities at Trivandrum; and to acquire additional land at Trivandrum to expand the airport to handle wide-bodied jets. IAAI also proposes to build two new hangars at Delhi for the exclusive use of private air taxi operators. The construction of the new passenger terminal at Calcutta is to be completed in early 1994. The Government is finalizing the Bombay Domestic Terminal - Phase II, now estimated to cost Rs. 960 million.

### Bombay

In February 1993, the Project Investment Board of the Government of India approved the Rs. 840 million construction of Terminal 2-C as part of the Bombay International Airport-Phase III project. The Phase III project will increase passenger handling capacity at the airport from five to 7.5 people million per annum. The new terminal, measuring 53,000 square metres, is expected to be completed in 40 months.

Perhaps the biggest challenge facing airport planners in India is to build a new airport for Bombay. The site has already been identified. Work involved includes land reclamation from the sea, surface access and land development, costing over Rs. 30 billion in the first phase, based on 1988-89 index. International consultants will have to be appointed to carry out a study for this project. Until the new airport is ready, the airlines and their customers will have to make do with the existing airport. With improvements and developments, the useful life of the current Bombay airport can be extended up to 2010. As an airport development project, Bombay provides the biggest opportunity in India in the field of airport consultancy and supply of equipment.

### Model Airports

The NAA has selected 12 domestic airports for development as model airports. The criteria for airport selection were: standard runway length of 7,500 feet, with taxi track 75 feet wide; good traffic potential; importance of the city; good tourism potential; and coverage of all regions in the country. The planned expenditure on development of the 12 model airports is Rs 3.5 billion (1.7 billion for civil works and 1.8 billion for equipment and installation). Work envisioned under the plan is to be completed in the next 18 months, and includes, the extension of runways and associated infrastructure, augmentation of navigation aids, communication and safety services, and construction/expansion of terminal buildings. The airports are:

a) Jaipur	}	
b) Lucknow	}	Delhi Region
c) Indore	}	
d) Nagpur	}	Bombay Region
e) Baroda	}	
f) Calicut	}	
g) Coimbatore	}	Madras Region
h) Hyderabad	}	
i) Patna	}	
j) Bhubaneshwar	}	Calcutta Region
k) Guwahati	}	
l) Imphal	}	North East Region

On May 13, the Civil Aviation Minister announced a Rs. 150 million project to expand the terminal building at Indore. A private company has been given the contract, which is to be completed in two years. At the end of May, the Minister announced a Rs. 540 million project to upgrade the airport at Hyderabad. A new two-level, 15,000 square metre terminal complex, including baggage handling equipment, aerobridges and escalators, a new cargo complex, and improvements to the existing terminal will cost Rs. 230 million. Another Rs. 280 million has been allocated for air traffic control equipment, ground safety equipment and strengthening of the runway. The modification and expansion of terminal buildings and passenger handling facilities at Patna will cost Rs. 580 million. The modernization of the airport at Bhubaneshwar will include construction of a new 6,000 square metre terminal building at a cost of Rs. 135 million, lengthening of the runway from 7,441 feet to 9,000 feet, construction of a link taxiway and a new apron, installation of an ILS, and the upgrading of ground safety facilities. Work on the airport at Guwahati, including extension and modernization of the terminal building, was to start in May. At Imphal, Rs. 500 million has been allocated to modernize the airport, including construction of a large terminal building and improvement to passenger facilities. New terminal buildings are to be built at Lucknow, Baroda and Nagpur. Extension and modernization of terminal buildings is to be done at Jaipur and Calicut.

#### New International Airports

Of the seven restricted international airports, only Bangalore and Goa have a claim to be considered as full fledged international airports, although the Bangalore airport is owned by Hindustan Aeronautics Limited (HAL) and the one at Goa by the Indian Navy. Answering a question in the Lok Sabha (Parliament) on May 10, 1993, the Civil Aviation Minister gave an assurance that Bangalore would be upgraded to an international airport within 18 months. It does not seem likely that the Government will proceed with its earlier proposal to develop Ahmedabad and Nagpur as international airports to relieve the pressure on Bombay.

