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**ASSEMBLY — 40TH SESSION**

**TECHNICAL COMMISSION**

**Agenda Item 30: Other issues to be considered by the Technical Commission**

**AIRPORT COMPATIBILITY STUDY FOR AEROPLANE WITH FOLDING WING TIP**

(Presented by the Republic of Korea)

**EXECUTIVE SUMMARY**

According to Annex14 — *Aerodromes*, when an aerodrome accommodates an aeroplane that exceeds the certified characteristics of the aerodrome, the assessment of its compatibility with the type of traffic or operations to ensure the safety of operations shall be conducted.

As ICAO is currently considering the inclusion of aeroplanes with folding wing tips into Annex14, conducting the compatibility study for adopting spanning two ARC code letters (code letter E, F) could be required as well.

Therefore, the purpose of this information paper is to share one of the compatibility study case of aeroplanes with folding wing tips in Incheon International Airport (ICN) for reference.

<i>Strategic Objectives:</i>	This information paper relates to Aerodromes.
<i>Financial implications:</i>	
<i>References:</i>	Annex14 - <i>Aerodromes</i> Doc9981, <i>Procedures for Air Navigation Services (PANS) - Aerodromes</i>

## 1. BACKGROUND

1.1 New type of aircraft with folding wing tips (FWT) has been developed and FWT is extended in flight (Code F), while the aeroplane is maintained Code E with wing tip folded on the ground. This allows airport operators to accommodate aeroplane with FWT without expansion of airport facilities such as runways, taxiways and aircraft stands.

1.2 ICAO has suggested that the airport operator have to establish the normal/abnormal operation procedure of aircraft with FWT based on their aerodrome structure and the information on the FWT operations which was included in the manufacturer's Airplane Characteristics for Airport Planning Manual.

## 2. AIRPORT COMPATIBILITY

2.1 As Incheon International Airport (ICN) was designed for the operation of ICAO code F aircraft, there seems to be no deficiency or defect in the facilities of manoeuvring area.

2.2 The characteristics (aircraft classification number (ACN)) of pavement of runways, taxiways and aprons are able to meet the requirements of B777-9x. And from the AviPlan™ software simulation, the outer main gear of B777-9x did not exceed taxiway edge lines when it moved the rapid exit taxiways and over 90 degree turn on manoeuvring area.

2.3 There is also no restriction in that B777-9x in normal FWT operations use taxiways on aprons, but the movement of the aircraft of abnormal FWT operations is prohibited at several taxiways because such operations cannot guarantee sufficient clearances between aircraft and obstacle(or aircraft).

Separation distances	ICAO Code F requirements	Requirements in normal FWT operations	Conditions of Incheon International Airport
Taxiway centre line to taxiway centre line	91m	82.8m	97.5~99m
Taxiway centre line to obstacles	51m	46.9m	57.5~60m
Taxilane centre line to taxilane centre line	87.5m	79.3m	97.5m
Taxilane centre line to obstacles	47.5m	43.4m	Over 42.5m

2.4 There seem to be restrictions on the availability of aircraft stands with jet bridges that can be used by FWT aircraft. It is caused by changes that the location of 2nd door from the nose is approximately 6 meters farther than B777-300ER and the distance between engine and 2nd door is shortened. In addition, as B777-9x of abnormal FWT conditions cannot use all aircraft stands attached on passenger terminals, it should be parked at remote parking aprons.

**3. SAFETY ASSESSMENT**

3.1 Although B777-9x does not exceed the physical requirements of Incheon International Airport, it can cause dangerous situations when the folding wingtip doesn't operate properly. The airport operator should establish contingency plans in preparation for various possible situations.



3.2 Safety assessment of the following three situations has been carried out and the risk level of those hazardous factors is as low as acceptable. Detailed descriptions are as follows:

	Take-off	Taxing	Entering the aircraft stand
Safety Considerations	FWT is not extended prior to entering the runway	Aircraft taxies on the code E taxiway without folding FWT	Aircraft enters the code E stand without folding FWT
Hazardous Factors	The pilot does not recognize the FWT extension point	Collisions with obstacles	Collisions with obstacles
Impact	Take-off failure ROT (runway occupancy time) is lengthened	Taxiway close	Aircraft stand close
Risk Assessment	Low (acceptable)	Low (acceptable)	Low (acceptable)
Risk Mitigation	Establish FWT extension point operation procedure	Abnormal FWT operations	Restriction of aircraft in abnormal FWT operations

