Summary of the Terminal Evaluation Results

1. Outline of the Project	
Country: Republic of Indonesia	Project title: Capacity Development Project for Improvement on Aviation Safety Policy
Issue/Sector: Transportation	Cooperation scheme: Technical Cooperation
Department in charge: Infrastructure and Peacebuilding Dept., JICA	Total cost (as of October 2013): Approx. 4.1 million yen
	Partner Country's Implementing Organization: DGCA: Directorate General of Civil Aviation, ATHRDC: Air Transport Human Resource Development Center and ICAI: Indonesian Civil Aviation Institute (STPI)
Period of Cooperation: (R/D) 10 July 2010 - 9 July 2015	
	Supporting Organization in Japan: Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism
	Related Cooperation: - Aircraft Accident Investigation Project (January 2008 – March 2010) - The Project for Strengthening Capacity on Ensuring Safe and Efficient Aircraft Operations (February 2009 – February 2012) - The Project for Airport Security System Improvement (Conclusion of Grant Agreement: November 2010)

1-1   Background of the Project

   Since more than 300 aircraft accidents occured in 10 years between 1998 and 2007 in Indonesia, it has become a situation that requires improvements in (1) compliance of rules by air operators and safety oversight by the authority, (2) reliability of air traffic control, (3) safety of airport operations, (4) security measures against unlawful actions such as terrorism and (5) aircraft accident investigation for recurrence prevention.

   Directorate General of Civil Aviation (DGCA) of Indonesia, with assistance from the international community, is strengthening the comprehensive measures related to aviation safety while also obtained cooperation. Above all, the new CNS/ATM systems, of which International Civil Aviation Organization (ICAO) promotes development globally, is to be introduced as a priority item in action plan.   Since installation of ground-based facilities such as radars is not easy due to the geographical limitation in Indonesia, it is expected to utilize satellite-based communivations, navigation and surveillance for eliminating blind spots.

   Transition to the new system will require establishment and publication of flight procedures based on the international standards set forth by ICAO's technical documents for aircraft operations (PANS-OPS, Doc 8168) in parallel with development/improvement of hardware; i.e. equipment and systems.   However, revision of the conventional flight procedures and establishment and implementation of new flight procedures based on Performance Based Navigation (PBN) are significantly delayed because human resources that have relevant knowledge are lacking.   In addition, JICA conducted a technical assistance project "The Project for Strengthening Capacity on Ensuring Safe and Efficient Aircraft Operations" and assisted development and implementation of

action plan on safety of aircraft operations in the past.

From such background, the Government of Republic of Indonesia requested the Government of Japan a technical cooperation relating to capacity building of new CNS/ATM systems and safety oversights on aircraft operations.

1-2　Project Overview

　(1) Overall Goal

　　To improve aviation safety in Indonesia

　(2) Project Purpose

　　To enhance capacity of DGCA and ATHRDC/ICAI of Ministry of Transport in the area of the new CNS/ATM systems and the safety oversight of air carrier operation

　(3) Outputs

　　Output 1: To develop and introduce PBN flight procedures

　　Output 2: To conduct human resource development related to the new CNS/ATM systems

　　Output 3: To strengthen DGCA's capacity on oversight of ANS provider by the introduction of SMS

　　Output 4: To strengthen DGCA's capacity on oversight of air carriers by the introduction of Safety Information System

　　Output 5: To deal with other related key issues on aviation safety and security

　(4) Inputs

　　Japanese side:

　　- Long-term Experts: 153.9 person-months

　　- Short-term Experts: 22.0 person-months

　　- Training in Japan and third country: 69 people in 24 courses

　　- Local cost: 31 million (includes planned budget in the remaining period)

　　- Equipment: Approx. 29.1 million Japanese yen

　　Indonesian side:

　　- Counterparts: Over 39

　　- Office space for the Japanese Experts with furniture

　　- Equipment: Receiver Autonomous Integrity Monitoring (RAIM) Equipment, Flight Check Aircraft and Full Flight Simulator

