AIR NAVIGATION SERVICES
OF SWEDEN

SPARA2020

ACDM Lite Hemavan

Validation & Verification

Northern Periphery and
Arctic Programme
2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

Smart Peripheral And Remote Airports
SPARA
2020

REVISION

VERSION	DATUM	UPPRÄTTAD AV	KOMMENTAR
00.01	2017-07-17	Åke Wall	Description of planned validation of developed ACDM Tool
00.02	2017-07-21	Åke Wall	Update of validation process. Assignment of SSR Code.
00.03	2017-09-15	Åke Wall	Update of traffic scenario
00.04	2017-10-03	Åke Wall	Update of Time plan
00.05	2017-12-18	Åke Wall	Update after Validation and Verification

CONTENT

1 INTRODUCTION

This document describes planned tests and verification of an ACDM Beta Tool for Hemavan AFIS with focus on arrival process and departure process linked to Stockholm-Arlanda Airport (Control Tower), Air Traffic Control Center in Stockholm (ATCC Stockholm) and Network Management Operations Center (NMOC) in Brussels.

The tests will be performed by a validation in an Air Traffic Real Time simulator with working positions, processes and technical setup (LFV at Malmö-Sturup) to perform a flight from Stockholm-Arlanda Airport to Hemavan Airport and also the return flight.

To support coordination with EUROCONTROL and SPARA2020 project partners these descriptions are in English.

2 HEMAVAN AIRPORT "ACDM LITE BETA" PROTOTYPE

Based on the technical design of a system for ACDM Lite Hemavan a number of examples for design of display for actors at Hemavan.

2.1 Actors at Hemavan Airport

At Hemavan actors with need to follow flight progress and estimated times for arrival and departure can be seen from both airside and landside. With landside actors there are actors at the airport as well as in the surrounding areas.

Hemavan actors listed with interest of accurate flight data progress;

- AFIS Operator
- Airport Operator, Ground Handler, Security
- Aircraft Operator, Flight Crew
- Landside actors (Taxi, Buses, Hotel etc.)

Remote actors providing and receiving information are;

- Air Traffic Control, Stockholm
    - ACC En-route Controller
- Network, Brussels

Display of flight data can be designed to meet information need from each type of actors. Design of software is expected to be dynamic for updates to meet new requirements. Display of flight data can be visible on computer screen, tablet and smartphone, depending on preferences of the actor.

2.2 Flight data display and input

2.2.1 Hemavan AFIS need to have access to following flight information;

Departure flight data

C/S	TYPE	REG	ADEP	ADES	EOBT	SSR	TOBT	CTOT	TTOT	ATOT

Arrival flight data

C/S	TYPE	REG	ADEP	ADES	SSR	ELDT	ALDT

2.2.2 Hemavan Airside users need to have access to following flight information;

Departure flight data

C/S	TYPE	ADEP	ADES	EOBT	TTOT	ATOT

Arrival flight data

C/S	TYPE	ADEP	ADES	ELDT	ALDT

2.2.3 Hemavan Landside users need to have access to following flight information;

Departure flight data

C/S	TYPE	ADEP	ADES	EOBT	TTOT	ATOT

Arrival flight data

C/S	TYPE	ADEP	ADES	ELDT	ALDT

2.2.4 ATCC En-route Controller

The ATCC En-route Controller need to have access to following specific flight information

- Departure list including SSR code
- Update of departure flight progress TOBT, TTOT and ATOT for update of relevant status in the TopSky Departure list

3 VALIDATION SETUP

The validation exercise will study possible benefits in predictability as well as associated human factors. Demonstration of technical maturity and feasibility will also be made.

The Exercises will be performed in an Industry-based (Real Time Simulation) platform with integrated systems;

- LFV NARSIM (located at Malmö-Sturup Airport):
  - Tower CWP combined (with 3D view)
    - Arlanda Tower/Ground
  - Approach CWP
    - Stockholm TMA
  - En-route CWP
    - Sweden Control
  - Exercise Control
  - Traffic generator
  - Rest of the World - support auto-mode functionality

- ACDM Lite module (at Malmö)
  - Hemavan AFIS
  - Vilhelmina AFIS (similar functionality as for Hemavan)

