Incheon A-CDM
Operation Manual for Pilot

Incheon International Airport

Table of Contents

Chapter 1 General

1.1 Purpose

This manual is to help users to understand Airport-Collaborative Decision Making (A-CDM) developed to utilize limited resources effectively and to support efficient flight operation in response to the increasing demand for air traffic. It is especially aimed at facilitating pilots' compliance with Incheon A-CDM procedure that visit Incheon Airport.

1.2 Scope of Application

This manual is applicable to the pilots that visit Incheon Airport and Seoul Regional Office of Aviation, Incheon International Airport Corporation, aircraft operators, ground handlers, etc.

1.3 Relevant Rationale

_____ (Notification of the Ministry of Land, Transport and Maritime Affairs)

1.4 Maintenance

This manual is written based on 「Incheon Int'l Airport A-CDM Operation Manual」. If some changes are made in the role of partners and operational processes, the relevant provision of this manual will be modified accordingly.

1.5 Definitions

Terms and abbreviations used in this Manual are defined as follows:

DMAN	**Departure Manager** is a system that improves the outbound flow at the airport by calculating TTOT and TSAT for outbound flights, factoring in various limitations and priorities.
Milestone	**Milestones** mean 16 reference points that affect the operation and preparations of a flight during the processes where an inbound aircraft takes off from the originating airport and arrives at Incheon Airport, and an outbound aircraft gets ready to take off from Incheon Airport. They consist of detailed time information. See <Table. A-CDM Milestone Information>
Return-to-Gate	**Return-to-Gate** means a situation in which an aircraft has to return to a parking stand after push-back or taxiing for reasons such as technical problem, weather condition, passenger disembark, etc.

The time information used in this manual consists of 39 time parameters that break down each milestone. Major outbound information is defined as below:

< Table. Major Time Parameters of A-CDM >

Acronyms	Term	Description
ACGT	Actual Commence of Ground handling Time	The time when ground handling on an aircraft starts.
AOBT	Actual Off Block Time	The time when an aircraft is cleared by the Apron Control Tower and pushes back.
ARDT	Actual Ready Time for taxiing	The time when an aircraft is ready for start up on the stand. It is calculated with the time when a boarding bridge is removed from an aircraft.

Acronyms	Term	Description
AROT	Actual apron Out Time	The time when an aircraft enters the maneuvering area from the apron or when the apron controller transfers the frequency of an outbound aircraft to the control tower before it enters the maneuvering area.
ASAT	Actual Start Up Approval Time	The time when the Apron Control Tower gives push-back approval for an aircraft that received flight clearance so that it can depart (in case of remote spot, the time of approval for engine start-up).
ASBT	Actual Start Boarding Time	The time when an outbound aircraft starts passenger boarding.
ASRT	Actual Start Up Clearance Request Time	The time when a pilot of an outbound flight requests engine start-up or push-back for departure to the Apron Control Tower.
ATOT	Actual Take Off Time	The time when an aircraft takes off from the runway.
AXOT	Actual Taxi Out Time	The time required for an outbound aircraft to taxi from the aircraft stand to the runway.
COBT	Calculated Off Block Time	The off-block time calculated and issued by the Air Traffic Command Center, taking into account the route capacity and adjusting the airport capacity.
CTOT	Calculated Take Off Time	The take-off time calculated and issued by the Air Traffic Command Center, taking into account the route capacity and adjusting the airport capacity.
EOBT	Estimated Off Block Time	The estimated time at which an aircraft will start movement off-block for departure.
EROT	Estimated apron Out Time	The time when an outbound aircraft is transferred from the Apron Control Tower to the control tower after push-back.
ETOT	Estimated Take Off Time	The estimated take-off time from the runway, which is calculated by adding EOBT and EXOT(or VTT).