The government has earmarked Rs. 100 million to upgrade the HAL airport in Bangalore. The plans, drawn up by the architects, Iyer and Mahesh, call for more floors to be added to the existing buildings, and to relocate all international operations to the upper floor of the terminal. They have also incorporated five 100 square foot cabins for private air taxi operators into their plans. This upgrade is seen as an interim measure, as a new airport may take a decade to build.

The long term plan for Bangalore is to build a new airport to function as the international hub for southern India. A committee headed by Mr. S. Ramanathan (the first Chairman of the IAAI), along with the Karnataka State Government, have identified a 1,500-acre site at Devenahalli, 27 kms from Bangalore. A six-lane national highway and railway shuttle will connect the airport to the city centre. In order to finance this Rs. 5.0 billion project, the

Ramanathan Committee has recommended that a separate Bangalore International Airport Authority be created as an independent subsidiary of the NAA. The NAA, the Karnataka State Government, Air India, Indian Airlines and Indian Oil Corporation would all have equity stakes in the new venture. Investment may also be opened to domestic and foreign private companies. The project has already attracted the interest of several international airport developers to possibly carry out the project on a turnkey basis. Completion of the project is slated for 2001.

A site inspection has already been done for a new airport at Goa, but the site proposed by the State Government was found to be unsuitable. The NAA plans to construct a new terminal, expand the existing apron to accommodate two wide-bodied aircraft at a time, and upgrade the navigation and ground safety equipment at a cost of Rs. 95 million. This will provide separate international and domestic terminals capable of handling 600 arriving and departing passengers concurrently. Rs. 27.5 million has been approved for 1993-94.

Citing good traffic potential, the Kerala State Government has decided to create the Kochi International Airport Development Society (KIADS) to develop and manage a new international airport at Nedumbanchery, near Cochin. The KIADS proposes to raise the Rs. 1.0 billion needed to fund the project from Kerala non-resident Indians. KIADS has already begun acquiring 1,500 acres of land. Of this, 850 acres will be used for the airport, 350 acres will be kept for future expansion, and the remaining 400 acres will be sold at a premium to private developers. Plans are to build an engineering and refuelling base, a cargo complex, a three-star hotel and tourist attractions. The NAA has promised to give all possible support to this project. It has delegated the work of preparing a detailed project report, costing Rs. 2.5 million, to a private firm. The airport architects, Mahesh and Iyer, have promised to design the airport free of cost. The project manager is Mr. V.C. Kurian, an Officer on Special Duty.

#### Gateway Airport

There is no world class airport in South Asia, comparable to those in Singapore or Hong Kong. Industry professionals feel that if one looks at the air traffic corridors and density of aircraft movements, a good case can be made for developing one Indian airport to become the gateway not only for India, but for all the countries in South Asia. Delhi has been suggested because there are 5,200 acres of land already owned by the airports authorities, whereas Bombay is already congested and has no space to expand. The IAAI sees merit in the suggestion and has a three year old plan to construct a second runway, with three interlocking taxiways, five more terminals, for a total of six on a concentric ring between the two runways (three would be for domestic traffic and three for international). A new access road is currently under construction, that fits into the overall plan, and construction of the first domestic terminal is slated to start within the next two years. No concrete plans have been made for the other terminals, but it is certain that outside financing will be required.

#### Air Traffic Management and Navigation Systems

Over the past few years, there has been mounting pressure on the Indian Government to improve the navigation facilities at its airports, principally out of an increasing concern over safety. In December 1992 and March 1993 respectively, the NAA awarded contracts to Westinghouse and Raytheon to provide four Monopulse Secondary Surveillance Radars (MSSR) and four ASR-9 Airport Surveillance Radars (ASR) at Trivandrum, Ahmedabad, Hyderabad and Guwahati for en route airspace requirements, and to modernize the air traffic control systems at the Bombay and Delhi international airports (See Appendix E for details on Indian air space management, as well as completed and recently contracted projects).

