China

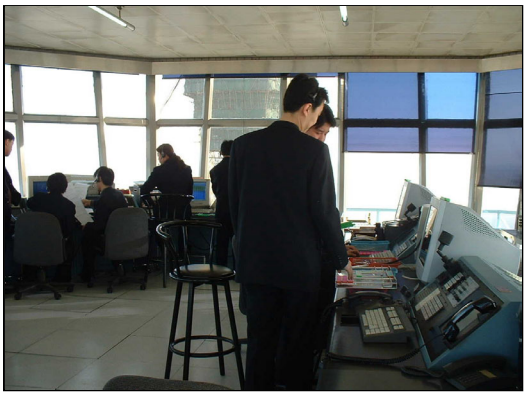
Air Navigation & Air Traffic Control System Modernization Project (I) (II) (III)

Report Date: February 2003

Field Survey: December 2002

1. Project Profile and Japan's ODA Loan

People's Republic of China



Equipment procured via the project
(Beijing Airport Control Tower)

1.1 Background

In 1988, although air transport accounted for a small share of the transport sector as compared to other transport systems, when the 1988 figures are weighed against the 1978 tourist transportation figures for each transport system (1978=100), the figure for air is 768, for cars 484, for railways 298, and for water transportation 202. It thus becomes clear that the growth rate for air transport had outstripped the rates for other transport systems by a wide margin. This remarkable growth rate was underpinned by a number of factors, including brisk economic growth in the late 1970s as China advanced along the route of reform and liberalization, increases in the numbers of foreign tourists, airport development and the rapid modernization and growth in size of aircraft, and it was estimated that by the year 2000, the number of flights on key aviation routes would increase by roughly 4.6 times over that for 1989.

However, coverage of the existing air traffic control radar system was focused exclusively on the southeastern regions of the country, the equipment used in the system was outdated and communication systems were also obsolete. In consequence, the safety of air traffic control was being compromised and it was proving impossible to improve aircraft use efficiency, creating a bottleneck to development in the air transport sector.

Against this background, a long-term aviation development plan commencing from the start of the Seventh Five-year Plan (1986-1990) and targeting the year 2000 was established to ensure the safety of air transport via the development of air traffic control/safety systems and to respond to increasing demand for air transport.

1.2 Objectives

To develop air traffic safety and control systems (including meteorological and communications equipment) for the Chinese civil aviation industry as a means of ensuring the safety and punctuality of air transport, and efficient aircraft management, and in an attempt to respond to projected future increases in the demand for air transport.

1.3 Project scope

Construction of additional air traffic safety and control systems at 150 locations throughout the country.

(1) Air traffic control radar systems (23 sets)
(2) Air traffic safety systems (ILS24 set, DVOR/DME, etc. × 76 sets, other)
(3) Flight check aircraft (× 2)
(4) Maintenance center
(5) Meteorological equipment
(6) Communications equipment
(7) Training facilities and training
(8) Engineering services

The ODA loan covered all foreign currency funds necessary for the above work.

1.4 Borrower/Executing Agency

Ministry of Foreign Trade and Economic Cooperation, PRC[1]/Civil Aviation Administration of China (CAAC)

1.5 Outline of Loan Agreement

	Project (1)	Project (2)	Project (3)
Loan Amount Loan Disbursed Amount	3,257 million yen 3,257 million yen	7,850 million yen 7,849 million yen	9,896 million yen 9,793 million yen
Exchange of Notes Loan Agreement	December 1990 January 1991	September 1991 October 1991	October 1992 October 1992
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 2.5% 30 years (10 years) General Untied	 2.6% 30 years (10 years) General Untied	 2.6% 30 years (10 years) General Untied
Final Disbursement Date	February 1996	November 1998	November 2001

[1] The current Ministry of Foreign Trade and Economic Cooperation. As of 1999, the borrower was changed to the government of the People's Republic of China (Ministry of Finance).

2. Results and Evaluation

2.1 Relevance

This project was implemented during the 1990s when foreign trade was expanding, and average annual growth in GDP in China reached 12.0% in the first half of the decade (1991-95) and 8.1% in the second half (1996-2000). Against this background of economic development, the air transport sector, which was already showing signs of rapid growth when the project appraisal was conducted, has continued to expand year on year. In order to respond to these increases in demand for air transport, therefore, the development of aeronautical infrastructure in China had been identified as a priority task.

The various air traffic safety and control systems, radar and wireless systems, communications and meteorological facilities, etc., that were developed via the project are essential elements in the bid to ensure the safety and punctuality of air transport, and efficient aircraft management, and to respond to increased use of air transportation, and were consistent with the needs of personnel employed in air traffic control and airport management. Moreover, the project's scope also encompassed internal airports, which were markedly underdeveloped at the time of appraisal but projected to see increased use in the future, thus the project also factored regional considerations into account.

Additionally, the project was positioned as a key Civil Aviation Agency project under the Eighth Five-year Plan (1991-95). Furthermore, subsequent policies to promote civil aviation policies have all emphasized guaranteeing the safety of air transport, one of this project's objectives, and given that China's economy continues to develop, this project is considered to have retained its relevancy.