2. Outline of the Evaluation Team

Evaluation Team	Japanese Side		
	Name	Job Title	Occupation
	Hiroyuki Ueda	Leader	Senior Advisor for Transportation Sector, JICA
	Yoshihiro Hara	Air Traffic Services Engineering	Special Assistant to the Director; Air Traffic International Affairs Office, Air Navigation Services Dept., Civil Aviation Bureau of Japan
	Masaaki Kanno	Air Traffic Services Engineering	Education section chief; Air Traffic Control Division, Air Navigation Services Dept., Civil Aviation Bureau of Japan
	Hiroyuki Fujise	Airline Safety	Deputy Director of Air Transport Safety Unit, Aviation Safety & Security Dept., Civil Aviation Bureau of Japan
	Kaoru Okada	Cooperation Planning	Deputy Director; Team 2, Transportation and ICT Group, Infrastructure and Peacebuilding Dept., JICA
	Toru Shimada	Evaluation Analysis	Consultant, ADAMIS Ltd.

	Indonesian Side	
	Name	Occupation
	Wahyu Ikwandono	Subdivision of Analyze and Evaluation, Planning Division, DGCA
	Edy Triyanto	Subdivision of Analyze and Evaluation, Planning Division, DGCA

Period of Evaluation	25 January 2015 - 7 February 2015	Type of Evaluation: Terminal Evaluation

3. Results of Evaluation

3-1 Project Performance

(1) Achievement of Outputs

  1) Output 1: To develop and introduce PBN flight procedures

      Output 1 has almost been achieved at the time of the Terminal Evaluation (14 indicators out of 17 indicators have been achieved 100％ or more, and achievements of the remaining 3 indicators are 90 to 98％).　It is estimated that remaining 3 indicators will be achieved with completion of publication of WGS-84 coordinates for additional 1 airport, publication of PBN flight procedures for additional 1 airport and flight validation for additional 2 airports by May 2015.

- The PBN development plan with detailed implementation schedule was established in 2010, and has been updated year by year. [Achievement: 100％]
- Representatives of airline companies are included in the task force members for establishment and update of the PBN development plan. [Achievement: 100％]
- WGS-84 coordinates are available for 59 airports.　It is estimated to publish WGS-84

coordinates for Sentani (Papua), for which the survey was conducted in January 2015, by March 2015. [Achievement: 98％]

- Twelve (12) officers are certified by DGCA as designers of conventional flight procedures. [Achievement: 100％]
- Twelve (12) officers are certified by DGCA as designers of PBN flight procedures. [Achievement: 100％]
- PBN flight procedures have already been designed for 26 airports. [Achievement: 130％]
- PBN flight procedures have already been designed for 23 air routes. [Achievement 115％]
- Ground validations have already been completed for 22 airports. [Achievement 110％]
- PBN flight procedures (SID, STAR, RNP APCH, RNP AR APCH) have been published for 14 airports. It is planned to publish PBN flight procedures for 4 airports, where flight validations were completed (Halim, Meulaboh, Molotai, Labuhan Bajo) in 2015. It is estimated to publish PBN flight procedures for at least 1 airport by May 2015. [Achievement 93％]
- PBN flight procedures have already been published for 23 air routes. [Achievement 115％]
- Flight inspection and flight validation procedures were developed as AC171-05. [Achievement 100％]
- Thirteen (13) officers are certified by DGCA as inspectors for flight inspection. [Achievement 100％]
- Thirteen (13) officers are certified by DGCA as inspectors for flight validation. [Achievement 100％]
- Flight validations have been completed for 18 airports. It is planned to conduct flight validations for 4 airports, where ground validations were completed (Cilacap, Siborong Borong, Padangsidempuan, Lasikin) in 2015. It is estimated to complete flight validation for at least 2 airports by May 2015. [Achievement 90％]
- CASR 91 was amended, and Performance Based Navigation Operations Approval Manual was published as SI8900-4.1. [Achievement 100％]
- Eighteen (18) officers are certified by DGCA as inspectors for operational approval of PBN flight procedures. [Achievement 150％]
- RAIM information has been notified by NOTAM. [Achievement 100％]

2) Output 2: To conduct human resource development related to the new CNS/ATM systems
   Output 2 has already been achieved at the time of the Terminal Evaluation.