Acronyms	Term	Description
EXOT	Estimated Taxi Out Time	The estimated taxi time for an outbound aircraft from the gate to the runway after push-back clearance.
MTTT	Minimum Turn-round Time	The minimum reference time required for ground handling of an aircraft that will depart after its arrival. It is set as the reference value for each aircraft operator or an average value of inbound/outbound quick-turn aircraft.
SOBT	Scheduled Off Block Time	Scheduled time an aircraft is expected to depart from the parking position, derived by an aircraft operator schedule.
TOBT	Target Off Block Time	Target estimated time when an aircraft will be ready, boarding completed, all doors closed, boarding bridge removed, push-back vehicle available and the pilot ready to start up immediately upon reception of push-back clearance.
TSAT	Target Start Up Approval Time	Target estimated time that the Apron Control Tower is expected to approve push-back for an outbound aircraft (in case of remote spot, engine start-up approval time). It is calculated with TTOT generated by the control tower, on the basis of TOBT provided by an aircraft operator. However, it is restrictively issued and operated in Phase 1 Operation.
TTOT	Target Take Off Time	The control tower's target take-off time taking into account TOBT, CTOT, traffic conditions, en-route situation and altitude separation. However, it is issued and operated restrictively in Phase 1 Operation.
VTT	Variable Taxi Time	The taxi time that an aircraft spends on the ground between its parking stand to the runway, or vice versa. A-SMGCS calculates it, factoring in an aircraft's ground taxing speed.

Chapter 2 Incheon A-CDM Introduction

2.1 Overview

2.1.1 Incheon Airport A-CDM supports the decision-making based on accurate forecasting for all partners including airport operator, the Air Traffic Control Center, aircraft operator and ground handler that perform the aircraft operation at the airport and other related jobs. Furthermore, it enables users to respond to the continuously increasing demand for air traffic and utilize limited resources at the airport efficiently, thereby actively managing flight delays.

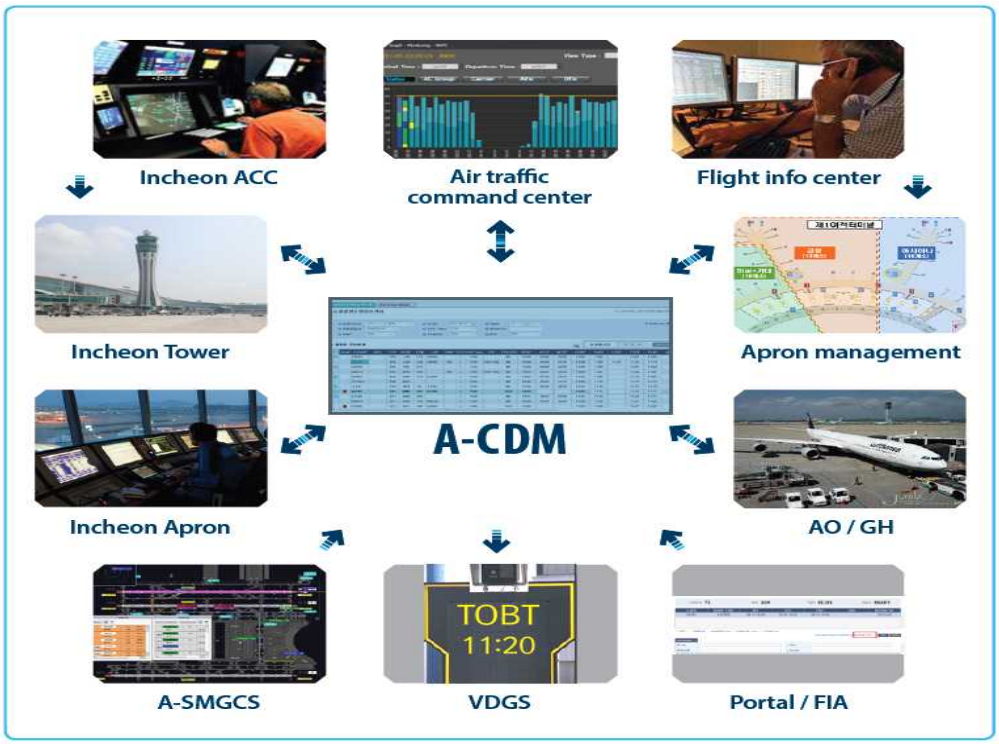
2.1.2 The success of A-CDM depends on collaboration and efforts of partners to share time information such as aircraft operation support, preparation and air traffic control, which has been managed separately by individual entity, and to predict and comply with the target time based on the shared time information.

2.1.3 Individual partners share the pre-estimated flight operation time information via A-CDM Portal System, which enables them to perform better decision-making by taking accurate measures in a timely manner. The whole process will help them to realize that they serve in the same aviation community.