2.2 Efficiency

2.2.1 Project Scope

Initial plans called for the installation of air traffic control radar equipment at 23 locations, however, the three locations of Lhasa, Hetian and Jinghong were cancelled because they were deemed to be low priority regions and it was found to be impossible to provide continuous radar coverage with other regions; thus the radar equipment was ultimately installed at 20 locations. Additionally, the communications network facilities were partially expanded, which had some impact on the implementation schedule, however, with regard to other items included in the project's scope, no modifications were made that would have a major effect on either costs or the implementation schedule.

2.2.2 Implementation schedule

The project was initially timetabled for December 1995 completion, however, the actual date was June 2000, i.e. a delay of four and a half years. The reasons for the delay are as follows: (1) the executing agency had had no previous involvement in a yen loan project, (2) since the yen loans

were granted in succession, it was necessary to review the implementation schedule in response to procurement conditions, and (3) the equipment procured was highly diverse and had to be installed at locations throughout the nation.

In specific terms, in addition to the fact that one of the loan agreements fell behind the initially planned schedule, exchange rate fluctuations necessitated numerous revisions to project costs, preparations for the international competitive bidding were time consuming, the installation and procurement of radar equipment took more time than was initially anticipated, and moreover, some of the radar equipment (Xi´an, Zhengzhou) was damaged in transit and had to be returned for repairs. However, it was possible to utilize land owned by the Civil Aviation University of China (CAUC) for the training center, which enabled the construction schedule to be scaled back by approximately a year.

2.2.3 Project Cost

The foreign currency portion of project costs amounted to 20,899 million yen as compared to 21,003 million yen under the revised plan (Phase 3), and was thus within the scope of planned costs. On the other hand, local currency costs actually amounted to 74,899 million yuan or approximately 2.7 times more than the planned figure of 27,025 million yuan (revised during Phase 3). This substantial overrun was largely due to the impact of price increases that occurred during the project's protracted implementation period (taking the consumer price index (CPI) for 1992 (Phase 3) as 100, the CPI for 2000 (project completion) was 182).

2.3 Effectiveness

2.3.1 Operational status of equipment

According to a report by the Air Safety Office, CAAC, of the communications equipment procured, the multi-channel voice recorders used for the Aeronautical Fixed Communications Network (AFCN) had a high failure rate and the majority has been replaced in the last 2-3 years, however, most of the other equipment procured for this project continues to operate satisfactorily.

Moreover, according to the company responsible for maintenance and the flight test center, no problems have been detected with the equipment procured for this project even in tests on the operational status of flight equipment used in the flight check aircraft.

In addition, we conducted interviews on the operational status of project equipment and the project's effects with the directors and deputy directors of Guilin Air Traffic Control Center, the North China Air Traffic Control Center (Beijing), and the Lanzhou Air Traffic Control Center, and with the centers' air traffic controllers, personnel in charge of communications and those involved in meteorological communications. A summary of the opinions provided is given below (compiled from the responses of a number of people).

Guilin Air Traffic Control Center

[Project equipment status]
(1) Equipment operation is unproblematic; we have the necessary technological skills.
(2) Operation has been stable since the equipment was introduced. Radar equipment has been operating stably since 1998.

[Safety, punctuality, aircraft use efficiency improvement effects]
(1) There are no specific indicators, but cancellations, which were a frequent occurrence prior to project implementation, have dwindled to virtually nothing since 1998. The figure stood at around 3-4% prior to implementation, it's now around 1% (however, a number of factors are incorporated into these figures).
(2) Prior to project implementation, meteorological data was limited to conditions at domestic airports, since completion it has been possible to get data on weather conditions at international airports as well. The accuracy of forecasts has improved since project completion.
(3) There have been considerable improvements in punctuality. Delays due to defective equipment were a frequent occurrence prior to project implementation.
(4) Before we had radar equipment, there were occasions when takeoffs and landings were not possible due to fog. On some occasions all flights were suspended for 2-3 days. Daily takeoffs and landings are now possible thanks to the radar equipment (even with time restrictions).
(5) There are indications that the project has contributed to increases in the number of takeoffs and landings and the number of routes.

[Other]
(1) The project has linked to improvements in air traffic control.
(2) The pressure on air traffic controllers has decreased.

North China Air Traffic Control Center (Beijing)

[Project equipment status]
(1) The operational status of radar equipment is extremely stable. Signal transmission is fast and the quality of our operations has improved.
(2) The radar equipment procured for the project has been in use for seven years, but advance and maneuver operations continue to be simple.
(3) Communications equipment is operating stably and on-site inspections and maintenance are being conducted in conformity with the standards. The accuracy of the equipment is generally good.
(4) The meteorological equipment introduced was extremely ahead of its time and was the first digital information system to be used at this center. Meteorological data processing was easily viewable and the accuracy of weather forecasts has improved markedly. Between April and October the equipment is operated round the clock.
(5) There have been no major problems with the equipment, maintenance is carried out daily, and the equipment is inspected so there are no problems. We are satisfied with the technical level of the equipment and there are no problems with staff assignment.

