

Summary of the Terminal Evaluation Results

1. Outline of the Project	
Country: Kingdom of Cambodia, Lao People's Democratic Republic and Socialist Republic of Vietnam	Project title: the Project for the Capacity Development for Transition to the New CNS/ATM Systems in Cambodia, Lao PDR and Vietnam
Issue/Sector: Transportation – Air Transport/Airport	Cooperation scheme: Technical Cooperation
Department in charge: Infrastructure and Peacebuilding Dept.	Total cost (as of June 2015): Approx. 5.5 million yen
	Partner Country's Implementing Organization: SSCA: State Secretariat of Civil Aviation (Cambodia) DCA: Department of Civil Aviation (Lao PDR) LATM: Lao Air Traffic Management CAAV: Civil Aviation Authority of Vietnam VATM: Vietnam Air Traffic Management ACV: Airport Corporation of Vietnam
Period of Cooperation: (R/D) 19 January 2011 - 18 January 2016	Supporting Organization in Japan: Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Related Cooperation: <East Mekong Region> - Master Plan Study on the Development of the New CNS/ATM Systems (2009-2010) <Cambodia> - Advisory Team for Airport Maintenance (Experts) (2002) <Lao PDR> - Project for the Modernization of Equipment for Transition to New CNS/ATM Systems (2013-2015) - Project for Expansion of Vientiane International Airport in Lao PDR (2011-2013) - Air Traffic Safety Improvement Project (2006-2009) <Vietnam> - Project for Support on Establishment of the Programs for Operation and Maintenance in Noi Bai International Airport (2012-2015) - Terminal 2 Construction Project in Noi Bai International Airport (2010-2016)
1-1 Background of the Project	
<p>International Civil Aviation Organization (ICAO) decided the global introduction of New Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) Systems, which utilize satellite technology in air navigation, in order to improve safety and efficiency of aircraft operations and to cope with increasing air traffic volumes. Accordingly the ICAO contracting states are enhancing the introduction of new CNS/ATM systems. In Asia, the transition</p>	

to the new systems is advanced in Japan, China, Korea, Thailand, Singapore, Philippines and Indonesia. Its earliest introduction is an issue for Cambodia, Lao PDR and Vietnam to realize seamless air navigation services, which are important for aircraft flying across the borders.

Responding to this issue, the Government of Japan conducted “The Master Plan Study on the Development of the New CNS/ATM Systems for three Eastern Mekong countries of Cambodia, Lao PDR and Vietnam in 2009-2010. The study assisted those countries in preparing master plans for system development, human resource development, and development of technical standards, etc. Accordingly, the governments of the three countries are modernizing their air navigation systems recognizing that the transition to the new systems in coordination with neighboring countries is an international obligation. However, they are in need for acquiring knowledge and developing capacity on the new CNS/ATM systems for their civil aviation staff in parallel with modernization of equipment and requested technical assistance to the Government of Japan.

1-2 Project Overview

(1) Overall Goal

To improve efficiency and safety of flight operations and to enlarge the capacity of airspace through the transition to the new CNS/ATM systems in Eastern Mekong Region

(2) Project Purpose

To enhance the transition to the new CNS/ATM systems in Cambodia, Lao PDR and Vietnam

(3) Outputs

Output 1: To develop capacity for establishing Performance Based Navigation (PBN) flight procedures

Output 2: To develop training system for air traffic controllers and air navigation technical staff on the new CNS/ATM systems

Output 3: To establish safety oversight system for air navigation services (Cambodia)
To strengthen safety oversight capacity by the introduction of Safety Management System (SMS) in air navigation services (Lao PDR and Vietnam)

(4) Inputs (as of June 2015)

Japanese side:

- Long-term Experts: 185.8 person-months
- Short-term Experts: 1,466 person-days
- Training in Japan: total 99 people in 14 courses
- Local Cost: Approx. 80.3 million Yen
- Equipment: Approx. 49.9 million Japanese yen

Cambodian, Laotian and Vietnamese side:

- Counterparts: Over 67 persons
- Facilities and Equipment: Office for JICA Experts
- Local Cost: Approx. 400 thousand US Dollar

2. Outline of the Terminal Evaluation Team			
Review Team	Japanese Side		
	Name	Job Title	Occupation
	Hiroyuki Ueda	Leader	Senior Advisor for Transportation Sector, JICA
	Daisuke Fujiwara	Air Traffic Control	Chief; Terminal Section Flight Procedures and Airspace Program Office, Air Traffic Control Division, Air Navigation Service Dept., JCAB
	Yoshiharu Minami	Air Navigation Services Engineering	Chief; Air Navigation Services Engineering Div., Air Navigation Services Dept., JCAB
	Masahiro Nakakubo	Air Navigation Services Engineering	Chief; Air Traffic International Affairs Office, Air Navigation Services Dept., JCAB
	Kenichi Takahashi	New CNS/ATM Systems	Director; Air Traffic International Affairs Office, Air Navigation Services Dept., JCAB
	Kaoru Okada	Cooperation Planning	Deputy Director; Team 2, Transportation and ICT Group, Infrastructure and Peacebuilding Dept., JICA
	Toru Shimada	Evaluation Analysis	Consultant, ADAMIS Ltd.
	Cambodian, Laotian and Vietnamese Side		
	Name	Occupation	
	Khim Bunna	Deputy Director of Administration and Human Resource Department. SSCA, Cambodia	
	Vanpheng Chanthaphone	Deputy Director General, DCA, Lao PDR	
	Somphonh Sygnavong	Director of Aviation Security, DCA, Lao PDR	
	Trinh Manh Hoa	Director of Science, Technology and Environment Dept., CAAV	
Period of Evaluation	14 June 2015 - 22 July 2015	Type of Evaluation: Terminal Evaluation	
3. Results of Evaluation			
3-1 Project Performance			
(1) Achievement of Outputs			
1) Output 1: To develop capacity for establishing Performance Based Navigation (PBN) flight procedures			
<u>Overall Achievements</u>			
[Cambodia]			
The average percentage of achievements of 10 indicators is 81%. Five (5) out of 6 remaining			

indicators will be achieved 100% with completion of flight validation, publication of WGS-84 coordinates and PBN flight procedures for Sihanouk International Airport by October 2015. It is estimated that the last remaining indicator will be achieved by appointment of additional one flight standard officer in mid 2016.