- Training course material on new CNS/ ATM systems became available for Diploma-IV air traffic controllers course in 2013. [Achievement 100％]
- Diploma-IV course with new CNS/ ATM systems training material has been running for air traffic controllers at AirNav Indonesia once a year since 2013. [Achievement 100％]
- Two (2) officers have been authorized by ICAI as assistant instructors to provide jointly training of new CNS/ATM module of ATC Diploma-IV course. [Achievement 100％]
- Training guidance on PANS-OPS Flight Procedure has been available for refresher training in Diploma-IV of air traffic controllers since 2013. [Achievement 100％]
- Diploma-IV course with PANS-OPS PBN Basic module has been running for air traffic

controllers at AirNav Indonesia once a year since 2013. [Achievement 100%]
- Five (5) officers have been authorized by ICAI as assistant instructors to provide training of PANS-OPS module of ATC Diploma-IV. [Achievement 100%]
- Training course material on new CNS/ATM systems has been available for Diploma-IV air navigation engineering staff course since 2013. [Achievement 100%]
- Diploma-IV course with new CNS/ATM training material has been running for air navigation engineering staff at AirNav Indonesia once a year since 2013. [Achievement 100%]
- Three (3) officers have been authorized by ICAI as instructors to provide training of new CNS/ATM module of CNS Diploma-IV course jointly. [Achievement 100%]
- Training guidance on GNSS module has been available for refresher training in Diploma-IV of air navigation engineering staff since 2014. [Achievement 100%]
- Diploma-IV course with GNSS modules has been running since 2014. [Achievement 100%]
- Ten (10) officers have been authorized by ICAI as assistant instructors to provide training of GNSS module of CNS Diploma-IV course. [Achievement 333%]
- AIM development plan with detailed implementation schedule is being coordinated with related parties such as AirNav Indonesia for implementation. [Achievement 100%]
- Qualification Management System for AIM was introduced with KP 246 in April 2014. [Achievement 100%]

3) Output 3: To strengthen DGCA's capacity on oversight of ANS provider by the introduction of SMS

Output 3 has already been achieved at the time of the Terminal Evaluation.

- CASR Part 171, 172, 173, 175 and related ACs, which includes SMS of ANS provider, were developed in 2009. [Achievement 100%]
- An aviation safety information system was installed in August 2012, and safety information has been collected. [Achievement 100%]
- Background of the cases, frequency of occurrence, severity of potential risks, etc. and risk reduction measures have been analyzed. [Achievement 100%]
- Safety information that was collected and analyzed has been shared with related parties, and contributes to preventing occurrence of similar cases. [Achievement 100%]
- AirNav Indonesia's SMS was certified by DGCA in January 2013. [Achievement 100%]
- Twenty-eight (28) DGCA officers are certified by DGCA as auditors for safety audits of ANS providers. [Achievement 100%]

4) Output 4: To strengthen DGCA's capacity on oversight of air carriers by the introduction of Safety Information System

Output 4 has been almost achieved at the time of the Terminal Evaluation (8 indicators out of 11 indicators have been achieved, and achievement of the remaining 3 indicators are all 90%). It is estimated that the remaining 3 indicators will be achieved by June 2015 with completion of record/storage of safety information on accidents and serious incidents in the Internal Management Safety Information System (IMSIS) and the assessment of implementation status

on initial and recurrent training program of safety oversight inspectors for air carriers.

- Assessment of implementation status of action plans on permission of Air Operator Certificate was documented in April 2013. [Achievement 100%]
- Assessment of implementation status of action plans on air carrier operation manual and maintenance manual was documented in April 2013. [Achievement 100%]
- Assessment of implementation status of action plans on operations, maintenance, safety, training, management facilities/support was documented in April 2013. [Achievement 100%]
- Assessment of implementation status of action plans on initial and continuous audit system was documented in April 2013. [Achievement 100%]
- Assessment of implementation status of action plans on authorized system for captaincy/ company check pilot/designated person was documented in April 2013. [Achievement 100%]
- Study on effective use of inspectors at local airport offices has been continued. Information sharing was enhanced by establishment of e-library. Enhancement of institution for collecting/analysis/action on Safety Information has been continued. Information on safety culture was accumulated in DGCA. [Achievement 100%]
- Function of IMSIS was enhanced, and airline companies have been providing safety information when a safety case occurred. [Achievement 100%]
- Analyses of Safety Information on each and every case were implemented. Record/ storage of safety information on accidents and serious incidents is being studied for analysis of tendencies. [Achievement 90%]
- Actions on Safety Information on each and every case were implemented. Record/storage of safety information on accidents and serious incidents is being studied for preventative actions. [Achievement 90%]
- SMS audit procedure was developed as SI120-02, and audits have been conducted about 60 times per month (once a month for each airline on average). [Achievement 100%]
- Implementation status on initial and recurrent training program has been monitored by training coordinators. Assessment report on results of implementation of the training program with respect to the training manual is being finalized. [Achievement 90%]