[Safety, punctuality, aircraft use efficiency improvement effects]
(1) There have been no accidents involving aircraft to date (this was also true prior to project implementation). Maintenance is undertaken consistently, thus conditions have remained constant since before the project was implemented.
(2) There is a rigorous management system for staff assignment, etc., so we have never experienced any near misses or dangerous situations.
(3) Beijing Capital Airport has a worldwide reputation for safety.
(4) Despite the marked increase in flight numbers since 1995, flight delays resulting from mid-flight management factors have decreased. Safety is assured even if the number of flights increases.
(5) Fast signal transmission has led to improvements in safety and reliability and consequent increases in the numbers of arrivals and departures. When I joined the company (9 years ago) arrivals and departures averaged 200/day; the figure now stands at 750/day (both figures are for summer, the current figure for winter is approx. 650/day).
(6) The percentage of cancellations or diversions due to weather conditions is around 17% (CAAC data for 2000). The percentage has dropped since the radar equipment was introduced in 1996. I believe this is because we are now able to conduct detailed analysis of abnormal weather conditions.

[Other]
(1) The introduction of this equipment has made it possible to ascertain the position of aircraft, which has increased my sense of security and made my job easier.

Lanzhou Air Traffic Control Center

[Project equipment status]

(1) The equipment is being used efficiently and is in line with the direction of future airport developments. There have been no major equipment failures to date and operating conditions are favorable.
(2) There are no problems with staff assignment. Staff are assigned according to the protocol and there are no technological issues.

[Safety, punctuality, aircraft use efficiency improvement effects]

(1) Before the equipment was introduced flight numbers were low and the subsequent increases are one conspicuous effect of the project. Prior to introduction in 1995 there were around 800-900 flights/month, that figure has now reached 1,200 flights/month (in terms of capacity, it is possible to control 1,500-1,700 flights/month or 50,000 flights/year (including passing flights)), which is the outcome of improved safety levels.
(2) This air traffic control center covers a 1,000km flight zone. Prior to 1995, radar equipment was unstable at high frequencies and it was not possible to determine the position of aircraft; it is now possible to pinpoint aircraft position. Specifically, it was not possible to ascertain the position of international flights (including Korean, Japanese, Thai, European airlines) passing through Lanzhou airspace (however, there were few flights and long intervals between them, which prevented any major accidents from occurring).
(3) Before 1995, the Hong Kong – Paris route passed over either Beijing or Singapore. It is now possible to fly direct to Paris by flying over Lanzhou airspace. This is one upshot of improved midair safety. Since the US attack on Afghanistan last year, flights from Thailand to Europe have been avoiding Afghanistan airspace and passing over Lanzhou instead. This is also the outcome of proven improvements in the over-fly guarantee rate for this zone. Moreover, the change in the Hong Kong – Europe flight path can be linked to reduced flight times (40 minutes at the very least).
(4) The radar has enabled us to conduct direct monitoring and the intervals between flights have become shorter. It was 100km before and is now 20km (at different altitudes; the interval is 75km when aircraft are flying at the same altitude).
(5) In the past, it was only possible to provide safe guidance for takeoff and landing down to 2km runway visual range (RVR); that is now down to 1km RVR. We currently control takeoffs and landings + midair transits for 150 flights/day, that figure (pre-1995) was 30-40 flights/day.
(6) The current flight cancellation rate is in the region of 2%. There is a sense that it has improved in relative terms. (In the past there were cancellations due to yellow sand and fog. Such cancellations still occur, but it is now possible to control takeoffs and landings during light yellow sand.)

2.3.2 Improvements to Air Traffic Control/Safety Systems and Personnel Capabilities

According to the CAAC Air Traffic Control Bureau, whilst it is difficult to evaluate the contribution of the project equipment in isolation since the equipment that was installed via this project is only responsible for certain functions in the civil air traffic control system, it has facilitated the following improvements in system performance:

- The range of flight guidance radar[2] has expanded and automation standards have improved. The equipment installed via this and other projects has made it possible to achieve full coverage of the eastern and central regions of China.
- Airports equipped with Instrument Landing Systems (ILS)[3] are now capable of providing

[2] 2 Under the project scope, 12 Secondary Surveillance Radar (SSR: maximum range, 370km) and 14 Airport Surveillance Radar (ASR: maximum range, 110km) were procured and installed at 20 locations nationwide (SSR and ASR were installed at 6 locations).

[3] ILS comprises a wireless system that plots descent approach routes using radio waves enabling aircraft to land safely even in adverse weather conditions. ILS performance is classified (by category) in accordance with operational capabilities. The ILS installed via the project are either Category I (capable of providing guidance information down to approx. 1km RVR) or Category II (capable of providing guidance information down to a few hundred meters RVR).

accurate takeoff and landing guidance, and airport operation rates have improved.

- The development of flight weather information/flight data facilities has enabled automated collection and processing of meteorological information and the accuracy of weather forecasts has improved. The composition of aeronautical charts and flight announcements is also now fully automated.