[Lao PDR]

The average percentage of achievements of all indicators is 73%. Four (4) out of 5 remaining indicators will be achieved 100% with completion of ground and flight validations, and implementation of PBN flight procedures for Luang Phabang International Airport by December 2015. It is estimated that the remaining 1 indicator, i.e. number of RNAV/RNP routes, will be achieved by 2018.

[Vietnam]

The average percentage of achievements of all indicators is 69%. The Vietnamese side aims at achieving 5 out of 7 remaining indicators by the end of the Project period and the last 2 indicators by March 2016. The Terminal Evaluation Team recognizes that these targets are challenging in consideration of the progress made to date.

Achievement of Individual Indicator

- Number of airports where WGS-84 data are completed:
 - [Cambodia] (Target: 3 airports) Achievement: 83%
WGS-84 data has already been published for 2 airports, and will be published for 1 airport, where the survey was completed, in October 2015.
 - [Lao PDR] (Target: 2 airports) Achievement: 100%
WGS-84 data has already been published for 3 airports.
 - [Vietnam] (Target: 5 airports) Achievement 40%
WGS-84 data that were already surveyed at 4 airports will be published by November 2015, and CAAV/ACV plan to publish WGS-84 data for 3 more airports in November 2015.

- Number of PBN flight procedures that design is completed
 - [Cambodia] (Target: 71 procedures) Achievement 100%
69 PBN flight procedures have been designed. It was found that 2 procedures originally planned for Sihanouk were not necessary.
 - [Lao PDR] (Target: 40 procedures) Achievement 58%
23 PBN flight procedures have been designed, and design of additional 40 procedures will be completed in July 2015.
 - [Vietnam] (Target: 75 procedures) Achievement: 73%
55 PBN flight procedures have been designed, and aiming at completing design of additional 20 procedures in December 2015.

- Number of PBN flight procedures that flight validation is completed
 - [Cambodia] (Target: 71 procedures) Achievement 68%
47 procedures have already been validated, and additional 22 procedures will be validated in August 2015. It was found that 2 procedures originally planned for Sihanouk were not necessary.

[Lao PDR] (Target: 38 procedures) Achievement: 55%
21 procedures have already been validated, and additional 38 to 40 procedures will be validated in September or October 2015.

[Vietnam] (Target: 75 procedures) Achievement: 73%
55 procedures have already been validated, and aiming at completing validation of additional 20 procedures in January 2016.

- Progress of development of standards for PBN operational approval

[Cambodia] (Target: “complete”) Achievement: 100%
Standards for PBN operational approval have been developed.

[Lao PDR] (Target: “complete”) Achievement: 100%
Standards for PBN operational approval have been developed.

[Vietnam] (Target: “complete”) Achievement: 100%
Standards for PBN operational approval have been developed.

- Number of airports where PBN procedures are implemented

[Cambodia] (Target: 3 airports) Achievement: 67%
PBN procedures has already been implemented at 2 airports, and will be implemented at 1 airport in October 2015.

[Lao PDR] (Target: 3 airports) Achievement: 67%
PBN procedures has already been implemented at 2 airports, and will be implemented at 1 airport in December 2015.

[Vietnam] (Target: 5 airports) Achievement: 20%
Unpublished PBN procedures at 2 airports have been used by Vietnamese airlines. PBN procedures will be implemented officially at 3 airports in November 2015, and it is aimed at to implement PBN at 2 airports in March 2016.

- Number and types of PBN procedures (SID/STAR/APCH) which are implemented at airports

[Cambodia] (Target: 71 procedures) Achievement: 68%
47 procedures have already been implemented, and 22 procedures will be implemented in October 2015. It was found that 2 procedures originally planned for Sihanouk were not necessary.

[Lao PDR] (Target: 40 procedures) Achievement: 53%
21 procedures have already been implemented, and 38 to 40 procedures will be implemented in December 2015.

[Vietnam] (Target: 75 procedures) Achievement: 42%
Unpublished 31 procedures have been used by Vietnamese airlines, and it is planned to implement 55 procedures (including above-mentioned 31 procedures) officially in November 2015. It is aimed at implementing additional 20 procedures by March 2016.

- Number of RNAV/RNP routes which are implemented for enroute

[Cambodia] (Target: 4 routes) Achievement: 75%

There are 3 RNP 10 routes in operation, and 3 routes will be designated as RNAV 5 in 2015.

[Lao PDR] (Target: 5 routes) Achievement: 0%

3 routes will be designated as RNAV 5 in 2015. DCA plans to implement additional 1 PBN route in 2016, and to start coordination with neighboring countries in 2016 for possibility of implementation of PBN at B465, B346, etc. by 2018.

[Vietnam] (Target: 10 routes) Achievement: 40%

There are 4 RNP 10 routes in operation, 1 route will be designated as RNAV 5 by the end of 2015, and it is aimed at implementing 5 more RNAV routes by the end of 2015 as well.

- Number of flight procedure designers capable of producing PBN flight procedures

[Cambodia] (Target: 8 persons) Achievement: 100%

8 flight procedure designers are capable of producing PBN flight procedures.

[Lao PDR] (Target 8 persons) Achievement: 100%

8 flight procedure designers are capable of producing PBN flight procedures.

[Vietnam] (Target: 17 persons) Achievement: 100%

18 flight procedure designers are capable of producing PBN flight procedures.

- Number of flight validation officers capable of conducting PBN flight validation

[Cambodia] (Target: 2 persons) Achievement: 100%

3 flight validation officers are capable of conducting PBN flight validation.

[Lao PDR] (Target: 2 persons) Achievement: 100%

2 flight validation officers are capable of conducting PBN flight validation.

[Vietnam] (Target: 2 persons) Achievement: 100%

5 flight validation officers are capable of conducting PBN flight validation.