In response to work action taken by the Indian Commercial Pilots Association (ICPA), the Director General of Civil Aviation (DGCA) has ordered the installation of navigation aids at defence airports where civil aircraft are

permitted to operate. The DGCA is also installing visual approach aids at 15 regional airports and simple approach lights at 32 airports. These upgrades are to be completed by 1995 at a cost of Rs. 1.05 billion (See Appendix F for the navigation aids currently in place at the major Indian airports).

As well as improving specific airport navigation systems, the Indian Government also plans to improve its overall navigation management network. Being strategically located at the confluence of the east and west corridors of aviation - the two main invisible air traffic paths - it is estimated that air traffic over India will grow by eight per cent every year until 2000. To accommodate this increase in air traffic, the Government of India has drawn up an ambitious Rs. 10 billion plan to comply with the Future Air Navigational System (FANS) recommended by the International Civil Aviation Organization (ICAO). FANS will be implemented in two stages in India, and completed before the 2010 deadline issued by ICAO.

The first stage of FANS is to introduce communications, navigation and surveillance facilities. Using the INSAT-2A satellite, an Aeronautical Fixed Telecommunication Network (AFTN) has been planned to connect 43 airports in the country and form part of a Remote Area Business Management Network (RABMN), whose hub will be located at Sikandarabad, near Delhi. The RABMN will provide dedicated data links, as well as a voice hot line, to each airport. India will soon be connected to INMARSAT through an earth station at Arvi, near Pune. Planes equipped with an Aircraft Earth Station (AES) will then be able to communicate to any point in the world through this link.

In the second stage of FANS, an Automatic Dependence Surveillance (ADS) system will be introduced by using the Russian-owned GLONASS and USA-owned GPS satellite systems. The Electronics Corporation of India Limited (ECIL) has already started to engineer an ADS system. The first phase is to develop the necessary hardware and software. The second phase, to be completed by 1995, is to develop a degree of basic competence in operating the ADS system. In early 1993, ECIL installed a prototype of the system at the Madras airport for trials. The final phase would see the addition of INMARSAT aero hardware at the Arvi earth station, which would be connected to the airports at Delhi, Bombay, Madras, Calcutta and Guwahati to provide complete ADS service over Indian air space (See Appendix E Long Term Plans for details on FANS).

#### Other Development Projects

Other development projects being planned by the NAA include:

- a) Construction of new airports at Langpui in Arunachal Pradesh and Tura in Meghalaya.
- b) Construction of new Terminal Complexes at Dimapur and Porbandar.
- c) Extension and modification of existing Terminal Buildings at Jodhpur and Agra.
- d) NAA is to start construction of a new terminal building and extension of the runway from 5,400 to 7,500 feet at Lilabari, as soon as the State Government transfers approximately 50 acres of land free of cost.
- e) Construction of a Civil Air Terminal at Bhubaneswar.
- f) Extension and strengthening of runways and associated pavements at Ranchi, Jabalpur and Salem.
- g) Development of an airport for B-737 and A-320 operations at Port Blair, Barapani and Tripura.
- h) Modernization of the Mangalore airport, including extension of the runway to 9,000 feet, has been delayed until the 9th Five Year Plan.
- i) Strengthening and widening of taxiways and aprons at Agra and Cochin.
- j) Upgrading of airports for B-737 operations at Tripura and Barapani.
- l) With financial assistance from the Tirupati Devasthanam Trust, a Rs. 120 million modernization project of the Tirupati airport will be started by October and completed by December 1994. The runway will be strengthened and extended from its present 4,500 feet to 6,000 feet initially to handle B-737 aircraft, then to 7,500 feet to handle A-320 aircraft. RITES has prepared a project report and tenders should be awarded by the end of September.

## **AIRPORT SECURITY**

The Government is considering the installation of full body scanners at major domestic and international airports, in light of the spate of hijackings which took place in the first half of 1993. The Government plans to import about 50 such scanners at a cost of about Rs. 100 million. Initially 15 full body scanners would be installed at each of the international airports in Bombay and Delhi. Scanners would subsequently be installed at Calcutta, Madras, Lucknow, Srinagar, Chandigarh, Trivandrum, Amritsar and Goa.