5) Output 5: To deal with other related key issues on aviation safety and security
   Output 5 has already been achieved at the time of the Terminal Evaluation.

- AirNav Indonesia was established. (Taking over of the services from AP-I, AP-II and UPT were almost completed in October 2014.) [Achievement 100%]
- All security equipment is utilized as at the time of Terminal Evaluation. [Achievement 100%]

(2) Project Purpose
   As 2 out of 4 indicators were achieved and achievements of the remaining 2 indicators are 97 to 99%, it can be said that the Project Purpose has been almost achieved at the time of the

Terminal Evaluation.   It is estimated that the remaining 2 indicators will be achieved by June 2015.

- The 17 objectively verifiable indicators for Output 1 represent DGCA's capability to conduct all process required for application of PBN flight procedures, and 14 out of 17 indicators have already been achieved. Achievements of the remaining 3 indicators are 90 to 98%, and expected to be achieved fully by May 2015. [Achievement 99%]
- The 14 objectively verifiable indicators for Output 2 represent ATHRDC/ICAI's capability to conduct basic training for new CNS/ATM systems and PBN, and all the 14 indicators have already been achieved. [Achievement 100%]
- DGCA have been conducting safety audit on SMS operation of AirNav Indonesia since its establishment in January 2013, and no problem has been found in SMS operations. [Achievement 100%]
- DGCA has been conducting safety oversight for air carriers and operating Safety Information System.   Enhancement of DGCA capacities by the Project is underway, and 8 out of 11 objectively verifiable indicators for Output 4 have been achieved.   Achievements of the remaining 3 indicators are all 90%, and expected to be achieved fully by June 2015. [Achievement 97%]

(3) Implementation Process
  1) General
      More than 90% of the respondents to the following 7 questions rated "Fair" or higher, and 48 to 70% "High" or "Very High".
   1: Level of understanding of the Project Purpose among the personnel involved in the Project
   2: Level of clear understanding of roles of each counterparts/task force members
   3: Level of active involvement of counterparts/task force members in the Project
   4: Support and guidance provided to the Project by JICA Indonesia Office and Headquarters
   5: Support and guidance provided to the Project by DGCA management
   6: Appropriateness in terms of volume, quality and timing of inputs (i.e. experts, training, equipment, etc.) from Japan side
   7: Appropriateness in terms of volume, quality and timing of inputs (i.e. personnel, facilities, equipment, etc.) from Indonesia side

  2) Amendments of PDM
      The Project revised the PDM 3 times as shown below to suit to assistance needs.   The revisions of contributed to the achievement of the Project Purpose.
   - The original version dated 22 October 2009.
   - The 1st revision dated 24 November 2011: Reorganized and added outputs (as shown below), and activities within the framework of the Project.   Record of Discussions was also amended.
   - The 2nd revision dated 6 December 2012: Addition of ICAI in the target group, clarification of the verifiable indicators, and addition of new activities related to the development of capacities of air traffic controllers at airports with PBN flight procedures, development of

AIM road map and development of mechanism to collect/analyze/share safety information by DGCA.

- The 3rd revision dated 28 November 2013: Clarification of some indicators, addition of new activities related to the development and implementation of training on GNSS module for CNS Diploma-IV course, and increase of the number of assistant instructors who can provide training of PANS-OPS module of ATC Diploma-IV course (as shown below).

3) Planning and Monitoring

The Project is managed properly. Review and update of the Project Plan have been done periodically with joint efforts of the JICA Experts and DGCA Counterparts so as to address the needs of DGCA accurately. Updated Project Plans were discussed and approved by JCC. Changes have all been reflected in the PDM and PO, and the Record of Discussions (R/D) was amended as necessary. The objectively verifiable indicators in the PDM have been utilized for monitoring the progress and achievements.