- Number of flight standard officers capable of developing standards for PBN operational approval

[Cambodia] (Target: 2 persons) Achievement: 50%

1 flight standard officer is capable of developing standards for PBN operational approval at present, and another flight standard officer will be appointed in mid 2016.

[Lao PDR] (Target: 3 persons) Achievement: 100%

3 flight standard officers are capable of developing standards for PBN operational approval.

[Vietnam] (Target: 4 persons) Achievement: 100%

4 flight standard officers are capable of developing standards for PBN operational approval.

2) Output 2: To develop training system for air traffic controllers and air navigation technical staff on the new CNS/ATM systems

Overall Achievements

[Cambodia]

The average percentage of achievements of all indicators is 97%. One remaining indicator will be achieved by July 2015, when ASM and SUR trainings are scheduled to complete.

[Lao PDR]

The average percentage of achievements of all indicators is 99%. One remaining indicator

will be fully achieved through GNSS training in August 2015

[Vietnam]

The average percentage of achievements of all indicators is 100%.

Achievement of Individual Indicator

- Ratio of air traffic controllers and air navigation technical staff who have obtained sufficient basic knowledge on the new CNS/ATM system.
[Cambodia] (Target: at least 90%) Achievement: 100%
96.4% of air traffic controllers and 97.8% of air navigation technical staff obtained sufficient basic knowledge on the new CNS/ATM system.
[Lao PDR] (Target: 90%) Achievement: 100%
100% of air traffic controllers and 96.4% of air navigation technical staff obtained sufficient basic knowledge on the new CNS/ATM system.
[Vietnam] (Target: 90%) Achievement: 100%
100% of air traffic controllers and 100% of air navigation technical staff obtained sufficient basic knowledge on the new CNS/ATM system.

- Number of instructors who can operate and improve the new CNS/ATM system basic training courses
[Cambodia] (Target: 4 persons) Achievement: 100%
4 instructors can operate and improve the new CNS/ATM system basic training courses.
[Lao PDR] (Target: 4 persons) Achievement: 100%
4 instructors can operate and improve the new CNS/ATM system basic training courses.
[Vietnam] (Target: 10 persons) Achievement: 100%
35 instructors who can operate and improve the new CNS/ATM system basic training courses.

- Ratio of air traffic controllers and air navigation technical staff who have obtained sufficient advanced knowledge on the new CNS/ATM system
[Cambodia] (Target: at least 50%) Achievement: 85%
34.8% of air traffic controllers and 59.2% of air navigation technical staff obtained sufficient advanced knowledge on the new CNS/ATM system. Additional air traffic controllers will be trained in July 2015 to achieve the target.
[Lao PDR] (Target: 50%) Achievement: 95%
81.3% of air traffic controllers and 44.6% of air navigation technical staff obtained sufficient advanced knowledge on the new CNS/ATM system. Additional air navigation technical staff will be trained in August 2015 to achieve the target.
[Vietnam] (Target: 40%) Achievement: 100%
75.0% of air traffic controllers and 45.8% of air navigation technical staff obtained sufficient advanced knowledge on the new CNS/ATM system.

- Number of instructors who can operate and improve the new CNS/ATM system advanced training courses

[Cambodia] (Target: 4 persons) Achievement: 100%
4 instructors can operate and improve the new CNS/ATM system advanced training courses.
[Lao PDR] (Target: 4 persons) Achievement: 100%
7 instructors can operate and improve the new CNS/ATM system advanced training courses.
[Vietnam] (Target: 6 to 10 persons) Achievement: 100%
20 instructors can operate and improve the new CNS/ATM system advanced training courses.

- Establishment of training program which includes new CNS/ATM subjects for new recruits of ATC and air navigation technical staff.
[Cambodia] (Target: “complete”) Achievement: 100%
SSCA established the Training Guidelines in November 2013.
[Lao PDR] (Target: “complete”) Achievement: 100%
DCA established the Training Guidelines in December 2013.
[Vietnam] (Target: “complete”) Achievement: 100%
CAAV instructed VATM and ACV to implement initial training of air traffic controllers and air navigation technical staff for certification.

- 3) Output 3: To establish safety oversight system for air navigation services (Cambodia)
To strengthen safety oversight capacity by the introduction of Safety Management System (SMS) in air navigation services (Vietnam and Lao PDR)

Overall Achievements

[Cambodia]

The average percentage of achievements of all indicators is 75%. It is estimated that 1 out of the 2 remaining indicators will be achieved 100% with approval of CATS’s SMS by July 2015, and the last one, i.e. implementation of SSP, will be achieved in early 2016.

[Lao PDR]

The average percentage of achievements of all indicators is 80%. It is estimated that 2 remaining indicators will be fully achieved with approval of LATM’s SMS by the end of 2016.

[Vietnam]

The average percentage of achievements of all indicators is 90%. One remaining indicator will be fully achieved by conducting the safety audits in 2015.

Achievement of Individual Indicator

- State Safety Program (SSP) and regulations on SMS for air navigation services have been developed.

[Cambodia] (Target: “complete”) Achievement: 75%

SSCA adopted the Air Navigation Regulation in January 2015. SSCA is reviewing draft SSP, and will enact the SSP in early 2016.

[Lao PDR] (Target: “complete”) Achievement: 100%

DCA adopted SMS Regulation in December 2012, and Lao PDR SSP was promulgated in February 2015.

[Vietnam] (Target: “complete”) Achievement: 100%

SSP including SMS requirements for the service providers was approved by MoT in May 2013.

- Approval of ANSP's SMS by SSCA, DCA, CAAV
[Cambodia] (Target: "complete") Achievement: 0%
SSCA will approve CATS' SMS after adoption of ANS-SMS Guidebook in July 2015.
[Lao PDR] (Target: "complete") Achievement: 50%
DCA has approved the LATM's SMS Manual in February 2014. DCA plans to approve LATM's SMS after "Evaluation of First SMS Implementation" in mid 2016.
[Vietnam] (Target: "complete") Achievement: 100%
CAAV has approved the SMS developed by VATM and ACV in November 2012 and May 2013 respectively.

- Record of SMS operation by ANSP is available.
[Cambodia] (Target: "available") Achievement: 100%
SMS operation record is available.
[Lao PDR] (Target: "available") Achievement: 100%
SMS operation record is available.
[Vietnam] (Target: "available") Achievement: 100%
SMS operation record is available.