2.1.4 Decision-making based on accurate forecasting is environment-friendly and also enhances the operational efficiency at the airport in that it optimizes the distribution of resources among individual partners and reduces unnecessary aircraft delay on the ground, which will reduce not only fuel costs but also carbon emissions.

2.1.5 A-CDM system takes the milestone approach that divides aircraft movement time information into milestones and manages flight arrival and departure time, taxiing, ground handling and so forth as milestone time information.

Thus, it allows for information management by systematically integrating with other systems at the airport such as the Air Traffic Service Unit, aircraft operators and ground handlers.



<Figure 2-1. Associated Systems of Incheon A-CDM>

2.1.6 The operation of Incheon Airport A-CDM is planned to be divided into 3 phases as follows:

- Phase 1 Operation (Dec. 2017 - Dec. 2019): Share basic time information with partners via A-CDM and implement system stabilization
- Phase 2 Operation (Jan. 2020 - Dec. 2024): Improve TTOT/TSAT and enlarge the scope to cover de-icing/anti-icing aircraft by upgrading DMAN (Departure Manager)
- Phase 3 Operation (Jan. 2025 -): Implement automation of A-CDM by using Industry 4.0 (Artificial Intelligence) and enhance the quality of information mutually shared with the Air Traffic Control Center

2.2 Outbound Milestones

Outbound milestones of Incheon Airport A-CDM consists of 9 milestones, and manages and shares 19 time parameters.

8. Ground Handling Commence	ACGT MTTT	Actual Commence of Ground handling Time Minimum Turn-round Time(each AO/average)
9. TOBT estimation	TOBT SOBT/EOBT	Target Off Block Time Scheduled/Estimated Off Block Time (ETD connected change)
10. TTOT calculation	TTOT CTOT	Target Take Off Time Calculated Take Off Time (Daegu ATCC)
11. TSAT issue	TSAT	Target Start Up Approval Time
12. Boarding	ASBT	Actual Start Boarding Time
13. Ready for start-up	ARDT ASRT	Actual Ready Time for taxing Actual Start Up Clearance Request Time
14. P/B clearance	ASAT	Actual Start Up Approval Time
15. Actual P/B	AOBT EROT/AROT	Actual Off Block Time Estimated/actual Ramp Out Time
16. Take-off	ETOT/ATOT EXOT/AXOT	Estimated/actual Take Off Time Estimated/actual Taxi Out Time

<Figure 2-4. Outbound Milestones and Time Parameters of Incheon A-CDM >

2.2.1 TOBT (Target Off Block Time)

2.2.1.1 Definition

TOBT is the time that an Aircraft Operator or Ground Handler estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle available and ready to start up / push back immediately upon reception of clearance from the apron control tower.

2.2.1.2 Necessity

TOBT serves as basic time parameter for pre-departure management that takes into account take-off sequence of an outbound aircraft and for calculation of TSAT and TTOT. Therefore, it shall be accurately managed for the purpose of accurate pre-departure management and stable operation of A-CDM.

2.2.1.3 Generation and Management

1. Aircraft operator or ground handler is responsible for generating, managing and complying with TOBT, and the responsibility for the overall management is on the relevant aircraft operator.
2. TOBT of an outbound aircraft is automatically generated 1 day prior to departure, considering EOBT of the flight schedule. If TOBT is estimated to deviate from EOBT for 15 minutes or more, EOBT shall be revised.
3. The accuracy of TOBT shall be within the range of ±5 minutes. Therefore, a pilot shall monitor TOBT, and if TOBT is estimated to deviate for more than 5 minutes due to a delay caused by aircraft maintenance check, passenger, etc, a pilot shall notify the relevant aircraft operator or ground handler of the delay time and request for TOBT or EOBT update.
4. A delay caused by external conditions such as en route and ground traffic is not reflected in TOBT. Thus, TOBT shall not be updated with TSAT created by Control Tower

2.2.1.4 Display and Utilization

1. At the VDGS serviceable stands, TOBT is displayed on PDU (Pilot Display Unit) of VDGS from 30 minutes prior to TOBT. Once the Control Tower issues TSAT with ATFM (agreed take-off, etc.), TOBT display will be terminated and TSAT will be displayed instead.
2. At the aircraft stand without VDGS or at the stand where VDGS is under maintenance, aircraft operator can share the information with a pilot by using the company frequency or during the cabin briefing.