In addition, the project included construction of a maintenance center and the Tianjin Air Route Training Center, which is affiliated to the Civil Aviation University of China (CAUC). The training center is the only facility in China to provide training that covers communications, flight guidance equipment and radar operation, and monitoring, and prior to its construction personnel were dispatched overseas. Concentrated training was provided for center personnel when the new equipment was introduced and, since it opened, the center has provided training for some 3,000 personnel until January 2003. The center is also used for training new recruits, research and by CAUC students.

2.3.3 Air Transport Safety/Punctuality and Efficient Air Traffic Management

In terms of air transport safety, it was not possible to obtain any specific data from the CAAC Air Traffic Control Bureau on changes in the number of aircraft accidents, or on the frequency of near misses, or frequency that air traffic controllers/pilots have felt to be in danger before and after the implementation.

However, according to the CAAC report there have been no accidents due to air traffic control guidance since project completion, and a review of global aircraft accident rates (number of accidents per million flights) for 1992-2001, shows that whilst the figure for China was 1.2 against a global average of 1.3. Though it was higher than the US figure of 0.4, it came out lower than the average for Asia, excluding China, at 2.6 and for Latin America and the Caribbean, which was 3.9[4]. Moreover, the 2002 International Aviation Safety Assessment (IASA) report released by the US Federal Aviation Administration (FAA) states that China meets International Civil Aviation Organization (ICAO) standards, which guarantees a certain standard of safety.

The CAAC Air Traffic Control Bureau report on flight punctuality states that the on-time departure rate for civilian aircraft has been maintained at a consistently high level, and delays due to air traffic control and safety systems account for a mere 2% of the total.

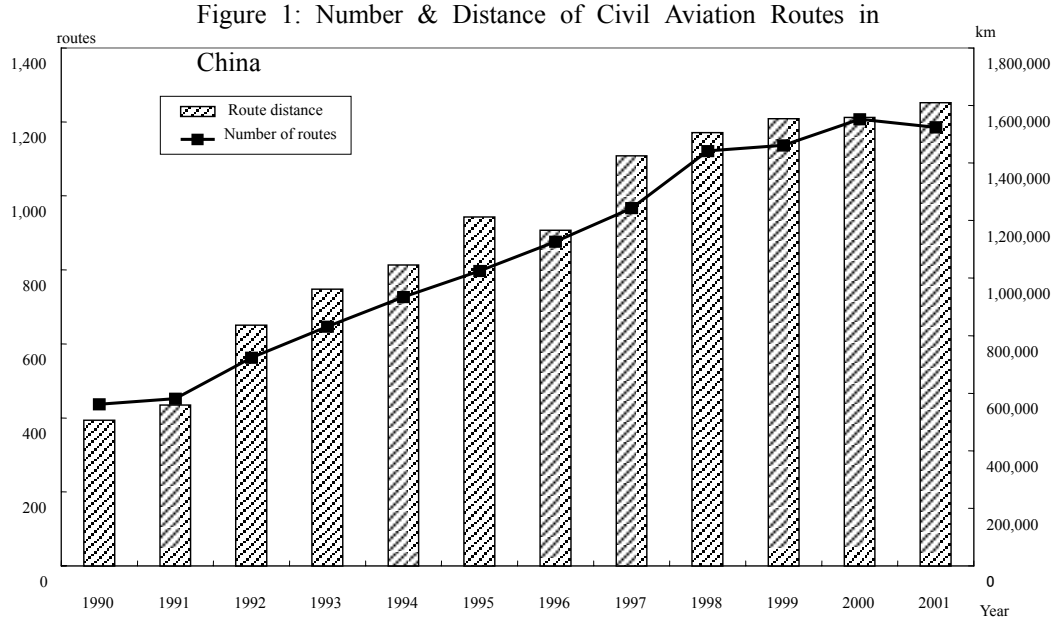
The final part of this section concerns efficiency in aircraft management. As stated in section 1.1 “Relevance”, the 1990s saw rapid growth in demand for air transport on the back of fast-paced development in the Chinese economy (Figure 1), and responding to the increased demand for air travel had been designated as a priority task.

Against this background, since the project was completed, air traffic control intervals (vertical

[4] Compiled using data from the CAAC website (http://www.caac.gov.cn)

interval: the interval between two aircraft traveling on the same flight path) for key domestic and international routes has been scaled back to approximately 75km from approximately 150km for aircraft traveling at the same altitude, enabling more aircraft to fly within the same airspace. Particularly between Beijing and Guangzhou, it has become possible to provide control at 20km intervals despite some differences in altitude, which has in turn made it possible to meet increased demand for air transport. In addition, according to the CAAC Air Traffic Control Bureau, prior to project implementation more than 35% of flights were delayed at Nanchang Airport, however, since the installation of ILS facilities and radar equipment, that figure has dropped to less than 10%.

Figure 1: Number & Distance of Civil Aviation Routes in China



Source: Civil aviation statistics for 1996 - 2000

2.4 Impact

2.4.1 Development of the Air Transport Industry

As Figure 2 and Figure 3 illustrate, between 1991-2001 the volumes of tourists and freight using air transport posted considerable growth against a background of rapid economic development, outstripping growth rates for other transport systems by a wide margin (Figures 4 & 5).