- Number of safety audits in air navigation services conducted by SSCA, DCA, CAAV
[Cambodia] (Target: "conduct in 2015") Achievement: 100%
SSCA conducted a safety audit in January 2015.
[Lao PDR] (Target: "at least once a year for international airport and once every 2 years for domestic airport") Achievement: 50%
DCA conducted safety audits to all 4 international airports during December 2014 and January 2015 and plans to conduct audit of all domestic airports in 2015/2016.
[Vietnam] (Target: 2-3 audits in 2014 and 2015) Achievement: 50%
CAAV conducted audits to 5 ATS units in December 2014, and plans to conduct audit to NORATS, SORATS and 6 airports of ACV in 2015

- Number of safety auditors who can conduct audits in air navigation services
[Cambodia] (Target: 4 persons) Achievement: 100%
4 safety auditors can conduct audits in air navigation services.
[Lao PDR] (Target: 8 persons) Achievement: 100%
8 safety auditors can conduct audits in air navigation services.
[Vietnam] (Target: 12 persons) Achievement: 100%
47 safety auditors who can conduct audits in air navigation services.

(2) Project Purpose: To enhance the transition to the new CNS/ATM systems in Cambodia, Lao PDR and Vietnam

The Project Purpose has been almost achieved at the time of the Terminal Evaluation, and

estimated to be fully achieved by the target groups by completing SSP enactment and appointment of additional flight standard officer by mid 2016 for Cambodia, by implementation of two additional RNAV 5 routes expected by 2018 for Lao PDR and by publication of PBN flight procedures at 2 airports in March 2016 for Vietnam.

1) Utilization of PBN flight procedures in Cambodian, Lao and Vietnamese airspace
[Cambodia]

PBN flight procedures have been implemented and utilized at Phnom Penh and Siem Reap International Airports, and 3 RNP 10 routes are in operation. Increased utilization of PBN operations is estimated within the Project period by implementation of PBN flight procedures at Sihanouk International Airport in October 2015 and three RNAV 5 routes within 2015.

[Lao PDR]

PBN flight procedures have been implemented and utilized at Vientiane and Pakse International Airports. Increased utilization of PBN operations is estimated within the Project period by implementation of PBN flight procedures at Luang Phabang International Airport in December 2015 and three RNAV 5 routes within 2015. DCA plans to implement additional 1 PBN route in 2016, and to start coordination with neighboring countries in 2016 for possibility of implementation of PBN at B465, B346, etc. by 2018.

[Vietnam]

4 RNP 10 routes are in operation. PBN flight procedures will be implemented and utilized officially at Phu Bai, Phu Quoc and Cam Ranh Airports by publication in AIP in November 2015. It is planned to implement 1 RNAV 5 route in 2015, and aimed at implementing additional 5 RNAV 5 routes, i.e. W1 (2 parallel routes), R474, G474 and R468, (G474 and R468 are subject for further coordination with Cambodia). It is also aimed at implementing PBN flight procedures at Con Son and Lien Khuong Airport by March 2016.

2) Utilization of knowledge of new CNS/ATM systems in implementation and operation
[Cambodia]

Answers to “Questionnaires to Trainees” (5-rank self-evaluation) indicate that the training provided by the Project is “good/sufficient” (average score 4.4) and will be “significantly” helpful (average score 4.3) for the development of new CNS/ATM Systems in Cambodia. Opportunity to use the knowledge obtained through the Project is still limited at present (average score 3.1), but it is estimated to increase as development of new CNS/ATM systems are further progressed.

[Lao PDR]

Answers to “Questionnaires to Trainees” (5-rank self-evaluation) indicate that the training provided by the Project is “very good/excellent” (average score 4.7) and will be “significantly” helpful (average score 4.4) for the development of new CNS/ATM Systems in Lao PDR. Opportunity to use the knowledge obtained through the Project is “often” (average score 4.4).

[Vietnam]

Answers to “Questionnaires to Trainees” (5-rank self-evaluation) indicate that the training provided by the Project is “very good/excellent” (average score 4.5) and will be “significantly” helpful (average score 4.2) for the development of new CNS/ATM Systems in Lao PDR.

Opportunity to use the knowledge obtained through the Project is “often” (average score 4.4).

3) Operation of SMS at all ANSPs

[Cambodia]

CATS, the sole ANSP in Cambodia, have been operating SMS. It will be approved by SSCA after adoption of ANS-SMS Guidebook in July 2015.

[Lao PDR]

LATM, the sole ANSP in Lao PDR, has started initial operation of SMS. The SMS will be approved by DCA after Evaluation of First SMS Implementation in mid 2016.

[Vietnam]

All ANSP in Vietnam, i.e. VATM and ACV, have been operating SMS since 2013.

(3) Implementation Process

1) General

About 72 to 88% of the respondents to the following 7 questions, which are related to the implementation process, rated “High” or “Very High”, and only 4 to 1% rated lower than “Fair”.

Q1: How do you rate level of understanding of the Project Purpose among the personnel involved in the Project?

Q2: How do you rate level of clear understanding of roles of each counterparts/task force members?

Q3: How do you rate level of active involvement of counterparts/task force members in the Project?

Q4: How do you rate the support and guidance provided to the Project by JICA Cambodia, Laos and Vietnam Office and Headquarters?

Q5: How do you rate the support and guidance provided to the Project by SSCA, DCA and CAAV management?

Q6: How do you rate appropriateness in terms of volume, quality and timing of inputs (i.e. experts, training, equipment, etc.) from Japan side?

Q7: How do you rate appropriateness in terms of volume, quality and timing of inputs (i.e. personnel, facilities, equipment, etc.) from Cambodia, Lao and Vietnam sides?

2) Amendments of PDM

The Project amended the PDM 3, 3 and 4 times for Cambodia, Lao PDR and Vietnam to suit to assistance needs. The amendments contributed to the achievement of the Project Purpose.