3. The pilot shall be aware of the aircraft preparation status and contact the Control Tower Clearance Delivery Position to request for the ATC clearance within ±5 minutes window of TOBT. The issuance of ATC clearance can be delayed due to the en-route situation.

2.2.2 TSAT (Target Start-up Approval Time)

2.2.2.1 Definition

TSAT (Target Start-up Approval Time) is the estimated time when the Apron Control Tower is expected to approve engine start-up and push-back for an outbound flight. It is calculated by the Control Tower, taking into account ATFM limitations, ground movement time, runway capacity, control separation, traffic situations, etc. However, in Phase 1 Operation, TSAT is divided and shared as follows. Tower TSAT or Tower TTOT(Release Time) which should be directly applied to the flight is shared to the pilots.

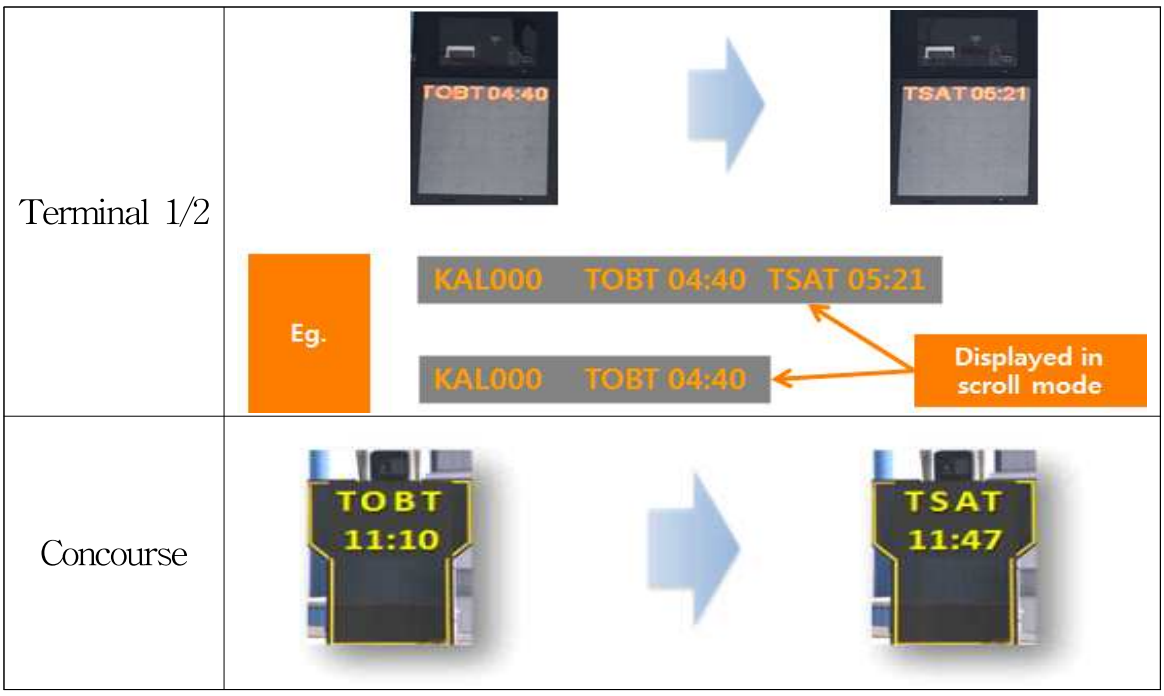
1. System TSAT : if there is no delay, or if delay is unpredictable, system TSAT if defined as the same value of TOBT.
2. Tower TSAT : the pushback time which reflects TWR-provided take-off time after the consultation with ACC considering ATFM.
3. TSAT reflecting COBT : defined as the same value of COBT which is provided from ATCC.

2.2.2.2 Generation

The Control Tower produces TTOT when it agrees with Incheon Air Traffic Control on take-off time due to ATFM. Then, TSAT is calculated by taking into account the time required to taxi from the aircraft stand to the assigned runway, together with produced TTOT. Therefore, TSAT will not be provided to non ATFM flights.