## **DOING BUSINESS WITH INDIAN AIRPORTS**

As public sector undertakings, the IAAI and the NAA follow public sector procurement and tendering practices prescribed by the Bureau of Public Enterprises (BPE), Ministry of Industry (Government tender guidelines are outlined in Appendix G). The majority of their tenders are domestic. Global tenders are restricted primarily to sophisticated equipment, which is not available in India. In the last two years, global tenders have been floated for: air traffic control systems; terminal and en route surveillance radars; aerobridges; baggage conveyors; crash and fire vehicles; electronic display boards; and communication equipment.

To be successful on global tenders, Canadian companies should have a permanent local presence, either through a representative office or an appointed agent. For advice on selecting an agent, contact the Canadian High Commission, New Delhi, or the Consulate of Canada, Bombay. Key aviation sector contacts are listed in Appendix H.

The second AVIA India airshow will be held in Bangalore December 15-18, 1993. This show provides the best opportunity for Canadian companies to meet Indian firms, government officials, agents and industrial collaboration partners involved in the airports, aviation and aerospace sector. AVIA India is being organized by Convex in cooperation with Hindustan Aeronautics Limited. For further details on AVIA India contact Ms Pushpa Nair, Convex, 14-F Basant Lok, Vasant Vihar, New Delhi-110 057, Tel: (91-11) 67-0346, 60-7582, Fax: (91-11) 687-5598, Tlx: 031-82031.

**INTERNATIONAL AIRPORTS AUTHORITY OF INDIA**

The functions of IAAI are spelt out in Section 16(3) of the IAAI Act, 1971, which states that the Authority may:

- "a) plan, develop, construct and maintain runways, taxiways, aprons and terminal and ancillary buildings at the airports;
- b) construct residential buildings and create townships for its employees;
- c) establish and maintain hotels, restaurants and restrooms at or near the airports;
- d) establish warehouses at the airports for the storage or processing of goods;
- e) arrange for postal, money exchange, insurance and telephone facilities for the use of passengers and other persons at the airports;
- f) make appropriate arrangements for watch and ward at the airports;
- g) regulate and control the plying of vehicles, and the entry and exit of passengers and visitors, in the airports with due regard to the protocol functions of the Government of India;
- h) develop and provide consultancy services in India and abroad in relation to planning and development of airports or any facilities thereat;
- i) establish and manage heliports and airstrips;
- j) provide such transport facilities as are, in the opinion of the authority, necessary to the passengers travelling by air;
- k) form one or more Companies under the Companies Act, 1956 or under any other law relating to companies to further the efficient discharge of the functions imposed on it by this Act; and
- l) take all such steps as may be necessary or convenient for, or may be incidental to, the exercise of any power or the discharge of any function conferred or imposed on it by this Act".

Section 16 (4) of the same Section goes on to add that in the discharge of the above functions the IAAI shall have due regard to the "development of air transport service and to the efficiency, economy and safety of such service".



## Appendix B

### DEVELOPMENTS MADE AT INTERNATIONAL AIRPORTS

During the first two decades of its existence (from April 1 1972 to March 31, 1992), IAAI invested Rs. 5.44 billion in updating, expanding and constructing new passenger and cargo terminals and other facilities at its airports. For the last six years it has met the entire expenditure on planned projects from its own internal resources without receiving any budgetary support from the Government. Its major achievements have been:

#### Passenger Facilities

- Delhi - New international passenger terminal, domestic arrival terminal and domestic departure terminal for Airbus passengers.
- Bombay - New international passenger terminal and domestic terminal for Airbus passengers. The Domestic Passenger Terminal now has the capacity to handle 4.5 million passengers annually, corresponding to a peak hour capacity of 1500 arriving and 1200 departing passengers.
- Madras - New domestic terminal.
- Calcutta- Relocation of domestic operations to new building and modifications to the existing building for international operations.

#### Cargo Facilities

New cargo complexes have been developed at Bombay, Delhi, Calcutta, Madras and Trivandrum airports.