3) Planning, Monitoring and Management

Review and update of the Project Plan have been done periodically with joint efforts of the JICA Experts and Counterparts so as to address their needs accurately. Updated Project Plans were discussed and approved by Joint Coordination Committee (JCC). Changes have all been reflected in the PDM and PO, and recorded in the Minutes of Meeting. “Project Outputs Evaluation Indicators”, which are based on the objectively verifiable indicators in the PDM, have been utilized for monitoring the progress and achievements.

The Project is well monitored. Respective Counterparts have properly monitored the progress and achievements of the activities, for which they are responsible. Progress reports have been prepared by the JICA Experts, reviewed by the Counterparts, and submitted to JICA on a semi-annual basis. All Short-term Experts have provided a detailed Task Completion Reports on their activities with very useful information for subsequent Japanese experts and continuity of technical transfer.

The semi-annual JCC and annual Regional JCC have been held six and three times respectively since the Project started in January 2011. In addition to these, Project Meetings were held 25, 25 and 15 times for Cambodia, Lao PRD and Vietnam respectively until now. The achievements of the previous period and the Project Plans for the coming period were presented and approved in JCC. These occasions enabled information exchange among the project members and provided good opportunities to inform the SSCA, DCA and CAAV top management on the Project. Regional task force meetings were held in RJCCs to address regional/common issues, e.g. WGS-84 survey guidelines, enroute PBN, training guidelines, etc.

4) Communication and Coordination

While the Project Office of the JICA Experts is located in Hanoi, which is very remote for the Counterparts of Cambodia and Lao PDR, there has been good communication between the Japanese Experts and the Counterpart members through e-mails, Project Meetings, the Project website, etc. Communications between the Japanese Experts and the Vietnamese Counterpart members have not been better than those with Cambodian and/or Lao Counterparts although the Project Office of the JICA Experts is located at CAAV Headquarters in Hanoi.

There have been good coordinations between SSCA and stakeholders including CATS and airlines and good cooperation of DCA and LATM. However, time-lag of information between CAAV and VATM/ACV sometimes made coordination difficult.

There has been good communication among the JICA Headquarters, JICA Vietnam Office and the Project as well.

5) Technical Transfer

According to answers of questionnaire to the counterparts, more than 90% of the respondents to the questionnaire rated the effectiveness and usefulness of the technical transfer provided to the Counterpart personnel “High” or “Very High”, and no one rated lower than “Fair”.

6) Technical Exchange with Neighboring Countries

The Project was implemented with effective use of technical exchange with neighboring countries including the Philippines, Indonesia, etc. The technical exchange includes:

- Sharing of “WGS-84 Survey Guidance” developed by Vietnam to Cambodia and Lao PDR;
- Sharing of “Instrument Procedure Design Approval Manual” developed by Lao PDR to Cambodia and Vietnam;
- Assistance of VATM specialists to Lao PDR for training of charting and AIP drafting;
- Sharing of SSP developed by Vietnam to Cambodia and Lao PDR.
- Presentation of a coordinated plan of RNAV routes implementation with a single chart by

- the three countries, and exchange of views among the Mekong countries and international organizations at the Mekong ATM Coordination Group meeting in Siem Reap;
- Invitation of participants from the Philippines to a regional workshop on new CNS/ATM system basic training at Ho Chi Minh;
 - Dispatch of CNS Advisor of this Project to Indonesia for a workshop on WGS-84 survey technology;
 - Invitation of lecturers from the Philippines for training courses on CNS/ATM; and
 - Dispatch of 2 counterparts from each of the 3 countries to AEROTHAI headquarters for training on flight inspection and RAIM prediction.

7) Public Relations

The Project has been making good public relations by establishing its website, accepting TV and newspaper interviews, etc. The website started in 2012 has also been used as a communication tool.

8) Promotion of Ecofriendly Operations

The Project declared “paperless” in December 2013, and reduced consumption of papers by more than 90% by distributing soft copy of documents and exchanging information on its website.

3-2 Summary of Evaluation Results

(1) Relevance

The relevance of the Project is judged “Very High” for the following reasons:

- The earliest transition to new CNS/ATM systems is required for realization of seamless air navigation services, which are important for aircraft flying across the borders, and contribute to efficiency and safety of aircraft operations. Thus, the Project Purpose and Overall Goal are consistent with the needs of civil aviation sector.
- The Project Purpose, i.e. to enhance the transition to the new CNS/ATM systems in Cambodia, Lao PDR and Vietnam, is consistent with “National Strategic Development Plan 2014-2018” of Cambodia, “The Seventh Five-Year National Socio-Economic Development Plan (2011-2015)” of Lao PDR and Resolution No. 88/NQ-CP of the Government of Vietnam, which include promotion of inspection and monitoring on airports and air navigation services, development of SSP and improvement of flight procedures as policies for ensuring safety and regularity of transport of Vietnam.
- SSCA, DCA and CAAV are the government authorities for regulating civil aviation, and LATM and VATM and ACV are organizations for air navigation services. Thus, they are the most appropriate organizations as the implementing agencies and target groups of the Project.
- The Project is in line with “Aviation Transport Policy and Strategies” of SSCA, DCA and LATM’s needs of transition to the new CNS/ATM systems and “Master Plan of Development of CNS/ATM in the Field of Civil Aviation up to 2020 and Vision to 2030 approved by MoT, Vietnam.
- The Japanese “Country Assistance Policy for Cambodia” (April 2012) established “Steady

and Sustainable Economic Growth and Balanced Development” as the basic policy of assistance, and the Project is listed as one of the projects under the Development Issue 1-1: Development of Economic Infrastructure. The Japanese “Country Assistance Policy for Lao People’s Democratic Republic” (April 2012) established “Supporting for achieving MDGs by 2015 and graduating from LDC index by 2020” as the basic policy of assistance, and the Project is listed as one of the projects under the Development Issue 1-1: Development of Transport Network. The Japanese “Country Assistance Policy for the Socialist Republic of Viet Nam” (December 2012) established “Japan supports Viet Nam to achieve sustainable development by strengthening the international competitiveness, conquer the vulnerability and create a fair society and country” as the basic policy of assistance, and the Project is listed as one of the projects under the Development Issue 1-3: Improving of Economic Infrastructure and Traffic Accessibility.