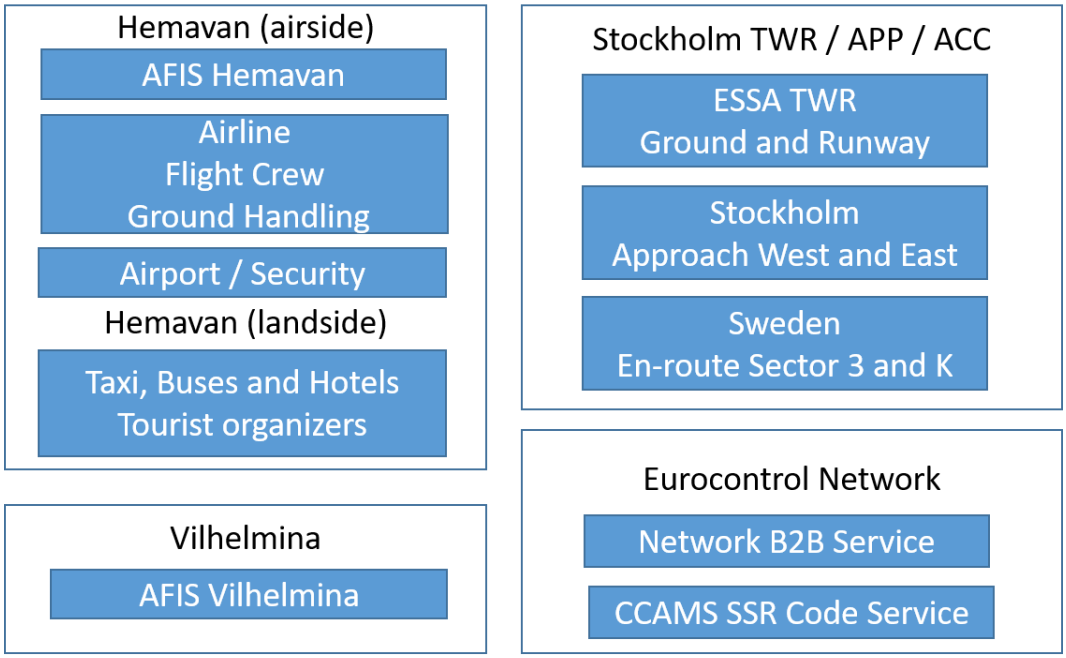


Figure 1: ACDM Lite Users

With the setup of operator roles main focus are of the AFIS Hemavan and the information exchange with Stockholm ATCC and also the Network.

The following figure gives an overview of the ACDM Lite users;

The following provide information on the operator roles and CWPs in the validation.

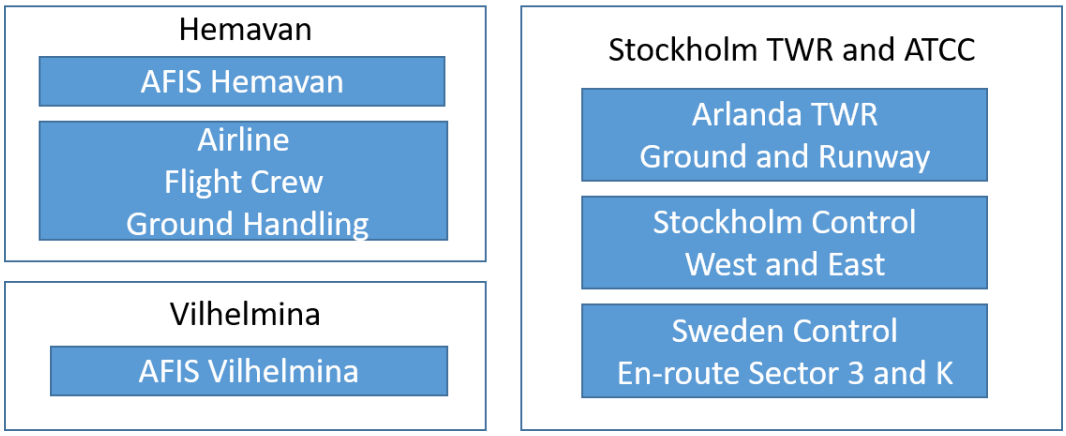


Figure 2: Operator roles / Actors in the validation

In the validation Stockholm TWR and ATCC will be performed in NARSIM environment with a functionality similar to real technical setup.