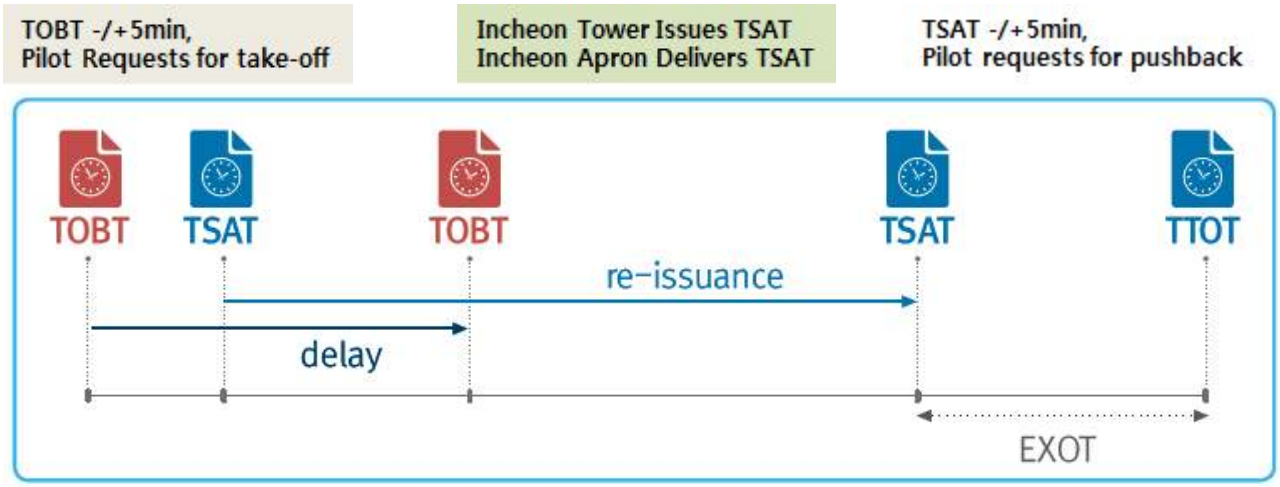
2.2.2.3 Provision and Display

1. At the aircraft stand that has VDGS, Tower TSAT is displayed by modifying TOBT on PDU of VDGS when TSAT produced by the Control Tower with ATFM(agreed take-off, etc.) is shared.
2. At the VDGS unserviceable stands, aircraft operator or ground handler can provide the pilot with TSAT by using company frequency if necessary.
3. The pilot can receive TSAT upon request, or if needed, when obtaining a ATC clearance by the Control Tower or when contacting the Apron Control Tower.
4. The pilot might have to stand by under the instruction of the controller in case of delay in TSAT creation due to the en route situation, the consultation with surrounding countries, and the consultation with Incheon Air Traffic Control.



< Figure. 2-11 TSAT display screen >

5. After Tower TSAT issuance, the take-off sequence of the aircraft is set. Therefore, if the pilot cannot comply with Tower TSAT, he/she shall immediately report the delay to the Control Tower and update EOBT, so that the take-off sequence is readjusted and the ATC clearance is re-issued.



<Figure 2-6. Role of Pilot and Flow Diagram in case of Delay>

2.2.2.4 Utilization

If there is a big difference between TOBT and TSAT, aircraft operator can perform departure management including ground handling and boarding based on TSAT produced by the Control Tower.

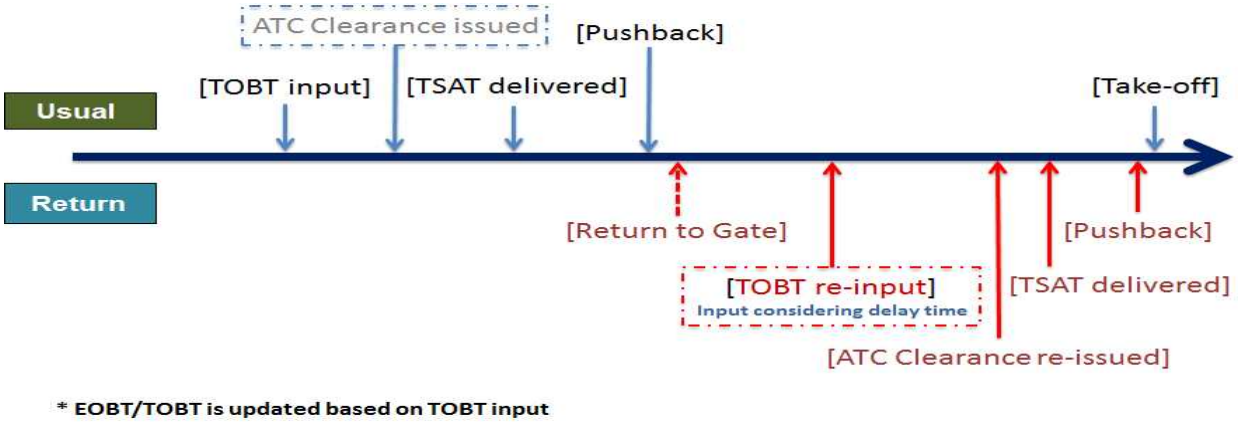
However, TSAT may be subject to change due to environmental changes (runway change take-off sequence change, additional delay in the en route or early termination of ATFM due to improved weather condition at the destination, etc.). Thus, it is required to continuously monitoring whether TSAT was revised and get ready with time to spare.