#### Other Facilities

In general, IAAI has strengthened and extended runways, developed taxi tracks and constructed new parking bays. There have also been improvements in runway lighting, fire fighting and other support services. Specifically:

**Delhi:** A new IAAI Operational office complex is under construction.

**Madras:** Extension of Main Runway and parallel taxi-track and two remote parking bays for domestic operations.

**Trivandrum:** Runway Repairs.

In 1992-93 IAAI proposed to buy operational and facilitation equipment costing Rs. 180.2 million and airfield lighting and electrical equipment at a cost of Rs. 80.5 million. A major part of this expenditure has already been incurred.

## Appendix C

### NATIONAL AIRPORTS AUTHORITY

The principal areas of responsibility of the National Airports Authority are:

- Air Routes and Air Space in the country;
- Domestic Airports;
- Aeronautical Communications;
- Navigational and Radar Services at domestic and international airports;
- Visual Aid and Ground Safety Services at domestic airports;
- Airport environment;
- Civil Aviation Training Centres; and
- Organization of Search & Rescue throughout the Indian air space for which India is responsible.

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## Appendix D

### DEVELOPMENTS MADE AT DOMESTIC AIRPORTS

From June 1986, when the NAA was set up, to December 1991, the total capital investment made by the NAA was Rs.3.16 billion. While there is no detailed account of the works completed by the NAA, as the latest annual report released in February 1993 is for the year 1989-90, the achievements of the NAA in the field of airport development during the first six years of operation can be summarised as follows:

- a) Construction and commissioning of 5 new airports at Shimla, Pondicherry, Calicut, Agatti and Tuticorin;
- b) Construction and commissioning of new terminal buildings at 11 airports, including Ahmedabad and Bhubaneshwar;
- c) Commissioning of 17 airports for Vayudoot operations at Ziro, Along, Daparijo, Kamalpur, Maldo, Thanjavur, Shadapur, Jagdalpur, Kolhapur, Belurghat, Kailashahar, Passighat, Neyveli, Bilaspur, Rajauri, Deesa and Satna;
- d) Extension and strengthening of the runways at 21 airports for Boeing 737 and Airbus operations, including Bhopal, Coimbatore, Dimapur, Ahmedabad, Bhubaneshwar, Amritsar and Lilabari; and
- e) Extension and modernisation of terminal buildings at 10 airports;

AIR SPACE MANAGEMENT

India has approximately 54,000 nautical miles of Very High Frequency Omni-directional Range (VOR) and Non-directional Beacon (NDB) airways, as well as standard Air Traffic Control (ATC) services. There is very close co-ordination between civil and military ATC services. The 5 Flight Information Regions (FIR) at Bombay, Calcutta, Delhi, Madras and the North East, along with 9 Area Control Centres (ACC), cover the whole country and the adjoining air space for which India has ATC and Search and Rescue (SAR) responsibility. Currently, civil radar coverage is limited to four Airport Surveillance Radars (ASR) in terminal areas and 5 Air Route Surveillance Radars (ARSR) associated with the 4 ASRs and an additional one at Nagpur in Central India. Air to ground communications are based on Very High Frequency (VHF) and Extended Range VHF (ER VHF) radio in terminal areas and HF for en route services. Thirteen message switches connect with all ATC facilities and adjacent international stations to process required ATC and meteorological data.

Works Completed

a) Navigation Aids:

- 1) Doppler VOR has been installed at Bombay, Madras, Hyderabad, Calcutta, Ahmedabad, Guwahati, Lucknow and Khajuraho;
- 2) Conventional VOR has been installed at Gulbarga, Rajkot, Udaipur, Sikandarabad, Dibrugarh, Jammu, Indore and Bagdogra; and
- 3) Instrument Landing System (ILS) has been installed and commissioned at eighteen airports including Bhopal, Lucknow, Guwahati, Calcutta (Reciprocal), Patna, Ahmedabad, Jammu, Nagpur, Imphal, Dibrugarh, Aizawal, Jaipur, Lucknow, Varanasi and Agartala.

(b) Communication Aids:

- 1) Fully computerised Automatic Message Switching System (AMSS) has been provided at Delhi, Bombay, Hyderabad, Trivandrum, Lucknow, Bangalore, Nagpur, Varanasi, Patna, Calcutta, Madras, Guwahati, Ahmedabad and Allahabad;
- 2) Single Side Band (SSB) operation of air to ground communication; and
- 3) Commissioning of land line teleprinter circuits and direct speech circuits between airport pairs.

c) Radar Aids:

- 1) For effective and reliable Air Traffic Control, Bombay, Delhi, Calcutta and Madras have been equipped with airport surveillance and air route surveillance radars, while Nagpur has been equipped with an air route surveillance radar.