- Japan has sufficient experiences in introducing and operating the new CNS/ATM systems, and has been providing various technical assistances in this field in Lao PDR, the Philippines, Indonesia and Myanmar. Therefore, Japan has technical advantages necessary for the Project.

(2) Effectiveness

The effectiveness of the Project is judged “Very High” for Cambodia and “High” for Lao PDR and Vietnam for the following reasons:

- The Project was designed appropriately through amendments of the PDM in the past, and 3 Outputs in the current PDM are necessary and sufficient for achievement of the Project Purpose.
- The Project Purpose has been almost achieved at the time of the Terminal Evaluation. It is estimated that the Target Groups will continue the remaining activities beyond the Project period and complete them by mid 2016 for Cambodia and by 2018 for Lao PDR. For Vietnam, the Counterparts aim at completing the remaining activities by March 2016, but this target is considered challenging.
- Answers to questionnaires to the Counter Parts (5-rank self-evaluation) shows that usefulness of the technical transfer provided by both Long- and Short-term JICA Experts is very high (average score 4.1, 4.7 and 4.3 for Cambodia, Lao PDR and Vietnam respectively).

(3) Efficiency

The efficiency of the Project is judged “High” for the following reasons:

- The Project was designed appropriately through amendments of the PDM in the past, and all the activities in the current PDM are essential for achievement of the Outputs.
- The project implementation has been properly managed by both the Cambodia, Lao PDR, Vietnam and Japanese sides, and the Inputs made by the Cambodia, Lao PDR, Vietnam and Japanese sides were used properly for the Project.
- The Project assigned four JICA Long-term Experts stationed in Vietnam, and those experts conducted technical assistance for Cambodia, Lao PDR and Vietnam with efficient use of Short-term Experts. Overall inputs from Japan are utilized efficiently for the three

countries.

- The maximum person-months of the Japanese Long-Term Experts for the 3 countries has been increase from 180 to 224 in order to support activities under Output 1, especially training of PBN flight procedure designers. Additional inputs from Japanese side beyond the original plan were also necessary to transfer the knowledge of WGS-84 survey method. All of these additional inputs are essential to achieve the planned outputs.
- About 186 person-months of Long-term Experts have been utilized by the end of June 2015, and about 24 person-months will be utilized by the end of the Project period, i.e. 18 January 2016. Thus, the total person-months will be about 210, i.e. within the maximum of 224.
- Start of activities for enroute PBN of the Output 1 has been delayed because the taskforce placed higher priority on the airport PBN.
- For Cambodia and Lao PDR, Output 3 (especially SSP) has been delayed due to the limited availability of resources of Short-term Experts.
- For Vietnam, prolonged decisions of CAAV and budget constraints caused delays in procurement of flight validation equipment and RAIM prediction system. However, the Project responded to the situation by outsourcing services as temporary measures.
- Answers to questionnaires to the C/P (5-rank self-evaluation) shows that volume, quality and timing of inputs from Japan side are very good (average score 4.0, 4.4 and 4.5 for Cambodia, Lao PDR and Vietnam respectively) and from Cambodia, Lao and Vietnam sides are good (average score 3.4, 3.9 and 3.6 for Cambodia, Lao PDR and Vietnam respectively).

(4) Impact

The impact of the Project is predicted as “High”. The Project has already given positive impacts on the capabilities of SSCA, DCA and CAAV in the areas of the new CNS/ATM systems and the safety oversight of air navigation service provider.

By the introduction of PBN flight procedures at Phnom Pen, Siem Reap and Sihanouk Airports in Cambodia, Vientiane, Pakse and Luang Phabang Airports in Lao PDR and Phu Bai, Phu Quoc, Cam Ranh, Con Son and Lien Khuong Airports in Vietnam, approximately \$US 3.5 million of fuel cost savings for airlines and 19,200 tons of reduction in CO₂ emission will be brought about every year in each of the three countries. These impacts in economy and environment of flights are expected to increase significantly by PBN at Tan Son Nhat, Noi Bai and Danang Airports (\$US 7.5 million of fuel cost savings for airlines and 41,600 tons of reduction in CO₂ emission every year) and introduction of straight international RNAV routes passing through the three countries in future.

Other impacts of the Project are predicted as follows:

- Cooperative relationship among the civil aviation authorities of Cambodia, Lao PDR and Vietnam has been strengthened through the Project, and will make the regional coordination in civil aviation smoother.
- It is expected that safety culture will be fostered in the civil aviation sector through implementation of SSP and SMS.
- Through the activities of WGS-84, officers of Ministry of Land Management, Urban

Planning and Construction (MLUC) of Cambodia, National Geographic Department (NGD) of Lao PDR and Ministry of Natural Resources and Environment (MNRE) of Vietnam improved their knowledge and capability on WGS-84 survey including data management. It is expected that MLUC, NGD and MNRE utilize these knowledge and capability in the national geographic survey.

There are no negative effect observed to date, and no negative impact is foreseen.

(5) Sustainability

The sustainability of the Project is estimated as “High” for Cambodia and Lao PDR and “Moderate” for Vietnam. The effect of the Project is expected to continue by the Governments of Cambodia, Lao PDR and Vietnam even after the Japanese technical cooperation terminates for the following reasons:

1) Policy Aspect

The Project is consistent with the policies in “National Strategic Development Plan 2014-2018” of Cambodia. As ICAO membership, the Cambodian government policy on strengthening of aviation safety will be continued to catch up on growth of tourism and other businesses.

DCA of Lao PDR intends to continue the improvement on the air navigation services in the next Five-Year National Socio-Economic Development Plan. Based on the ICAO USOAP and ICVM recommendations, DCA and the Ministry of Public Works and Transport are committed to maintain and to secure sufficient staff in order to meet an acceptable level of safety under SMS.

It is well expected to continue transitioning to the new CNS/ATM systems in Vietnam even after the Project period based on Resolution No. 88/NQ-CP of the Government of Vietnam, “Master Plan of Development of Civil Aviation up to 2020 and Vision to 2030” and “Master Plan of Development of CNS/ATM in the Field of Civil Aviation up to 2020 and Vision to 2030”.