The Project is well monitored. Respective DGCA 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 DGCA 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 annual JCC has been held five times since the Project started in July 2010. The achievements of the previous years and the Project Plans for the coming year were presented and approved in JCC. These occasions enabled information exchange among the project members and provided good opportunities to inform the DGCA top management on the Project.

4) Communication

There has been good communication between the Japanese Experts and the DGCA and ICAI Counterpart members. The office spaces for the Long-term Experts have been provided near the offices of the key counterparts in DGCA and ICAI, and communication was made smoothly.

There has been good communication among the JICA Headquarters, JICA Indonesia 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 "Fair" or higher, and more than a half rated "High" or "Very High".

3-2 Summary of Evaluation Results

(1) Relevance

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

- The Project meets the needs of target group, i.e. DGCA and ATHRDC/ICAI. Indonesian

side had issues in transition to new CNS/ATM systems and the safety oversight of air carrier operation.   DGCA is the authority for the planning and surveillance of air transportation. ATHRDC/ICAI is a training center for the air traffic controllers and air navigation engineering staff.   Therefore, it is appropriate to select them as target groups.

- DGCA has been upgrading aviation safety by developing a long term civil aviation plan called "Blue Print for Air Transportation 2005-2024" and implemented action plan, "DGCA 5-Year Strategic Plan 2010-2014".   The "National Medium Term Development Plan (RPJMN) 2015-2019" identified "the decline in the ratio of an accident of air transportation on the Air Operator Certificates 121 and 135 to less than 3 incidents per 1 million flight cycle" as one of the targets for achievement of national connectivity of development agenda.   The Project is consistent with this policy.

- The Japanese "Country Assistance Policy for the Republic of the Indonesia" (April 2012) established "Assistance for well-balanced development and enhancement of capacity to address issues of the Asian region and international society" as the basic policy of assistance, and identified the following development issues:

  1-1: Infrastructure development in Jakarta Metropolitan Area

  1-2: Business Environment Improvement and Professional Human Resource Development

  2-1: Correction of imbalance and connectivity enhancement

  2-2: Disaster management and emergency response

  3-1: Response to climate change

  3-2: Response to Issues of Asian Region and International Society

  The Project is placed in the Development Issue 2-1: Correction of imbalance and connectivity enhancement.

- Japan has sufficient experiences in introducing and operating the new CNS/ATM systems, and has been providing various technical assistances in this field in the Philippines, Cambodia, Lao PDR, Vietnam and Myanmar.   Japan has also experience in assistance in air carrier safe operations.   In Indonesia, it provided a technical assistance to "The Project for Strengthening Capacity on Ensuring Safe and Efficient Aircraft Operations".   Since Japan has technical advantages necessary for the Project, assistance to the Project is appropriate.

(2) Effectiveness

The effectiveness of the Project is judged "Very High" for the following reasons:

- The Project was designed appropriately through amendments of the PDM in the past, and 5 Outputs in the current PDM are necessary and sufficient for achievement of the Project Purpose.

- As stated in Section 4.1, the Outputs 2, 3 and 5 have been achieved, and Outputs 1 and 4 are almost achieved.   Answers to questionnaires to the C/P (5-rank self-evaluation) shows that usefulness of the technical transfer provided by both Long- and Short-term JICA Experts is relatively high (average score ranging from 2.9 to 4.3).

(3) Efficiency

The efficiency of the Project is judged "Very 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.
- Both the Indonesian and Japanese sides have been providing their inputs as planned. The maximum person-months of the Japanese Long-Term Experts were increase from 159 to 204 in the First Amendment to the Record of Discussions in November 2011 together with amendment of the PDM. About 154 person-months were utilized by the end of January 2015, and about 19 person-months will be utilized by the end of the Project period, i.e. 9 July 2015. Thus, the total person-months will be about 173, which is within the planned maximum.
- The Inputs made by the Indonesian and Japanese sides were used properly for the Project. Answers to questionnaires to the C/P (5-rank self-evaluation) shows that volume, quality and timing of inputs from Japan and Indonesia sides are relatively good (average score 3.6 and 3.5 relatively).
- The project implementation has been properly managed by both the Indonesian and Japanese sides.