Works in Hand

- a) On March 19, 1993, Raytheon signed a Rs. 3.5 billion contract to modernize the air traffic control systems at the Delhi and Bombay international airports. This is a turn-key project to be completed in 30 months. The Project involves automation of the Air Traffic Control (ATC) systems with the installation, integration, testing and commissioning of: Airport Surveillance Radar (ASR) and Air Route Surveillance Radar (ARSR), both with co-located Monopulse Secondary Surveillance Radars (MSSR); Very High Frequency Omni-directional Ranges (VORs) with co-located Distance Measuring Equipment (DME); Instrument Landing Systems (ILS) for three runways at each of these airports; flight data and radar data processing systems (FDPS & RDPS); voice communication control systems; and automatic self-briefing systems. The controller work stations will be user friendly, fail-safe systems with multi-colour raster scan displays with built in provisions for continuation of control functions even in the unlikely event of catastrophic failures of the RDPS or FDPS. The MSSRs will have the capability to handle Mode-S data transfer thereby complying with the Future Air Navigation Systems (FANS) recommendations. Surface Detection

Equipment will assist the pilots to operate on the ground under extremely poor visibility conditions. The Project includes the construction of an entirely new technical block and a 150-foot high control tower, where the new system is to be installed without interruption of operations.

- b) In December 1992, Westinghouse, USA signed a Rs 900 million contract to install four Monopulse Secondary Surveillance Radars (MSSR) and four ASR-9 Airport Surveillance Radars (ASR) at Trivandrum, Ahmedabad, Hyderabad and Guwahati to provide for en route airspace requirements. These radars will cut fuel costs, save flight time and enhance the revenue earnings of the NAA. As part of the contract, Westinghouse has entered into a joint venture agreement with Bharat Electronics Limited (BEL) to manufacture these radars for the domestic and export markets.
- c) In May-June 1993, the NAA awarded a Rs. 150 million contract to Gujarat Communications and Electronics Limited (GCEL) to supply 23 Distance Measuring Equipment (DME) units. GCEL is also in the process of executing a previously-awarded Rs. 170 million contract to supply 232 Doppler VHF Omni Range units.
- d) Installation of Doppler Very High Frequency Omni-Range (DVOR) with DME at Patna and Delhi.
- e) Installation of ILS at Bhubaneswar, Trichy, Khajuraho, Delhi (Secondary Runway), Kanpur and Ranchi.
- f) Computer-based Speech Switching Systems at Bombay, Delhi, Calcutta, Madras, Ahmedabad, Hyderabad and Nagpur.
- g) DME with glide path at Amritsar, Calcutta, Guwahati and Varanasi.
- h) DME at Bhopal, Jaipur, Trichy, Kanpur and Khajuraho.
- i) High Power Distance Measuring Equipment (DME) at Coimbatore.
- j) VOR at Dimapur and Pratapgarh
- k) Extended Range VHF Air/Ground communication at Ahmedabad.

#### Long Term Plans.

In September-October, 1992, the ICAO Assembly recommended the establishment of Satellite Aided Communication Navigation Surveillance System. This will help in switching over from ground based equipment to a Satellite Aided Communication System. Future Air Navigation System (FANS) envisages the establishment of global positioning system. It will involve:

- Covering the entire Indian landmass by 23 MSSRs, with Mode 'S' capability;
- Data and Voice communication links to the SSR locations through Indian Satellites;
- Indigenous development of an Airborne VHF data link;
- Data communication for AFTN messages through Indian Satellites by means of a packet-switched network. The master stations will be near Delhi and Bombay and the receiving airports will be provided with Very Small Aperture Terminals (VSAT);
- With implementation of the FANS concept the number of Flight Information Regions (FIRs) will be reduced from its present 5 to 2; and
- Long range and oceanic coverage interaction will be with INMARSAT through the Videsh Sanchar Nigam Ltd (VSNL) earth station at Arvi.