2) Organization and Financial Aspect

SSCA, DCA and CAAV are government organization to regulate the civil aviation, LATM is a government organization to provide air navigation services, and VATM and ACV are government owned corporation. Therefore, their organizations and financial bases are sound. As long as the Governments maintain their policies on the aviation safety, it is expected that necessary budget will be allocated to the Target Groups. However, continuous efforts of CAAV and the Ministry of Transport will be required to secure necessary budget since there were significant delays of activities in the Project due to the budget constraints.

3) Technical Aspect

Many of the activities assisted by the JICA Experts are already continuing as routine work, not ad-hoc only during the Project period. The Target Groups developed capacity to provide trainings on the technologies learned through the Project, and has already been conducting such

in-house trainings so as to secure sufficient number of staff to sustain the Outputs of the Project.

4) Ownership

For Vietnam, there is a concern that lack of ownership by the Vietnamese Counterpart would adversely affect the achievement of Overall Goal when they face difficulties.

3-3 Factors enabling the realization of positive effects

(1) Factors concerning planning

JICA's "Master Plan Study on the Development of the New CNS/ATM Systems in Cambodia, Lao PDR and Vietnam" (2009-2010) served as preparatory phase and contributed to identify adequate approach to enhance transition to the new CNS/ATM systems in Cambodia, Lao PDR and Vietnam.

(2) Factors concerning implementation process

Despite various inhibiting factors, good progress of Output 1 has been made under strong leadership of the Taskforce Leader (Cambodia). JICA Expert noted that the members of Taskforce-1 were highly motivated, kept good communications among the members and worked as a team (Cambodia and Lao PDR).

Procurement of flight validation services for PBN flight procedures was initially delayed; however, the Counterparts of Cambodia and Lao PDR took adequate actions to conduct flight validations after the Project organized a trip to Thailand for a meeting with AEROTHAI.

With commitment to complete the tasks, TF-2 Teams of Cambodia and Lao PDR developed their own training materials proactively, and have been updating the training materials autonomically.

With commitment to complete the tasks, VATM and ACV implemented trainings for a large number of air traffic controllers and CNS engineers spread over the country although there were other training needs including those for inauguration of new Hanoi ACC.

3-4 Factors obstructing the realization of positive effects

(1) Factors concerning planning

The WGS-84 data was initially considered to be available at all airports of Vietnam. However, the accuracy and integrity of the WGS-84 coordinates turned out to be not sufficient to carry out the Project activities. It was also found after the start of the Project that there was no national control point for WGS-84 survey in the 3 countries. It required additional inputs from Japanese side for basic trainings on WGS-84 data survey and establishing permanent geodetic control in the airports, and delayed starts of other activities under the Output 1.

(2) Factors concerning implementation process

Shortage of financial resources in ACV, CAAV and VATM caused delay in WGS-84 surveys, procurement of flight validation equipment and RAIM prediction system respectively.

Due to the priority work on the airport PBN and needs of coordination with neighboring countries for enroute PBN, it was not possible to start full-fledged activities on the enroute PBN until April 2015.

Delays in implementation of WGS-84 surveys, flight validations, etc. were caused by lengthy formalities for approvals/decision making process of CAAV combined with retroactive management of the Project by the Vietnamese Counterparts.

Due to limited availability of resources of Short-term Experts, the activities under the Output 3 had to be postponed. In addition, large part of inputs of JICA Long-term Experts was concentrated in activities under the Output 1 during the first half of the Project period. This situation inhibited effective implementation of activities under the Output 3 until June 2014.

There were some occasions such as absence of trainees from training courses, missing deadlines of administrative arrangements, sudden change of trainees/meeting participants, etc., which hindered smooth operation of the Project.

3-5 Conclusion

The Project Purpose has been almost achieved at the time of the evaluation. It is expected that all outputs will be achieved by conducting planned activities within the Project period and continuing remaining activities by the target groups without additional input from Japan, by 2016 for Cambodia and Vietnam and by 2018 for Lao PDR.

In terms of the Five Evaluation Criteria, the relevance is very high for the 3 countries, effectiveness is very high for Cambodia and high for Lao PDR and Vietnam, and efficiency is high for the 3 countries. Some positive impacts have been observed in terms of costs savings for airlines and reduction in flight distance and time. The sustainability of the Project is evaluated as high for Cambodia and Lao PDR in policy, financial and technical aspects. For Vietnam, the sustainability is evaluated as moderate considering budget arrangement and ownership.

Therefore, it is expected that the Project will be finished in January 2016 as planned.

3-6 Recommendations

(1) Recommendations to the Project

1) Clarification of Indicators in the PDM

It is recommended to clarify the verifiable indicators of the PDM as follows:

- Indicators for Overall Goal (to be reviewed in an ex-post evaluation in 2019) should be defined more precisely.
- The “targets” currently set in the “Project Outputs Evaluation Indicators” separately from the PDM should be integrated to the PDM for easy reference in the ex-post evaluation.

2) Completion of the Remaining Activities

CAAV should complete the following major remaining activities.

- PBN flight procedures at Con Son and Lien Khuong Airports
 - WGS-84 Survey: September 2015
 - Procedure Design: November 2015
 - Ground Validation: December 2015
 - Flight Validation: January 2016
 - Publication: March 2016
- RNAV 5 at B329, W1 (2 parallel routes), R474, G474 and R468 (G474 and R468 are

subject for further coordination with Cambodia.)

- Safety Audits of NORATS, SORATS and 6 airports of ACV in 2015 (Quality of safety audits should be improved in accordance with OJT in December 2014.)

(2) Recommendations Commonly to the 3 Partner Countries

1) Maintenance of Capacity of Flight Procedure Designers

The Counterparts have developed capacity to conduct all processes required for application of PBN flight procedures including SID, STAR, RNP APCH, Baro-VNAV, RNP AR APCH and RNAV 5 Routes through the Project. The SSCA, DCA/LATM and CAAV/VATM/ACV should;

- continue to maintain, refresh and update skills of the existing designers through internal training by senior designers in accordance with ICAO Quality Assurance Manual for Flight Procedure Designer, and
- evaluate competency of the flight procedure designers periodically in accordance with PANS-OPS Volume II.