(4) Impact

The impact of the Project is predicted as "High". The Project has already given positive impacts on the capacity of DGCA and ICAI in the areas of the new CNS/ATM systems and the safety oversight of air carrier operation to improve aviation safety in Indonesia. Other impacts of the Project are predicted as follows:

- With introduction of PBN flight procedures, it is expected that efficiency of flights will be improved by aircraft flying shorter paths. Garuda Indonesia estimated that introduction of RNAV1 flight procedures at Soekarno-Hatta International Airport saved 147 million liters of fuel and reduced 368 tons of CO_2 emission in 2014.
- As a part of transfer of operational function related to ANS from DGCA to AirNav Indonesia and as stipulated in CASR 173, responsibility of flight procedure design will be shifted from DGCA to AirNav Indonesia. DGCA, as the regulator, will be responsible for review and approval of the proposed flight procedures. Airlines are also allowed to design and propose flight procedures for their own benefits. This Project built good foundation for DGCA as a regulator of flight procedures. At the same time, the Project also contributed to capacity development of flight procedure design for AirNav Indonesia and airlines, which will facilitate smooth transition to new demarcation of roles in flight procedure design. It is expected that ICAI will also contribute to this restructuring since the Project enhanced ICAI's capability in PANS-OPS (flight procedure design) training.
- It is expected that safety culture will be fostered in the civil aviation sector through collecting/analysis/ action on Safety Information and audits on SMS operations of AirNav Indonesia and air carriers.
- 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". The effect of the Project is expected

to continue by the Indonesia Government even after the Japanese technical cooperation terminates for the following reasons:

1) Policy Aspect

The Project will be consistent with the policies of the Indonesia Government as stipulated in "National Medium Term Development Plan (RPJMN) 2015-2019".

2) Financial Aspect

DGCA and ATHRDC/ICAI are government organizations under the Ministry of Transportation, and their financial bases are sound. As long as the Government of Indonesia maintains its policy on the aviation safety, it is expected that necessary budget will be allocated to DGCA and ATHRDC/ICAI.

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. DGCA and ATHRDC/ICAI developed capacity to provide trainings on the technologies learned through the Project, and has already been conducting such training so as to secure sufficient number of staff to sustain the outputs of the Project. Therefore, sustainability in technical aspect is sufficiently high.

3-3 Factors enabling the realization of positive effects

(1) Planning Process

The planning process followed by the Project has enabled efficient and effective implementation of the Project. Grate efforts have been made by Japanese Experts and the Counterparts in making sure that the Project will effectively address the needs of the civil aviation sector by assessing the needs and planning necessary activities. Modifications of the Outputs and Activities were undertaken according to the progress of the Project. To meet the needs for expanded activities, ICAI was added to the counterpart agency, and Project Coordinator was added as JICA Long-term Expert. The performances in the area of "human resource development related to new CNS/ATM system" and project coordination have been improved significantly with this change.

(2) Support from Civil Aviation Bureau of Japan

It must be noted that the Project has benefited greatly from the support provided by Civil Aviation Bureau of Japan (JCAB). Its contribution includes the provision of Long-term Experts, Short-term Experts and training in Japan. Without the support of JCAB, the Project would not have attained the current status.

(3) Proactive Counterpart Members

It is also noted that one of the air navigation experts at DGCA and an ATC instructor at ICAI exerted strong leadership in implementing related activities of the Project. This has contributed greatly in mobilizing the resources of their organizations. The proactive Counterpart members are also contributing to achievement of the Outputs. It has been observed that once the Japanese

Experts provide the right knowledge and guidance, the Counterpart will autonomously develop their plans and implement the necessary activities, in particular, for Output 1 area.

3-4 Factors obstructing the realization of positive effects

(1) Factors concerning planning

At the beginning of this Project, it was considered that education and training related part of the Project for whole aviation training institutes in Indonesia should be coordinated through Civil Aviation Training Center (CATC) under the Education and Training Agency (ETA) of Ministry of Transportation, and CATC was selected as a Counterpart organization together with DGCA for this Project. It was also considered that CATC coordinated all training activities for air traffic controllers and air navigation engineering staff. (CATC was renamed to ATHRDC later.)