Amidst such circumstances, by the time of completion in 2000, the equipment supplied via the project had been provided to 127 airports, which are more than 90% of all of the airports in China(139)This may inferthat the project has contributed to meeting increased demand for air transport and to supporting rapid economic growth in China by providing aviation infrastructure.

Figure 2: Air Tourism in China

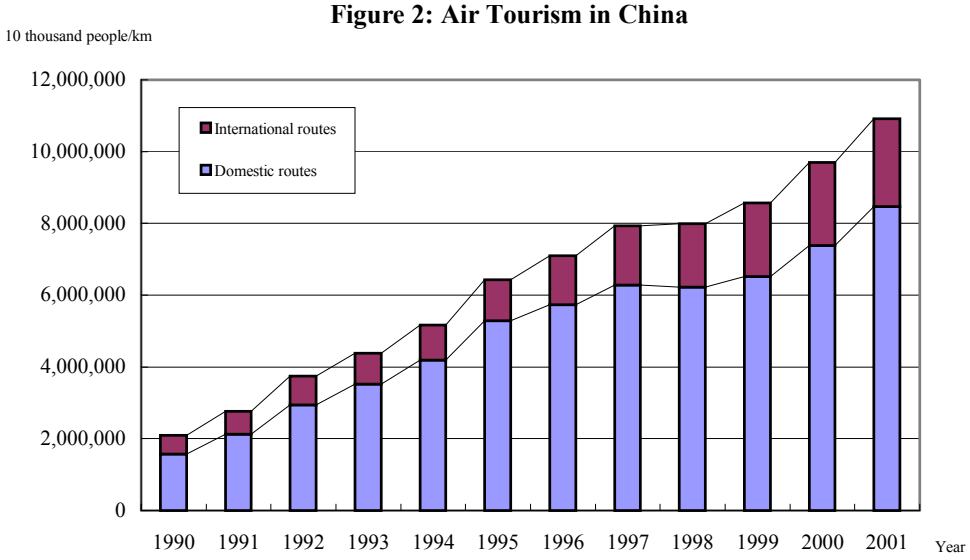


Figure 3: Air Freight Volumes in China

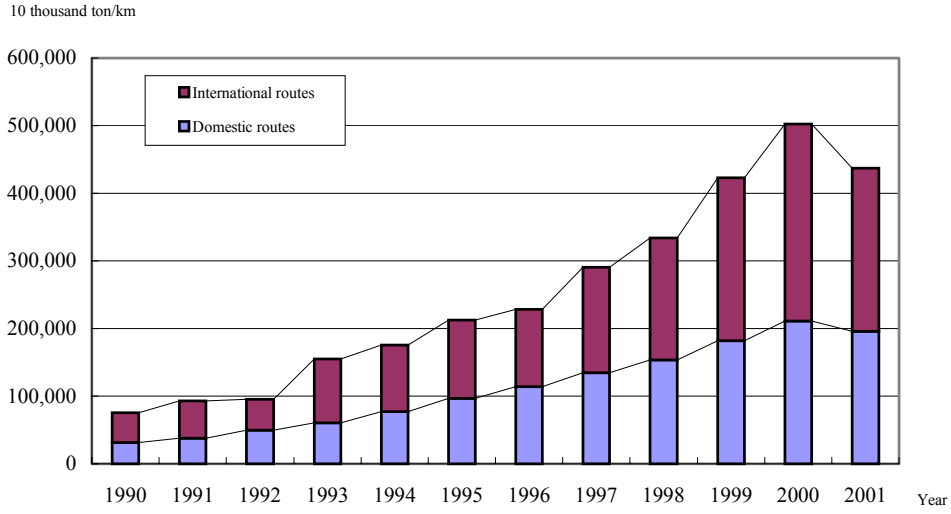


Figure 4: Tourism Growth Rates by Mode of Transport (based on figures for 1990)