2) Capacity Development of New Flight Procedure Designers

The SSCA, DCA/LATM and CAAV/VATM should plan for fostering new flight procedure designers to maintain its flight procedure design capacity in consideration of retirement of experienced designers and introduction of instrument flight procedures to other airports.

3) Maintenance of Published Flight Procedures

Designed flight procedures require periodic review within five years and continuous maintenance in response to new obstacle, runway extension, change in radio navaid, etc. It is recommended that SSCA, DCA/LATM and CAAV/VATM continue to assure that terrain data, map data, obstacle data and facility data are current, and conduct periodic review and continuous maintenance as its routine task.

4) Continuous Updated of New CNS/ATM Training

SSCA, DCA/LATM and CAAV/VATM/ACV should continuously acquire latest information on the new CNS/ATM systems and update and/or add subject materials to improve training contents.

5) Capacity Development of New Instructors for New CNS/ATM Training

SSCA, DCA/LATM and CAAV/VATM/ACV should plan for fostering new instructors for new CNS/ATM systems to maintain its in-house training capacity.

6) Increased Application of New CNS/ATM Technology

The Project successfully built the foundation for application of new CNS/ATM systems in particular introduction of PBN flight procedures in the area of navigation. While air traffic volume is expected to increase continuously, introduction of new technology will be required to fully utilize benefits of new CNS/ATM systems. It would include introduction of Baro-VNAV approach, RNP AR approach and parallel RNAV routes, Ground Based

Augmentation System (GBAS), etc. It is recommended for SSCA, DCA/LATM and CAAV/VATM/ACV to plan application of new CNS/ATM technology to accommodate ever increasing air traffic volume with enhanced air safety.

7) Securing Budget for Maintenance of Developed Capacity

The Target Groups should secure and allocate sufficient budget to ensure recommendation mentioned above.

(3) Recommendations to Cambodia

1) Expedient Implementation of SMS/SSP for Air Navigation Services

Implementation of SSP was not realized by the time of this terminal evaluation, partly because of prolonged review of draft SSP by the top management of SSCA. It is recommended that SSCA should shorten reviewing period so that the SSP will be implemented in early 2016 without further delay.

2) Expansion of Safety Audit to Other ATS Units

In the meantime before SSP, which requires safety audit as a part of the program, is formally established, SSCA should conduct safety audits at other ATS units by utilizing experience of OJT in January 2015 for Phnom Penh control tower.

(4) Recommendations to Lao PDR

Implementation of SMS/SSP is in progress by the time of this terminal evaluation, following ICAO's phased implementation process. It is recommended that DCA/LATM should implement the planned process without any delay toward the full implementation of SMS/SSP in 2016.

(5) Recommendations to Vietnam

CAAV should enhance SMS/SSP application in air navigation services. CAAV should:

- set the national safety targets/indicators, review the Acceptable Level of Safety (ALoS) indicators of ANSPs, and monitor achievements of ALoS indicators;
- check and analyze ANSP's safety reports at regular intervals, instruct appropriate remedial actions, and monitor implementation of remedial actions by the ANSPs; and
- understand that the safety audit is a part of SSP framework, and carry out the safety audits to make sure the national regulations are appropriately reflected on the ANSP's operations.

(6) Recommendations to JICA

Recommendations toward the end of the Project period are:

- to provide appropriate advice to the Long-term Experts in administration of closing the Project;
- to monitor progress of activities related to the following outputs that are still to be achieved periodically through its offices in Cambodia, Laos and Vietnam for assuring full achievements; and
 - Cambodia: Airport PBN (Outputs 1-1, 1-3, 1-5a, 1-5b), RNAV Routes (Output 1-5c), Flight Standard Officer (Output 1-8), Advanced Knowledge on New CNS/ATM System (Output

- 2-3), SSP and SMS Regulations (Output 3-1) and Certification of ANSP's SMS (Output 3-2)
- Lao PDR: Airport PBN (Outputs 1-2, 1-3, 1-5a, 1-5b), RNAV Routes (Output 1-5c), Advanced Knowledge on New CNS/ATM System (Output 2-3), Certification of ANSP's SMS (Output 3-2) and Conduct of Safety Audit (Output 3-4)
- Vietnam: Airport PBN (Outputs 1-1, 1-2, 1-3, 1-5a, 1-5b), RNAV Routes (Output 1-5c) and Conduct of Safety Audit (Output 3-4)
- to keep useful data/information/materials produced by the Project for reference by the similar projects.

3-7 Lesson Learned

(1) Identification of common issues as main issues for regional cooperation

For a regional cooperation targeting various countries with different starting points like this Project, it is important in the planning stage of the project to identify common issues as main components of the project for effective implementation. The new CNS/ATM master plan study for the three countries provided a good basis for the formulation of this project.

(2) Importance of evaluation of initial conditions

Evaluation of initial conditions during the detailed planning survey is very important to plan a technical cooperation project. Absence of national control point for WGS-84 survey in Lao PDR affected the progress of Output1 in this project.

(3) Limited Resource of JCAB and Effective Use of Consulting Firm

In planning technical cooperation projects in the aviation sector that require inputs from JCAB, it is necessary to take into account of limited resource of JCAB. Use of consulting firm to some areas of expertise as practiced for assignment of FPO Advisor in this project is effective, but needing due consideration on costs.

(4) Exchange of Knowledge and Experience with Other Countries

In implementing a technical cooperation project that is similar to past or ongoing projects in other countries, exchange of knowledge and experience through training in those countries and invitation of experts from those countries is effective and often efficient as practiced among the three countries, the Philippines and Indonesia in this project.

(5) Assignment of Experienced Expert at the Beginning of the Project

For Japanese experts to manage a project for the first time, advice from an experienced expert at an early stage is very beneficial. Providing a short-term assistance by an experienced expert at the beginning of the project is an effective measure for smooth implementation of the project. In the case of replacement of experts in the middle of a project, it is necessary to have enough period for transfer of the project tasks from predecessor to successor.