Electronics Corporation of India Ltd (ECIL) claims that as a first step it has designed, developed and installed a FANS at Madras airport recently. It is estimated that for full implementation of FANS, an expenditure of more than Rs. 1.0 billion would have to be incurred.

Appendix F

THE STATE OF INDIA'S AIRPORTS

<u>Airport</u>	<u>Runway Length</u>	<u>Facilities</u>	<u>Remarks</u>
Ahmedabad	7,500 feet	NDB, VOR, DME, ILS, VASI	Totally inadequate, cattle hovering, boundaries broken
Aurangabad	6,000 feet	NDB, VOR, DME, PAPI	No boundary wall, highway at end of runway
Bangalore	10,847 feet	VDF, NDB, VOR, DME, VASI, ILS, PAPI	Fairly adequate, HAL maintenance
Baroda	8,100 feet	NDB, VOR	Not adequate
Bhopal	5,144 feet	ILS, NDB, VOR, DME, VASI	Not adequate
Bombay	11,525 feet 8,995 feet	NDB, VOR, DME, ILS, VASI	Only one ILS, alternate runway inadequate, visual approach
Calcutta	12,000 feet	NDB, VOR, ILS, DME	Parallel runway too close
Chandigarh	9,000 feet	VDF, NDB, VASI, Localiser, Locater marker	Fairly adequate
Delhi	12,500 feet	VDF, NDB, VOR, DME, ILS, VASI	Fairly adequate
Hyderabad	9,000 feet		Encroachments have reduced the effective runway length to 7,700 feet
Lucknow	7,835 feet	NDB, ILS, VOR, DME, VASI	Not adequate
Madras	10,042 feet 6,225 feet	VDF, ILS, DME, VOR, NDB, VASI	NDB needs to be relocated
Mangalore	5,328 feet	NDB, VOR, DME, VASI	Tricky airfield, table top, can't extend runway, 737 operation unsafe during monsoon
Madurai	5,990 feet	NDB, VOR, DME	Upgraded recently
Nagpur	10,500 feet	NDB, VOR, DME, ILS, VASI	Large runway, poorly maintained

Patna	7,500 feet	NDB, VOR, DME, ILS, VASI	Obstacle (clock tower)
Pune	8,338 feet	NDB, VASI, Ground control approach	Fairly adequate
Shimla	3,400 feet	NDB	Small runway, not adequate for jets
Tiruchi	6,115 feet	NDB, VOR, DME, ILS, PAPI	Upgraded recently
Trivandrum	10,000 feet	NDB, VOR, DME, ILS, VASI	Badly managed
Udaipur	6,000 feet	NDB, VOR	Man hit on runway recently
Visakhapatnam	5,810 feet	NDB, VOR, DME	Naval field

**GOVERNMENT PROCUREMENT AND TENDERING PRACTICES**

Air India, Indian Airlines, Vayudoot, International Airports Authority of India and National Airports Authority are all public sector undertakings. They follow public sector procurement and tendering practices prescribed by the Bureau of Public Enterprises (BPE), Ministry of Industry.

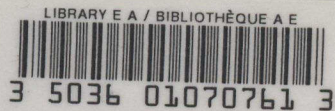
The Public Sector undertakings prepare their revenue budget and capital budget for the financial year beginning on 1st April and ending on 31st March. The budget requires the approval of the Board of Directors and of the administrative Ministry. Normally all capital works should have been included in the capital budget for the year. In exceptional circumstances new items can be purchased provided they are included in the revised budget for the year.

According to the guidelines issued by the BPE on August 20, 1986, a public sector undertaking has powers to incur expenditure up to Rs. 200 million on capital equipment without the prior approval of the Government. For purchases above Rs. 200 million, the proposal, after the approval of the Board of Directors and the administrative Ministry, has to be cleared by the Public Investment Board and the Cabinet Committee for Economic Affairs.