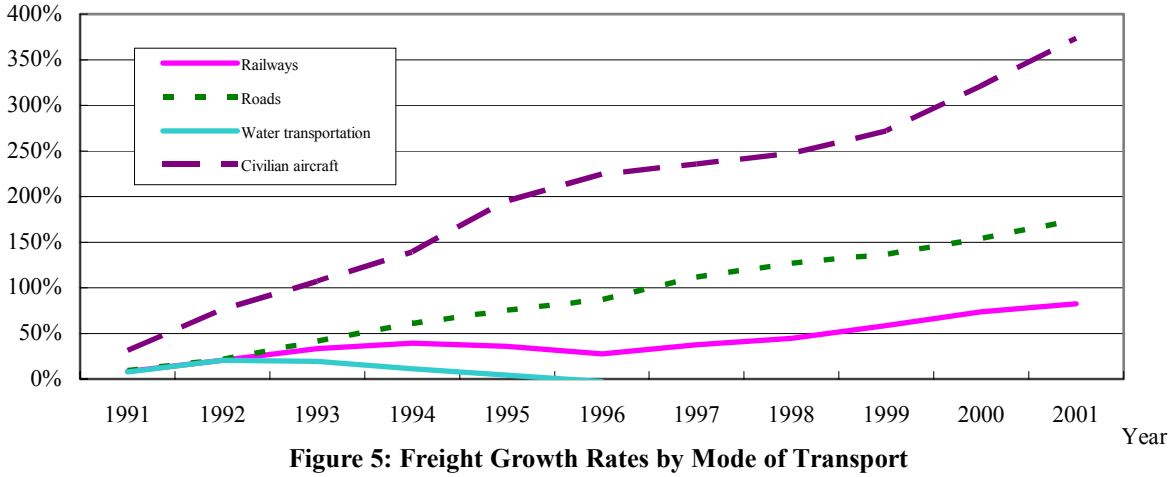
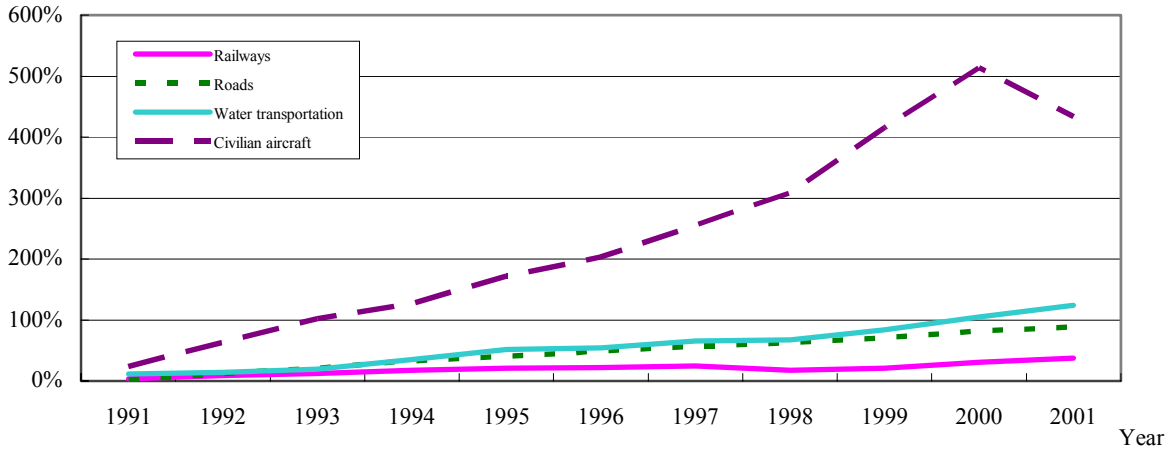


Figure 5: Freight Growth Rates by Mode of Transport (based on figures for 1990)



Source: Figures 2-5 were compiled from CAAC statistics for 2002 and the China Statistical Yearbook 2002

2.4.2 Social and Environment Impacts

Since the project involved the procurement of equipment relating to air traffic control systems, and moreover, the training center and other structures were constructed on Civil Aviation land, it did not incur any particular environmental or social problems.

2.5 Sustainability

2.5.1 Organizational Capability

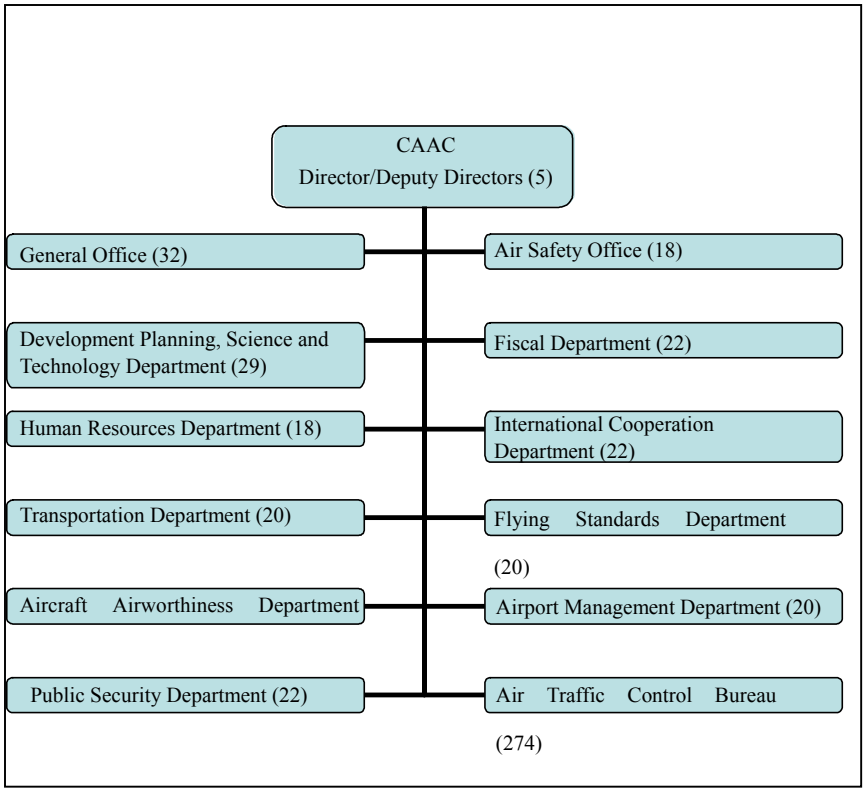
Project maintenance is being undertaken by the CAAC Air Traffic Control Bureau (Figure 6). The Air Traffic Control Bureau has jurisdiction over seven regional air traffic control bureaus and 32

regional air traffic control centers. The maintenance center is being managed by the CAAC Technical Installation Corporation Limited, a maintenance specialist affiliated with the Air Traffic Control Bureau.