2.2.2.5 Operation and Cancellation

After receiving the ATC clearance, the pilot shall request engine start-up and push-back to the Apron Control Tower within ±5 minutes window of TSAT produced by the Control Tower. Subject to TSAT change or traffic condition, the pilot can contact the Apron Control Tower for early pushback. However, after receiving the ATC clearance, the pilot shall monitor the Apron Control Tower frequency. If the pilot cannot request for pushback to the Apron Control Tower within TSAT +5 minutes, the ATC clearance is cancelled and additional delay may occur.

2.2.2.6 Return-to-Gate

If an aircraft returns to a parking stand after push-back or taxiing, TTOT is cancelled. Therefore, aircraft operator shall revise EOBT(and TOBT accordingly) so that the relevant aircraft receives new ATC clearance and depart without confusion.



<Figure 2-7. Return-to-Gate Flow Diagram >

2.3 Departure Procedure

2.3.1 The departure procedure starts with the step to commence ground handling for departure, and TOBT of a turn-around aircraft is estimated and shared automatically, taking into account MTTT (Minimum Turn-round Time) and in-block time(EIBT and AIBT).

2.3.2 TOBT, which is the most important parameter in A-CDM, is input by aircraft operators or ground handlers from 90 minutes prior to automatically shared TOBT if there needs to be time change of more than 5 minutes.

2.3.3 In Phase 1 Operation, if ATFM is issued and agreed take-off is in progress, the Control Tower produces TTOT at the time agreed with Incheon Air Traffic Control taking into account TOBT provided by aircraft operator.

