

Internal Ex-Post Evaluation for Technical Cooperation Project

conducted by Cambodia Office, Laos Office, and Vietnam Office, February, 2020

Country Name	Project for the Capacity Development for Transition to the New CNS/ATM Systems in Cambodia, Lao PDR, and Viet Nam
Kingdom of Cambodia	
Lao People's Democratic Republic Socialist Republic of Viet Nam	

I. Project Outline

Background	<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 were enhancing the introduction of new CNS/ATM systems. In Asia, the transition to the new systems had been advanced in Japan, China, Korea, Thailand, Singapore, Philippines, and Indonesia. Responding to this issue, “The Master Plan Study on the Development of the New CNS/ATM Systems for three Eastern Mekong countries of Cambodia, Lao People’s Democratic Republic and Viet Nam” was conducted by the government of Japan through the year 2009 to 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 were modernizing their air navigation systems recognizing that the transition to the new systems in coordination with neighboring countries was an international obligation. However, they needed acquiring knowledge and developing capacity on the new CNS/ATM systems for their civil aviation staff in parallel with the modernization of equipment.</p>				
Objectives of the Project	<p>Through the capacity development of Performance-Based Navigation (PBN) flight procedures, the development training system on new CNS/ATM systems and the establishment of safety oversight system for air navigation services for Cambodia and strengthening of safety oversight capacity by Safety Management System (SMS) in air navigation services for Lao PDR and Viet Nam, the project aims to enhance the transition to the new CNS/ATM system in Cambodia, Lao PDR and Viet Nam , thereby improving efficiency and safety of flight operations and enlarging the capacity of airspace in Eastern Mekong Region.</p> <ol style="list-style-type: none"> 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. Project Purpose: To enhance the transition to the new CNS/ATM systems in Cambodia, Lao PDR and Viet Nam. 				
Activities of the Project	<ol style="list-style-type: none"> Project site: Cambodia, Lao PDR and Viet Nam (Eastern Mekong Region) Main activities:¹ (1) Capacity development for PBN flight procedures including collection of World Geodetic System 1984 (WGS-84) data, design/validation/standards-development/implementation of the PBN flight procedures, implementation of Area Navigation (RNAV) flight routes; training for flight procedure designers, flight validation officers, and flight standard officers; (2) Development of training system for air traffic controllers and air navigation technical staff on the new CNS/ATM systems; (3) Establishment of safety oversight system for Cambodia and strengthen safety oversight capacity Lao PDR and Viet Nam by introduction of SMS at air navigation services providers (ANSPs) Inputs (to carry out above activities) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> Japanese Side <ol style="list-style-type: none"> Experts: (Long-term) 4 persons, (Short-term) 70 persons Trainees received: 99 persons in 14 courses Equipment: 2 sets of PANADES Software (automated flight procedure design system), computers, GPS receivers, laser range finders, etc. Local Expenses including operation and maintenance cost for PANADES </td> <td style="width: 50%; border: none;"> Cambodian/Laotian/Vietnamese Side <ol style="list-style-type: none"> Staff allocated: 67 persons Facilities: Office spaces for JICA experts Local Expenses </td> </tr> </table> 			Japanese Side <ol style="list-style-type: none"> Experts: (Long-term) 4 persons, (Short-term) 70 persons Trainees received: 99 persons in 14 courses Equipment: 2 sets of PANADES Software (automated flight procedure design system), computers, GPS receivers, laser range finders, etc. Local Expenses including operation and maintenance cost for PANADES 	Cambodian/Laotian/Vietnamese Side <ol style="list-style-type: none"> Staff allocated: 67 persons Facilities: Office spaces for JICA experts Local Expenses
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Project Period	January 2011 – January 2016	Project Cost	(ex-ante) 500 million yen, (actual) 595 million yen		
Implementing Agency	<p>Cambodia: State Secretariat of Civil Aviation (SSCA) Lao People’s Democratic Republic (Lao PDR): Department of Civil Aviation (DCA); Lao Air Traffic Management (LATM) (currently known as Lao Air Navigation Services: LANS) Viet Nam: Civil Aviation Authority of Viet Nam (CAAV); Viet Nam Air Traffic Management (VATM), Airport Corporation of Viet Nam (ACV)</p>				
Cooperation Agency in Japan	Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism				

¹ Definitions of terms:

- Performance-Based Navigation (PBN) – Aircraft system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for the proposed operations in the context of a particular Airspace Concept. The concept of PBN relies on the use of both area navigation (RNAV) and required navigation performance (RNP).
- Area navigation (RNAV) – A method of navigation enabling aircraft to fly on any desired flight path within the coverage of desired navigational aids or within the limits of the systems, or a combination of these capabilities.
- Required navigation performance (RNP) – RNAV operations with the added feature of on-board navigation performance monitoring and alerting.
- World Geodetic System 1984 (WGS-84) – A geodetic coordinate system as the common reference datum for civil aviation adopted by ICAO. (Reference: “The Master Plan Study on the Development of the New CNS/ATM Systems for three Eastern Mekong countries of Cambodia, Lao People’s Democratic Republic and Viet Nam”, 2010)

II. Result of the Evaluation

1 Relevance

<Consistency with the Development Policy of Cambodia, Lao PDR and Viet Nam at the Time of Ex-Ante Evaluation and Project Completion>

As a member state of ICAO, the three countries were committed to implementing the transition to the new CNS/ATM systems. Domestically, the project was in line with national policies of the respective countries, namely, “Aviation Transport Policy and Strategies 2009-2013” (Cambodia), “New CNS/ATM Development Plan” (2012-present)” (Lao PDR), “Aviation Transport Development Master Plan of Vietnam” (2009) and “CNS/ATM Implementation Plan up to 2020 and Vision to 2030” (Viet Nam), all of which identified transition to the new CNS/ATM systems as one of the priority areas.

<Consistency with the Development Needs of Cambodia, Lao PDR and Viet Nam at the Time of Ex-Ante Evaluation and Project Completion>

At the time of ex-ante evaluation, the project was consistent with the needs for transition to the new CNS/ATM systems, as described in “Background” above. At the time of project completion, the earliest transition to the new CNS/ATM systems was required for the realization of seamless air navigation services, which are important for aircraft flying across the borders, and contribute to efficiency and safety of aircraft operations.

<Consistency with Japan’s ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with the following priority issues in development policies in respective countries: “development of social and economic infrastructure” in the “Country Assistance Program for Cambodia” (2002); “development of social and economic infrastructure” in the “Country Assistance Program for Lao PDR” (2006); and “focuses on improving urban development, traffic accessibility, and telecommunication network” in the “Country Assistance Program for the Socialist Republic of Viet Nam” (2009).

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the time of project completion. Utilization of the PBN flight procedures started in all three countries in terms of laying out of RNAV routes (Indicator 1). Through the training provided under the project, air traffic controllers and air navigation technical staff in all three countries obtained advanced knowledge on the new CNS/ATM system, and the degree of utilization of such knowledge was “often” in Lao PDR and Viet Nam and “sometimes” in Cambodia according to trainees (Indicator 2). The initial operation of SMS started at all ANSPs in the three countries, while the approval of SMS at each ANSP by respective civil aviation authorities was delayed in Cambodia and Lao PDR (Indicator 3) (It was approved in 2017 in Cambodia; see the next paragraph for the situation in Lao PDR).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have continued to the time of ex-post evaluation. The use of the PBN flight procedures has continued and further expanded in all three countries as the number of RNAV routes, and the number of airports with RNAV approaches/departures has increased, although the degree of expansion varies. The use of knowledge of the new CNS/ATM systems has continued in all three countries. The operation of SMS has continued in three countries, although in Lao PDR, DCA considers the operational level of SMS by airliners as partial as it is not fully compatible with the newly introduced State Safety Program (SSP) that is made compulsory by ICAO.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal has been achieved by the time of ex-post evaluation. The total number of aircraft operations at the designated airports (Indicator 1) achieved the respective targets in all three countries, to which the contribution of the reduced risk by using the PBN flight procedures and SMS was acknowledged by the respective civil navigation authorities. Also, the number of unsafe occurrences (Indicator 2) achieved the respective targets in all three countries, while the exact figure on Viet Nam was not available. The number of RNAV routes in airspace (Indicator 3) achieved the respective targets in Cambodia and Viet Nam, while it did not achieve the target in Lao PDR due to some technical issues (e.g., certification of airlines, permit for the pilot, equipment installation on aircrafts) and differences in route planning in neighboring countries (difficulties in clearing the routes in these countries as it will cause conflicts with their domestic flights). DCA is planning to build four more RNAV routes, two of which are parallel routes to the existing routes.