However, ATHRDC's main function is the management of the whole civil aviation training in Indonesia, and has limited role in the implementation of civil aviation training. On recognition of this matter, the Indonesia Civil Aviation Institute (ICAI) was added to the Counterpart of the Project with the decision of the 2nd JCC in November 2011. Although approximately one year has been elapsed to improve the Project organization of the Indonesian side, this obstructing matter has been resolved at present.

(2) Factors concerning implementation process

Nil.

3-5 Conclusion

The Project Purpose has been almost achieved at the time of the evaluation, and it is expected that all outputs will be achieved by the end of the Project period by conducting planned activities.

In terms of the Five Evaluation Criteria, the relevance, effectiveness and efficiency are very high. Some positive impacts have been observed in terms of benefits to airlines in saving of operational costs and smooth transition of roles in air navigation services. The sustainability of the Project is evaluated as high in policy, financial and technical aspects.

Therefore, it is expected that the Project will be finished in July 2015 as planned.

3-6 Recommendations

(1) Recommendations to the Project

There is no particular recommendation that is necessary to eliminate obstructing issues for the achievement of the project outputs and project purpose by the end of the Project. It is recommended that the Project members will continue planned activities without delay toward the end of the project period.

(2) Recommendations to DGCA

- Maintenance of Capacity in Flight Procedures

DGCA has developed capacity to conduct all processes required for application of PBN flight procedures including SID, STAR, RNP APCH, Baro-VNAV, RNP AR APCH and RNAV5 Routes through the Project. It has also improved skills to establish conventional flight procedures for SID, STAR, VOR/DME APCH and ILS APCH. It is necessary that

DGCA continues to maintain, refresh and update skills through internal OJT training, which includes;

- ・ OJT Training for Conventional Flight Procedures for Designers by OJT Instructors
- ・ OJT Training for PBN Flight Procedures for Designers by OJT Instructors

Through these OJT training, designers collect required data, design flight procedures that are applicable to actual airports, and conduct quality management activities (documentation, verification and storage of data). Designers attend stakeholders' meeting to understand requirements on airspace management, constraints from environmental aspects and requests from airlines.

- Maintenance of Published Flight Procedures

Designed flight procedures require Periodic Review with fixed intervals and Continuous Maintenance in response to new obstacle, runway extension, change in radio navaid, etc. It is recommended that DGCA 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.

- Monitoring and Enhancement of Expansion of SMS of AirNav Indonesia

By the time of this terminal evaluation, AirNav Indonesia has introduced SMS for major airports, and it is in the process of expanding SMS to all ATS units in Indonesia. DGCA should continue to enhance and monitor the introduction of SMS by AirNav Indonesia. Increase in the number of ATS units with SMS is necessary not only to complete AirNav's SMS coverage, but also to utilize safety information collected and analyzed at ATS units to be used for preventive action against similar risks at other ATS units.

- 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 increase in air traffic volume in Indonesia is among the highest in the world, current situation requires introduction of new technology to fully utilize benefits of new CNS/ATM systems. It would include alleviation of air traffic congestion at Soekarno-Hatta International Airport and other busy airports/airspace by Air Traffic Flow Management (ATFM), expansion of ATS route capacity by introduction of parallel RNAV routes, etc. It is recommended for DGCA to plan application of new CNS/ATM technology to accommodate ever increasing air traffic volume with enhanced air safety.

- Enhanced Use of Reporting System

The Project developed the system to utilize Service Difficulty Report (SDR), which includes fact of event, analysis and corrective action to avoid reoccurrence of similar events. It is important to continue to accumulate SDR data for DAAO to analyze unsafe events, and to use these data more effectively for the corrective action against similar events. It is also important to introduce voluntary reporting system so that safety information is further widely gathered and used to strengthen proactive measures to reduce potential risk of air safety.

Enhancement of safety culture through education regarding reporting systems is an important element of successful aviation safety.

- Further Development of Human Resource in Aviation Security

    The Project assisted training of DGCA, Angkasa Pura and Batam Airport staff in the areas of operation of security equipment including Explosive Trace Detection System (ETDS), profiling of people with suspicious behaviors, risk management and crisis management in relation to security equipment grated to major airports in Indonesia by the Government of Japan. The training program included training of instructors, and knowledge and skills obtained through the training under the Project was shared to other security staff. It is necessary that the current effort be continued to cover all relevant security inspectors and managers.

