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Airport survey method for transition to the new CNS/ATM systems in east Mekong area

NAKAGAWA, Yuji[1*] ; OKADA, Kaoru[2] ; SHIMADA, Seiichi[3] ; SATOMURA, Mikio[3] ; SHINDE, Yohei[1] ; ITOH, Hirokazu[1] ; UKEI, Kazuyuki[1]

[1]Nippo Co.,Ltd., [2]Japan International Cooperation Agency, [3]NIED, [4]Hot Springs Res. Inst, Kanagawa Pref.

The project by the name of ”Capacity Development for Transition to the New CNS/ATM Systems in Cambodia, Lao PDR and Vietnam” (Jan.2011-Dec.2015) was officially announced by Japan International Corporation Agency (JICA) on April 2011, and Nippo got the order, after that we got the orders five times for two years. We would like to introduce the procedure of surveying airport coordinates.

The concept of New CNS/ATM System (Communication, Navigation and Surveillance/Air Traffic Management) utilizing satellite technologies was developed by International Civil Aviation Organization (ICAO) in 1991 for globally harmonized implementation in order to cope with the expected increase of air traffic. All the Contracting States of ICAO are required to move from the conventional air navigation systems to the New CNS/ATM Systems in accordance with ICAO Global Plan.

In order to shift air navigation from the ground-based facility use to the satellite use, it is essential to have accurate and updated data of latitude and longitude of airports and air navigation facilities based on WGS-84 coordinates as ICAO Standard. However, in Cambodia, Lao PDR and Vietnam it has not been made known whether airport survey has been conducted, applying long-baseline analysis by using International GNSS Services (IGS) points in accordance with ICAO WGS-84 Manuals (Doc9674 2nd edition).

The purpose of the project is transferring survey method and surveyed airport coordinates in accordance with WGS84 coordinate system.

Airport survey procedure and recommendation

1.Confirmation of required survey points and facilities

Runway ends, ILS, VOR/DME, control tower, TV antenna, etc.

2.Reconnaissance of Primary Airport Control Station (PACS) and Secondary Control Station (SACS). Installed two PACS survey markers near runway ends and seven or eight SACS survey markers at a regular distance.

3.Set up receivers at two PACS and one SACS and surveyed 24 hours at PACS for three days, at SACS for 1.5 hours simultaneously by differential GPS satellite surveying. (when prepared three receivers. if prepared four receivers, observe two PACS and two SACS simultaneously)

4.Install GPS receivers at other SACS points over lapping the base line on every session.

5.Install total station (TS) at every PACS and SACS and observe each other to verify the coordinates surveyed by GPS receivers.

6.Survey runway ends, radio navigation facilities (ILS, VOR/DME, etc.) and obstacles like control tower, big Buddha stature, tall building. If the obstacle cannot seen from coordinates known points PACS, SACS, set up receivers at PACS and auxiliary two points in the vicinity of the obstacle.

7.Determine the coordinates of PACS using long baseline analysis software (Bernese) by down loading ultra rapid orbit. Coordinates of SACS using short baseline analysis software.

8.Survey runway ends, radio navigation facility and obstacles by TS using SACS and PACS.

9.We surveyed a fiducial point which have x, y coordinates and above sea level height, and compared the result which obtained by Earth Gravitational Method (EGM) 2008 software in Cambodia. (The result of EGM2008 is higher than our survey by about 80cm, but we could not confirm the accuracy of the height of fiducial point.)

10.Lecture on how to choose the PACS and SACS location, how to use the long baseline software and how to maintenance the result data including process of calculation.

Keywords: WGS84, GPS, CNS/ATM, Airport coordinates, East Mekong area