<Other Impacts at the time of Ex-post Evaluation>

No negative impacts of the project were observed. As a positive impact, CAAV (Viet Nam) pointed out that the PBN flight procedures allowed aircrafts to have optimum flight routes and avoid crowded areas, which would contribute to the reduction of the adverse effects on the environment in terms of noise. Besides the environment, SSCA (Cambodia) pointed out the continuation of training on SMS positively affected not only SMS facilitators trained under the project or air traffic controllers and air navigation technical staff but also all SSCA staff. DCA (Lao PDR) pointed out another positive impact –high-rank management of Ministry of Public Works and Transport understood the requirements and importance of PBN, which led to the PBN training of an additional flight procedure designer. Moreover, all of these civil aviation authorities acknowledged the saving of fuel cost by taking shorter/flexible routes and reducing the waiting time before landing in crowded airports, while there were no specific assessments made. They also agreed that the implementation of the new CNS/ATM systems in collaboration among the three countries contributed to flight coordination among the flight information regions of these countries, and thus to the smooth operation in Eastern Mekong Region.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is high.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results			
(Project Purpose) To enhance the transition to the new CNS/ATM systems in Cambodia, Lao and Viet Nam	Indicator 1: Utilization of PBN flight procedures in Cambodian, Lao and Vietnamese airspace	Status of the Achievement: achieved (continued) (Project Completion) (Ex-post Evaluation)			
		The number of RNAV routes and the number of airports with RNAV approaches/departures			
		Country	Before the project	Project completion (2016)	Ex-post evaluation (2019)
		Cambodia	3 routes / 0 airports	5 routes / 2 airports	12 routes / 3 airports

PDR and Viet Nam.	Lao PDR	0 routes / 0 airports	0 routes / 2 airports	1 route / 5 airports	
	Viet Nam	4 routes / 0 airports	10 routes / 3 airports	30 routes / 9 airports	
Indicator 2: Utilization of knowledge of new CNS/ATM systems in implementation and operation	Status of the Achievement: achieved (continued) (Project Completion) Answers to the questionnaires to 15 trainees at the time of the terminal evaluation (average score of the 5-rank self-evaluation)				
	Country	Usefulness the training provided by the project	How helpful to the development of the new CNS/ATM system	Opportunity to use the knowledge obtained	
	Cambodia	Good /sufficient (4.4)	Significantly helpful (4.3)	Sometimes (3.1)	
	Lao PDR	Very good/excellent (4.7)	Significantly helpful (4.4)	Often (4.4)	
	Viet Nam	Very good/excellent (4.5)	Significantly helpful (4.2)	Often (4.4)	
	(Project Completion) (Ex-post Evaluation) Number of air traffic controllers (ATC) and air navigation technical staff (ANT) who completed training courses designated for the new CNS/ATM systems and the degree of utilization of the learned knowledge				
	Country	Staff	Terminal evaluation (2015) No. of ATC and ANT who completed training courses / Total No. of ATC and ANT	Ex-post evaluation (2019) No. of ATC and ANT who completed training courses / Total No. of ATC and ANT	Degree of the utilization of the learned knowledge
	Cambodia	ATC	92 out of 92 (100%)	115 out of 115 (100%)	100%
		ANT	29 out of 49 (59%)	39 out of 46 (85%)	Almost 100%
	Lao PDR	ATC	91 out of 112 (81%)	99 out of 99 (100%)	100%
ANT		25 out of 56 (45%)	54 out of 54 (100%)	100%	
Viet Nam	ATC	526 out of 701 (75%)	818 out of 818 (100%)	100%	
	ANT	459 out of 958 (48%)	1,097 out of 1,097 (100%)	100%	
Indicator 3: Operation of SMS at all ANSPs	Status of the Achievement: partially achieved (partially continued) (Project Completion) (Ex-post Evaluation) Situation of operation of SMS at ANSPs				
	Country	Project completion (2016)	Ex-post evaluation (2019)		
	Cambodia	Cambodia Air Traffic Services (CATS), the sole ANSP in Cambodia, started the initial operation of SMS. The SMS at CATS was planned to be approved by SSCA after the adoption of SMS Guidebook for Air Navigation Service in 2015.	SMS at CATS has been continuously operating since it was approved in November 2017, after SMS Guidebook for Air Navigation Service was approved in June 2015 and the “Cambodian Civil Aviation Regulations (CCAR) Part 19: Aviation Safety” was established in October 2017.		
	Lao PDR	DCA adopted SMS Regulation in December 2012, and Lao PDR SSP was promulgated in February 2015. LATM, the sole ANSP in Lao PDR, started the initial operation of SMS. The SMS at LATM was planned to be approved by DCA after the Evaluation of First SMS Implementation in mid-2016.	Although SMS at LANS (former LATM) has been operated based on the past regulation, the status of operation should be regarded as partial in the light of the newly-introduced SSP (higher-level plan), which has different requirements and level of acceptance from SMS.		
Viet Nam	All ANSPs in Viet Nam, i.e., VATM and ACV, had been operating SMS since it was approved by CAAV in 2012 and 2013, respectively.	SMS has been continuously operated at VATM and ACV. The latest version of SMS was approved in December 2016.			
(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.	Indicator 1: Total number of aircraft operations in targeted airports	(Ex-post Evaluation) achieved Number of aircraft operations			
		Country	Country-specific indicator	Actual value (2018)	
		Cambodia	Total number of aircraft operations at Phnom Penh, Siem Reap and Sihanouk Airports in 2018 is more than 64,000.	104,803	
		Lao PDR	Total number of aircraft operations at Vientiane, Pakse and Luang Phabang International Airports in 2018 is more than 31,000.	45,487	
	Viet Nam	Total number of aircraft operations at Phu Bai, Phu Quoc, Cam Ranh, Con Son and Lien Khuong Airports in 2018 is more than 63,000	89,112		
	Indicator 2: Total number of unsafe occurrences	(Ex-post Evaluation) achieved Number of unsafe occurrences			
		Country	Country-specific indicator	Actual value (2018)	
		Cambodia	Total number of unsafe occurrences caused by ATC at Phnom Penh and Siem Reap Airports in 2018 is not more than 3 despite increase of aircraft operations.	0	
		Lao PDR	Total number of incidents of “Air Miss” in 2018 is not more than 2 despite increase of aircraft operations.	0 (1 each in 2016, 2017 and 2019)	
	Viet Nam	Total number of incidents, in which ATC is involved, in 2018 is not more than 12 despite increase of aircraft operations.	12 or less		
	Indicator 3: Number of RNAV routes	(Ex-post Evaluation) partially achieved Number of RNAV routes			
		Country	Country-specific indicator	Actual value (2019)	
		Cambodia	The number of RNAV routes in Cambodian airspace is more than 6.	12	
Lao PDR		The number of RNAV routes in Lao airspace is more than 5.	1		
Viet Nam	The number of RNAV routes in Vietnamese airspace is more than 10.	30			