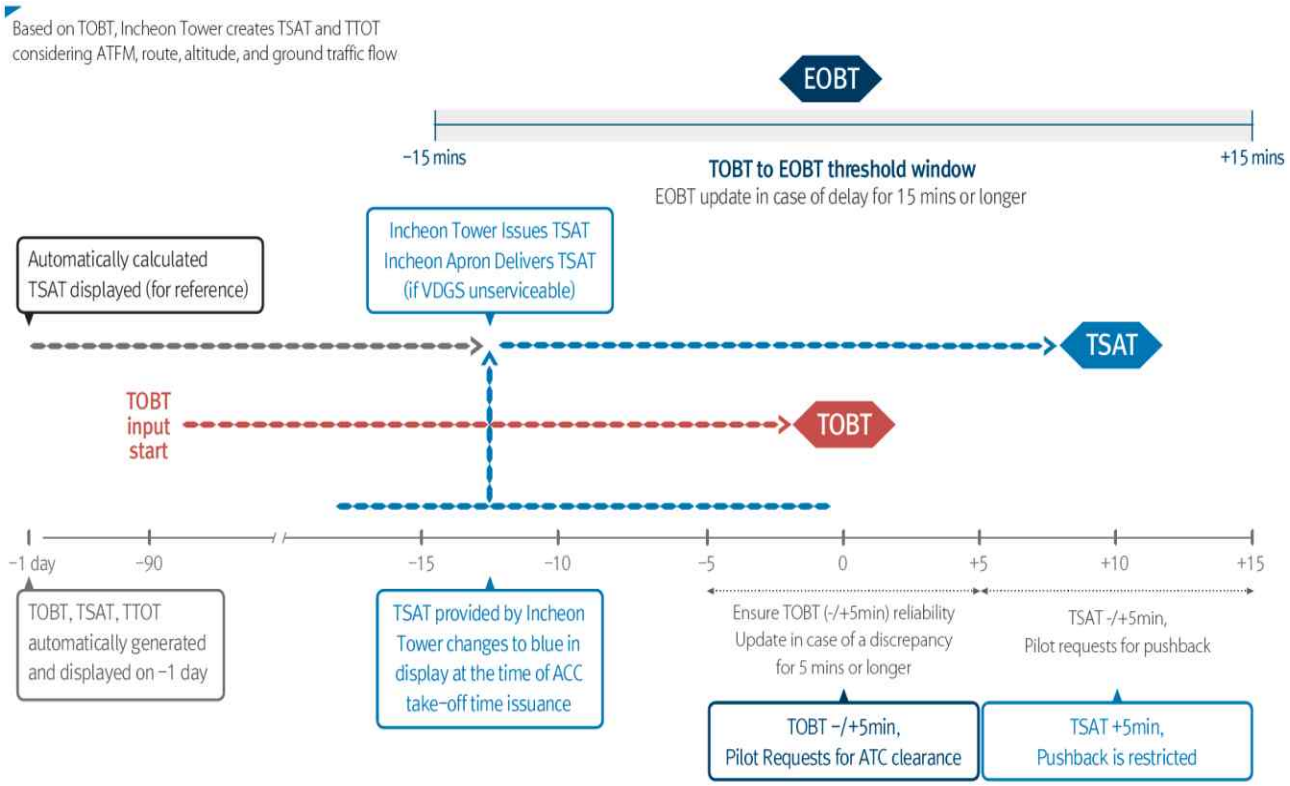
2.3.4 In Phase 1 Operation, if ATFM is issued and agreed take-off is in progress, TSAT is produced as the difference between TTOT provided by the Control Tower and EXOT(Estimated Taxi Out Time). At the VDGS serviceable stands, TSAT is displayed on VDGS PDU, and at the VDGS unserviceable stands, TSAT can be provided upon contact with the Apron Control Tower after the aircraft receives a ATC clearance.

2.3.5 The pilot may estimate that the aircraft will be ready for departure at TOBT and shall request for ATC clearance to the Control Tower within TOBT ±5 minutes. However, if it is impossible due to the reasons such as the aircraft maintenance check, the pilot shall notify the relevant aircraft operator or ground handler of the delay time and request for TOBT or EOBT update, so that there is no additional delay due to the ATC clearance omission.

2.3.6 If ATFM is issued and agreed take-off is in progress, the take-off issuance of Incheon Air Traffic Control may be postponed, leading to the delay in ATC clearance and TSAT issuance.

2.3.7 In order to avoid the confusion of control frequency and the situation where other pilots miss the chance to receive ATC clearance, pilots shall restrain from making unnecessary queries and refer to AIP, and inquire of the relevant aircraft operators.

2.3.8 The pilot who receives TSAT from the Apron Control Tower (including the case in which the pilot checks TSAT from VDGS) shall keep monitoring the Apron Control Tower frequency and then contact the Apron Control Tower within TSAT ±5 minutes to request engine start-up and push-back. If he/her fails to request push-back within TSAT +5 minutes, the ATC clearance is cancelled. TOBT(or EOBT) shall be revised and a clearance and TSAT shall be re-issued.



<Figure 2-5. TOBT and TSAT Flow Diagram >

2.3.9 The pilot without TSAT shall notify the Apron Control Tower that it is ready for departure once the ATC clearance is issued and follow the instruction of the Apron Controller.

2.3.10 The pilot shall monitor the frequency while standing by after TSAT issuance since there may be a sudden change in TSAT due to the en route situation and weather change.

2.4 De-icing Procedure

In Phase 1 Operation of Incheon A-CDM, TSAT will not be provided to the aircraft that receives de-icing.

2.5 Non A-CDM Mode

2.5.1 Overview

If information cannot shared normally due to a problem of A-CDM Portal or other associated systems, TSAT will not be provided and non A-CDM procedure shall be performed.

2.5.2 Non A-CDM Procedure

1. Without TOBT input, aircraft operator and ground handler should comply with ETD (EOBT) and in case of delay, they should revise and submit the flight plan or update ETD (EOBT) via wired communication to get ready for departure.
2. Pilot should comply with the departure procedure in Incheon AIP.