Routine operation and maintenance tasks and the replacement of standard components is the responsibility of personnel at each of the regional air traffic control bureaus and centers, whilst breakdowns, problems with equipment and so forth are handled by the CAAC Technical Installation Corporation Limited.

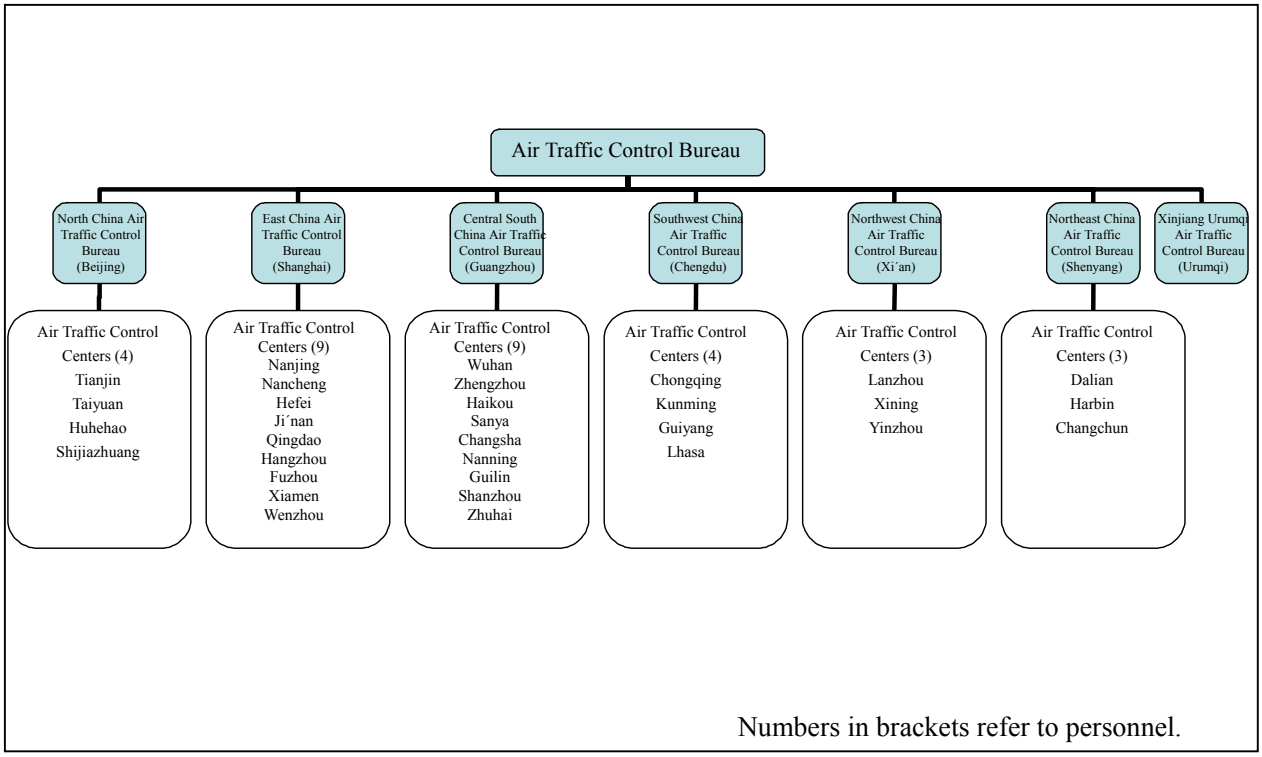
According to the CAAC Air Traffic Control Bureau, some 6,000 personnel have been assigned to operation and maintenance nationwide, and the CAAC Technical Installation Corporation Limited has allocated 20 of its 50 or so staff members to the maintenance center constructed via this project.

Figure 6: CAAC Organizational Chart



Numbers in brackets refer to personnel.

Figure 7: CAAC Air Traffic Control Bureau Organizational Chart



2.5.2 Technological Capability

The technicians working with civil air traffic control equipment have all received training at the maintenance center constructed via this project and some 1,100 have also undertaken training overseas. Additional training is provided where necessary and given that there have been no accidents attributable to air traffic control since project completion, it may be assumed that the maintenance, management and operation of equipment is being appropriately undertaken.

2.5.3 Financial Status

According to the CAAC Air Traffic Control Bureau report, the operation and maintenance costs for this project amount to 200 million yuan in total, and this sum has been incorporated into the costs for each related organization. There have been no reports of budget shortfalls and we have found no evidence of financial problems that might hinder the operation and maintenance of project facilities.