3 Efficiency

While the project period was within the plan, the project cost exceeded the plan (ratio against the plan: 100% and 119%, respectively). The Outputs of the project were produced as planned. Therefore, the efficiency of the project is fair.

4 Sustainability

<Policy Aspect>

Use of the new CNS/ATM systems is continuously supported by policies in all three countries, such as “CCAR Part 19: Aviation Safety” (2017) in Cambodia, “New CNS/ATM Development Plan” (2012)” in Lao PDR, and “Regulation 19 on Air Navigation Services” (2019) in Viet Nam.

<Institutional Aspect>

The organizational structure and responsibilities for the new CNS/ATM systems (involving the respective civil aviation authorities and ANSPs) are firmly established in all three countries.² Although the data on the number of staff members involved in the operation of the systems was available only from one of them, all of the SSCA (Cambodia), DCA (Lao PDR), and CAAV (Viet Nam) acknowledged that there was no problem in the workforce as the necessary operation was continuously performed.

<Technical Aspect>

At all of the civil aviation authorities and ANSPs in the three countries, most of the personnel trained under this project still engage in the new CNS/ATM systems. Regarding training of new staff, training of ATC and ANT have continued, newly-hired flight procedure designers have gone through all necessary training including on-the-job training with existing designers, and the systems have been operated with no problem as described in “Effectiveness/Impact” above. The equipment provided under this project is all used in good conditions.

<Financial Aspect>

Although the same level of budget information was not collected from the three countries, the available information indicates constant or increasing level of budget allocation in all countries to operate the new CNS/ATM system. In Lao PDR, the budget to renew the license of PANADES (necessary for designing PBN procedures) in 2020 has not been secured yet; it is planned to be approved in the 2020 budget.

Budget allocation for the new CNS/ATM system

Cambodia	CATS allocated 5 million USD in 2017, 6 million USD in 2018, and around 3 million USD in 2019 (8 months) for the new CNS/ATM system. CATS spent 68,000 USD to buy a three-year license, including maintenance services (2016-2019) of PANADES provided by JICA. CATS has a plan to buy a new five-year license (2020-2025) of PANADES as part of the new Aeronautical Information Services (AIS)/Aeronautical Information Management (AIM) system to be purchased from a Spanish Company.
Lao PDR	The budget approved for the operation of LANS is increasing annually – 2.6 million USD in 2017, 2.7 million USD in 2018, and 3.1 million USD in 2019. In 2020, approx. 3.6 million USD is expected to be disbursed. The budget is sufficient in terms of operation but is not enough in terms of maintenance of the whole CNS/ATM system. LANS needs to renew the key and the license of the module of PANADES, which will expire in 2019, but it has not allocated the budget for it yet. LANS is proposing the updating budget plan to the government, and it is expected to obtain approval in FY2020.
Viet Nam	The operational budget for CAAV, VATM, and ACV has been provided annually based on government regulations. 500 million VND has been allocated every year since 2016 for maintaining PANADES provided by JICA.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the financial aspects of the implementing agency in Lao PDR. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