All capital works and equipment form a part of the project which is shown in the budget. If the equipment is a low-value item, quotations can be obtained from vendors on the approved list. For all major purchases national tenders (if the equipment is manufactured indigenously) or global tenders are floated. Tenders may be invited in two parts: technical bids and price bids. Technical bids are opened first and vetted by the user Department. The price bid is opened only if the vendor is found professionally competent.

A tender committee containing representatives of the user Department, a non-user Department and the Finance Department opens the tenders in the presence of the vendors or their representatives. After the scrutiny and vetting by the user Department, the Finance Department submits its comments on the recommendations of the user department and forwards them to the Chairman for approval. Normally the lowest bid submitted by a qualified tenderer is awarded the work. However, if the lowest bidder is not considered technically competent or reliable, the second lowest tenderer is invited to match the price quoted by the lowest tenderer to get the work. The tender committee is required to give justification when the work is awarded to a vendor who has not given the lowest quotation.

In the past year, the NAA and the IAAI have tendered for baggage conveyor systems, aerobridges, crash and fire vehicles, and distance measuring equipment; and completed tenders for air traffic control systems and surveillance radars. An encouraging sign is the speed and transparency with which the tender for the modernization of the air traffic control systems at the Bombay and Delhi international airports was handled. Final offers were submitted to the NAA on July 10, 1992 and the contract was signed on March 19, 1993. This, despite the fact that the tender went to both the High Court and the Supreme Court, with both upholding the integrity of the tender process.



Appendix H

USEFUL CONTACTS IN INDIA AND CANADA

National Airports Authority  
Operational Complex  
Safdarjung Airport  
New Delhi-110 003  
Tel: (91-11) 463-2930  
Fax: (91-11) 463-2990

Mr. K.N. Ardhanareeswaran, Chairman

International Airports Authority of India  
NDMC Building, Yashwant Place  
Chanakyapuri  
New Delhi-110 021  
Tel: (91-11) 688-5691  
Fax: (91-11) 687-2951

Mr. K.N. Ardhanareeswaran, Chairman

Civil Aviation Training College  
Bamarauli  
Allahabad-211 012  
Uttar Pradesh  
India  
Tel: (91-532) 633015, 633826  
Fax: (91-532) 633015

Mr. S.R.C. Rao, Principal

Director General of Civil Aviation  
Opp. Safdarjung Airport  
New Delhi-110 003  
Tel: (91-11) 462-2495, 462-0784  
Fax: (91-11) 462-9221

Mr. H.S. Khola, Director General

Ministry of Civil Aviation and Tourism  
Sardar Patel Bhawan  
Sansad Marg  
New Delhi-110 001  
Tel: (91-11) 344153, 345779, 351700  
Fax:

Mr. Gulam Nabi Azad, Minister  
Mr. S. Kanungo, Secretary

Canadian High Commission  
Commercial Section  
7/8 Shantipath, Chanakyapuri  
New Delhi-110 021  
Tel: (91-11) 687-6500  
Fax: (91-11) 687-5387  
Tlx: 031-72363 DMCN IN

Consulate of Canada  
4th Floor, 41/42 Maker Chambers VI  
Jamnalal Bajaj Marg, Nariman Point  
Bombay-400 021  
Tel: (91-22) 287-6027  
Fax: (91-22) 287-5594  
Tlx: 011-85122 COC IN

External Affairs and International Trade Canada  
Pacific South Trade Development Division (PST)  
125 Sussex Drive  
Ottawa, Ontario K1A 0G2  
Tel: (613) 995-7689  
Fax: (613) 996-4309

External Affairs and International Trade Canada  
Aerospace and Defence Programs Division (TAG)  
125 Sussex Drive  
Ottawa, Ontario K1A 0G2  
Tel: (613) 996-1814  
Fax: (613) 996-9265

Industry, Science and Technology Canada  
C.D. Howe Building  
1st Floor, East Tower  
235 Queen Street  
Ottawa, Ontario K1A 0H5  
Tel: (613) 952-ISTC  
Fax: (613) 957-7942

Director General Service and Construction  
Industries, Peter J. Sagar, Tel: 954-2994

Director General Aeronautics, W.J. Laycock,  
Tel: 954-3343

Director General Defence Electronics and  
Space, Bob Burns, Tel: 954-3415





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