(3) Recommendation to ICAI
- OJT Training of Instructors

    ICAI has improved capacity to provide PANS-OPS training through the Project. Procedure design is a subject that improvement of knowledge and skills are effectively accumulated through designing flight procedures for actual airports in addition to experience of teaching at classrooms. This is already recognized by ICAI, and some assistant ICAO PANS-OPS instructors receive OJT training at DGCA.   The same would apply to ATC, CNS and other instructors. It is recommended that ICAI continue and expand OJT training opportunities at DGCA, AirNav Indonesia and AP-I/AP-II for its instructors.

- Continuous Update of New CNS/ATM Training

    The Project successfully upgraded new CNS/ATM training courses at ICAI.   However, it is necessary for ICAI to continuously update its training modules since technology advances day by day in this area.   For example it is recommended that teaching basic of Air Traffic Flow Management (ATFM) as well as ICAO's ANS plan such as Global Air Navigation Plan (GANP) and Aviation System Block Upgrades (ASBUs) be included in its long courses or as dedicated short courses.

- Strengthening of Instructors at CNS Department of ICAI

    As recommended in the Mid-Term report, CNS Department of the ICAI has limited number of active instructors as compared with ATC Department. It is recommended that ICAI would continue its effort to increase the number of instructors so that the knowledge and skills obtained through the Project would be effectively utilized.

(4) Recommendation to AirNav Indonesia
- Well Planned Transfer of Flight Procedure Design Function from DGCA

    As a part of integration of operational function related to ANS and as stipulated in CASR 173, the role of designing flight procedures will be shifted from DGCA to AirNav Indonesia. AirNav Indonesia is currently building up its flight procedure design capacity, and the Project contributed to it by adding AirNav's designers to PANS-OPS training courses by JICA

short-term experts.　It is important for AirNav Indonesia with assistance from and in close coordination with DGCA to establish a capacity development plan for flight procedure design that will include the following components:

- ・ Training of flight procedure designers including training of new designers at ICAI and OJT at DGCA as well as internal training at AirNav Indonesia
- ・ Introduction of automated design tool
- ・ Training of flight procedure designers automated design tool
- ・ Establishment and management of database with sharing of data with DGCA
- ・ Implementation of PBN roadmap with demarcation of design roles at specific airport level
- ・ Periodic Review and Continuous Maintenance of published flight procedures

As for automated design tool, it is recommended that AirNav Indonesia will select the same design tool that DGCA uses, i.e., PANADES to ensure consistency of OJT training at DGCA and practice at AirNav Indonesia and to assure that design data accumulated at DGCA can be shared to AirNav without any software inconsistency.

(5) Recommendations to JICA

Recommendation toward the end of the Project period is "to provide appropriate advice to the Long-term Experts in administration of closing the Project".

3-7　Lesson Learned

The lesson learned in the Mid-term Review, i.e. advice on project management is valid at the terminal evaluation.　In addition, the following lessons are learned through the Project.

(1) Collaboration of various specialists for PBN implementation

Introduction of the PBN flight procedures, especially at airports, is a complex task.　It requires collaboration of various specialists, such as WGS-84 surveyors, flight procedure designers, flight inspectors, operational approval inspectors, safety oversight officers and AIS officers.　These specialists belong to different groups, i.e. various sections of the Directorate of Air Navigation and Directorate Airworthiness and Aircraft Operations in the case of DGCA. Coordination among these specialists and mutual cooperation are a key to smooth implementation of PBN flight procedures.

(2) Collaboration with other similar projects

The Project is highly technical and was the first of its kind assisted by JICA.　Several similar projects in the Philippines, Vietnam, Lao PDR, Cambodia and Myanmar have been implemented by JICA in parallel with the Project.　The Chief Advisor of the Philippine project and his Philippine counterparts was dispatched to Indonesia as Short-term Experts to conduct trainings on ATFM and CNS/ATM.　A Long-term expert of Vietnam project also dispatched to Indonesia as Short-term Expert on WGS-84.　Dispatching a Long-term Expert of one country to other country as a Short-term Expert is an effective method in using the limited resources and conduct training efficiently and flexibly.