In all of Cambodia, Lao PDR, and Viet Nam, the project achieved the Project Purpose of enhancing the transition to the new CNS/ATM systems and the Overall Goal of improving efficiency and safety of flight operations and enlarging the capacity of airspace in Eastern Mekong Region. Regarding sustainability, a problem was observed in the financial aspect of the implementing agency in Lao PDR as the budget to renew the license of the flight procedure design system for the year 2020 and after that has not been firmly secured yet. Nevertheless, the policy support, institutional settings, technical capacity, and the operational budget are all secured in all three countries. As for efficiency, the project cost exceeded the plan. Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

- In Lao PDR, negotiation with the supplier over the price of a new key and license of PANADES has been ongoing, but the proposed price changes from time to time, causing difficulties in applying the exact figure of the budget from the government. It is necessary that LANS complete the negotiation with the supplier of on the price of the renewal and include that cost into the 2020 budget to ensure continuous operation of the CNS/ATM system.

Lessons Learned for JICA

- Good combination of software and hardware components, i.e., training components highly consistent with the provided equipment, led to good sustainability. Planning of technical cooperation project that requires the use of advanced equipment, system, etc., should ensure a high level of consistency between the type and scope of the training and the equipment provided.
- In Lao PDR, the budget for PANADES’s key & license renewal has not been secured since price negotiation with the supplier is taking a long time. In implementing a project that requires continued use of an advanced system provided by an external service provider, supplier, etc., preparation for renewal of the license of the critical system, software, etc. (negotiation with the supplier and the ensuring the necessary budget) should be started well in advance to ensure continuous operation of the system.

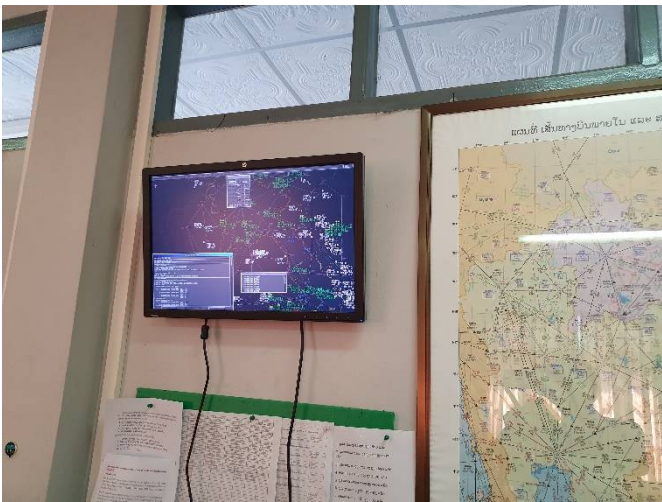
² Regarding the ANSP in Lao PDR, the name LATM was changed to Lao Air Navigation Services (LANS) and there was structural reshuffling within and between LANS and DCA. However, the restructuring has no negative effect on the operation of the new CNS/ATM systems since the divisions in charge have still maintained their responsibilities in the operation.



Operating PANADES (Cambodia)



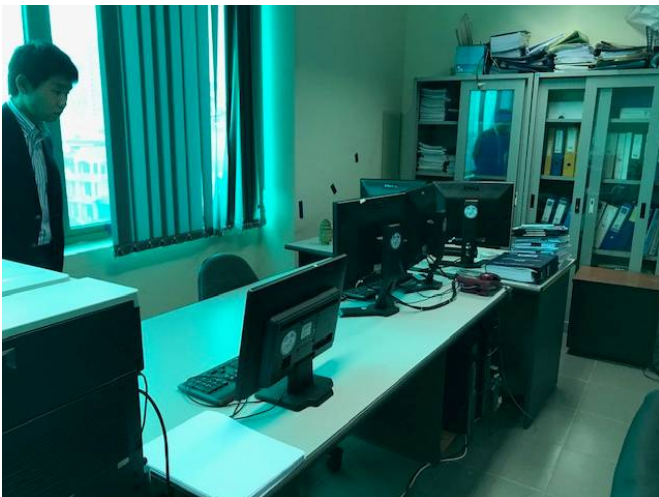
Capacity building at CATS (Cambodia)



Air Traffic Control Center (Lao PDR)



Flight Route Chart (Lao PDR)



Operating PANADES (Viet Nam)