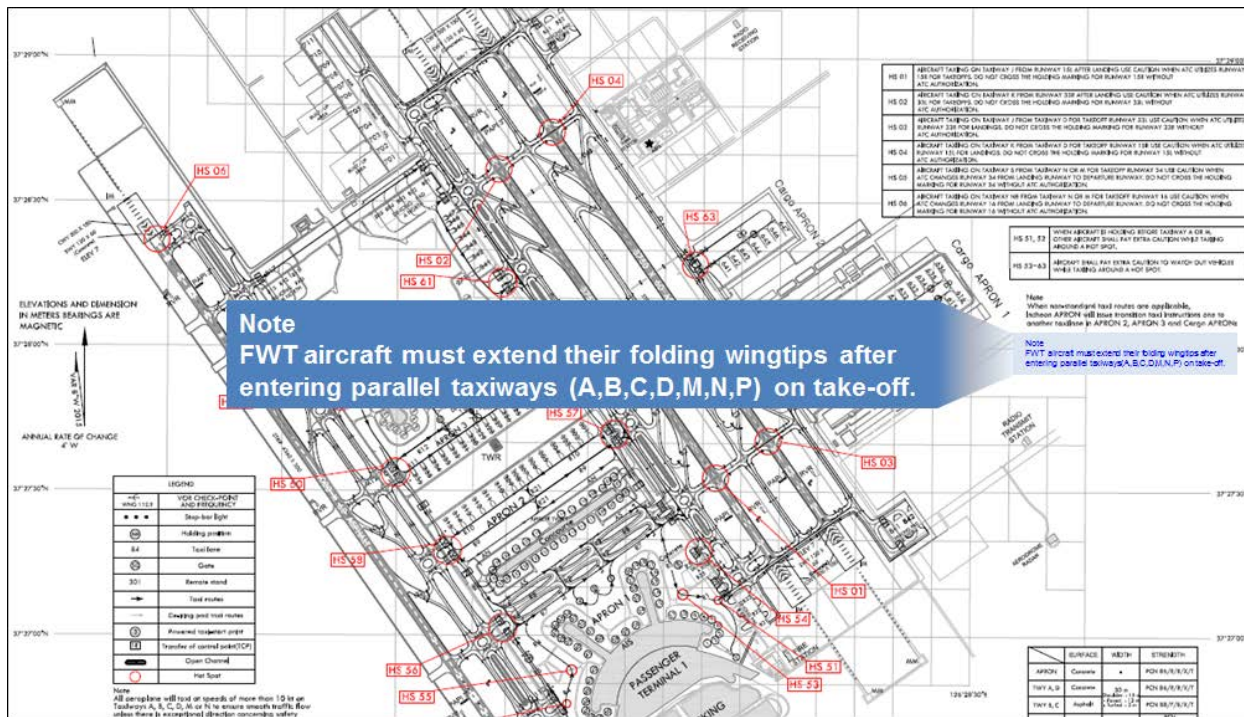
**4. RISK MITIGATION**

4.1 Procedure for FWT extension operations:

- a) it is difficult to specify the position of FWT extension because the airside layout varies from airports. It will be safe to extend the FWT after entering the runway, but it may affect the take-off time of the departure flights on the next runway in order to maintain separation intervals of landing flights;
- b) there are restrictions on ground movements of Code F aircrafts on aprons of Incheon International Airport, since these taxiways are designed to accommodate Code E aeroplanes. It is necessary to designate the FWT extension position for the safe operations. Incheon International Airport has studied with ATC controllers, airlines, pilots on the following 3 procedures;
- c) in conclusion, since there is no restriction on ground movement of code F aircraft on manoeuvring area, stakeholders agreed to the FWT extension procedure that pilots should follow after entering parallel taxiways and prior to departure runway; and

<i>FWT extension point</i>	Prior to borders of manoeuvring area	Prior to runway holding position	After entering the parallel taxiways
<i>Advantages / disadvantages</i>	Not familiar with TCP	Too close to the RWY	No need for visual aids and ATC instructions
<i>Visual aids</i>	TCP (Transfer of control point) markings	Runway holding position markings (type A)	No visual aids
<i>Figures</i>			
<i>Conclusions</i>	Not satisfactory	Not satisfactory	Satisfactory

d) the information on FWT extension procedure will be included on the ground movement chart as follows:



4.2

Procedure for abnormal FWT operations:

a) the movement of Code F aircraft such as A380 (except B747-8) is restricted to certain taxiways in Incheon International Airport. Aeroplanes with FWT in abnormal operations cannot be operated on such areas because there are not enough clearances between aircraft and obstacles (aircrafts); and