3. Feedback

3.1 Lessons Learned

On projects which cover a wide area and involve a number of procurement, careful and critical examination of components (e.g. coordination of procured lots, utilization of consultants, etc.) to improve the efficiency of project supervision is considered necessary from the earliest stages of project formulation and/or appraisal

Comparison of Original and Actual Scope

Item	Initial plan (Phase 1)	Revised plan (Phase 2)	Revised plan (Phase 3)	Actual
1. Project scope				
1) Air traffic control radar systems	1) 23 sets	As left	Changed to 20 sets (Lhasa, Hetian, Jinghong cancelled)	As left
2) Air traffic safety systems	2) ILS × 24 sets, DVOR/DME, etc. × 76 sets, computer system for flight path control × 1 set, emergency data command display × 8 sets.		As left	
3) Flight check aircraft	3) 2			
4) Beijing Maintenance center	4) Beijing Maintenance Center			
5) Meteorological equipment	5) Functional expansion of the Beijing Meteorological Center, functional expansion of meteorological sub-centers, etc.			
6) Communications equipment	6) Aeronautical Fixed Communications Network, VHF/HF transceiver equipment, satellite communications network, etc.			
7) Training facilities and training	7) Training facilities and training			
8) Engineering services	8) Engineering services			
2. Implementation schedule				
1) Radar	Apr. 1990 – Dec. 1995	Jul. 1991 – Dec. 1995	Jul. 1991 – Jun. 1996	Jul. 1994 – Jun. 2000
2) Aviation safety	Apr. 1990 – Dec. 1995	Jul. 1991 – Sep. 1996	Jul. 1991 – Sep. 1996	Jul. 1992 – Dec. 1997
3) Flight check aircraft	Oct. 1990 – Dec. 1993	Jul. 1992 – Jun. 1994	Apr. 1992 – Jun. 1995	Oct. 1993 – Mar. 1996
4) Maintenance	Apr. 1990 – Dec. 1995	Jul. 1991 – Dec. 1995	Jul. 1991 – Dec. 1994	Jul. 1993 – Dec. 1996
5) Meteorological equipment	Apr. 1990 – Dec. 1995	Jul. 1992 – Dec. 1995	Jul. 1992 – Dec. 1995	Oct. 1993 – Sep. 1997
6) Communications equipment	Apr. 1990 – Dec. 1995	Jul. 1991 – Dec. 1995	Jul. 1991 – Dec. 1995	Oct. 1992 – Dec. 1997
7) Training	Apr. 1990 – Dec. 1995	Jul. 1991 – Dec. 1995	Jul. 1991 – Dec. 1994	Oct. 1994 – Mar. 1997
3. Project cost				
Foreign currency	20,338 million yen	20,338 million yen	21,003 million yen	20,899 million yen
Local currency	11,034 million yen	11,034 million yen	6,324 million yen	11,310 million yen
	(320,770,000)	(320,770,000)	(270,250,000)	(748,990,000)
Total	31,422 million yen	31,422 million yen	27,327 million yen	32,209 million yen
ODA yen loan portion	20,388 million yen	20,388 million yen	21,003 million yen	20,899 million yen
Exchange rate	1US$ = 146 yen 1 yuan = 34.4 yen 1990 rate	1US$ = 146 yen 1 yuan = 34.4 yen 1990 rate	1US$ = 137 yen 1 yuan = 24.4 yen 1992 rate	1 yuan = 15.1 yen average rate for 1992 - 2000

Third Party Evaluator's Opinion on

Air Navigation & Air Traffic Control System Modernization Project (I) (II) (III)

Rong Jian
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Relevance

- Against the sustaining economic growth in China, air tourism increased from 20 billion people.km in 1990 to above 80 billion people.km in 2000. The air freight volume increased about 5.37 times from 1990 to 2000. The quickly increasing air demand need the guarantee of safety and punctuality. To establish the air traffic safety and control systems is the best way to improve safety and punctuality of air transport with minimum cost. Up to now, air transport occupancy about 1% in all transport modes, it will increase with the demand of comfortable travel. The project objectives can met the current requests in China today.
- There were no important changes in the background of the project or external factors that affected project plan and/or scope.
- In my view, there were no similar projects by other donors in the project area. The project is the largest and most significant one for improving civil traffic control system in China.
- In order to improve the air transport safety and efficiency, the advanced radar and meteorological equipments were introduced. The radar and meteorological equipments absolutely were faults of the air traffic control system before the project.

Impact

- The overall goal has been achieved by the project. The improved aspects included safety, punctuality and aircraft use efficiency. In many air companies, the relevant equipments works properly. The management system has never experienced any near misses or dangerous situations. Safety is assured even if the number of flights increases. Fast signal transmission has led to improvements in safety and reliability and consequent increases in the numbers of arrivals and departures. North Air China approved that the arrivals and departures has increased 2.75 times during 9 years. The percentage of cancellations or diversions due to weather conditions has dropped.
- The accurate radar equipments can strengthen the identification capability in operation, this can decrease the affects of the bad weather and emergency cases. The rigorous management system and fast signal transmission are necessary to implement the flying schedule with shorter interval, this can increase the capacity of the airport lanes.
- The advanced equipments can detect the aircraft status under all kinds of conditions, including almost bad weather. This provides management staff enough information to control the airport operation in various conditions. The equipments were so reliable that they can work properly for a long time. This is basic grantee for system functions' operation.
- The passengers respects more accurate punctuality of the air traffic currently.