For the AFIS units at Hemavan and Vilhelmina the new development of an *ACDM Lite Beta version* will provide basis for the information exchange and used for updating flight progress at the regional airports.

The *ACDM Lite Beta version* is developed to support multiple user interfaces and will be used to provide information also to selected actors on both airside and landside.

Overview of setup for the ACDM Lite trials at Malmö-Sturup;

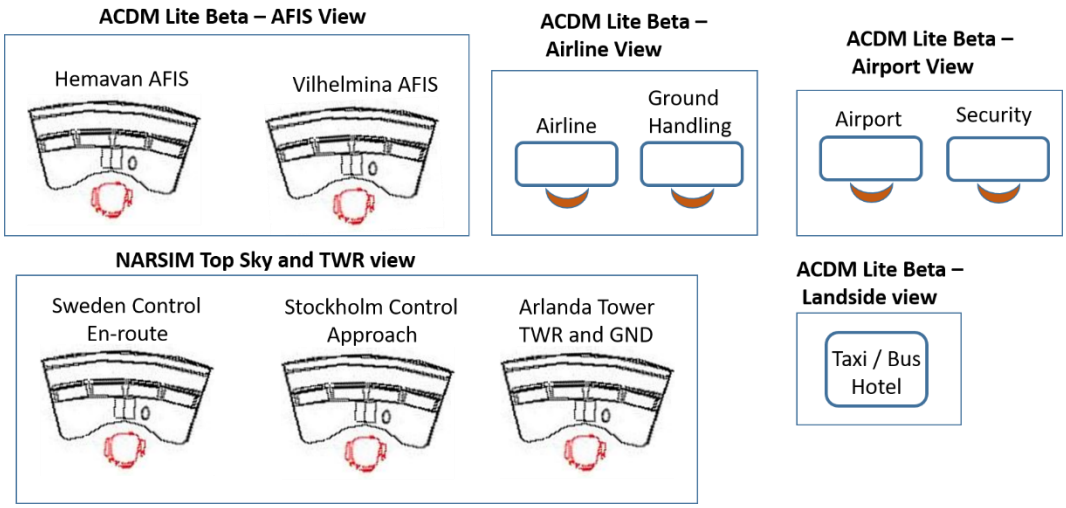


Figure 3: RTS Validation setup

3.1 Traffic scenario

Following traffic scenario is developed based on real flight (including return) from Stockholm-Arlanda Airport to Hemavan Airport. Additional scenario presenting stop at Vilhemina Airport for outbound and return flight.
Flights departure times to be adjusted to support an efficient real time simulation.

3.1.1 From Stockholm-Arlanda ESSA (ARN) to Hemavan/Tärnaby ESUT (HMV)

- Flight Nextjet **NTJ662**, BAE ATP from Arlanda to Hemavan
  - Departure Arlanda at 09:15 to Hemavan arriving at 11:20
    - ESSA Departure Runway 19R
    - ESUT Runway 33 ILS approach

3.1.2 From Stockholm-Arlanda ESSA (ARN) via Vilhelmina ESNV (VHM) to Hemavan/Tärnaby ESUT (HMV)

- Flight Nextjet **NTJ772A**, SAAB 340 from Arlanda to Hemavan
  - Departure Arlanda at 09:05 with stop at Vilhelmina arriving 10:35
    - ESSA Departure Runway 19R
    - ESNV Runway 28 ILS approach
- Flight Nextjet **NTJ772B** SAAB 340 from Vilhelmina to Hemavan
  - Departure Vilhelmina at 10:55 to Hemavan arriving at 11:30
    - ESNV Departure Runway 28
    - ESUT Runway 33 ILS approach

3.1.3 From Hemavan/Tärnaby ESUT (HMV) to Stockholm-Arlanda ESSA (ARN)

- Flight Nextjet **NTJ665**, BAE ATP from Hemavan to Arlanda
  - Departure Hemavan at 12:00 to Arlanda arriving at 14:10
    - ESUT Departure Runway 15
    - ESSA Runway 19L ILS approach

4 TIME PLANNING

LFV schedule of activities during 2017 for validation of the ACDM Lite Beta version.

4.1 Validation preparation

Preparation and planning for the Real Time Simulation (RTS) can be seen in the following table:

Validation Preparatory activities			
Date	**Activity**	***Resources***	**Responsible**
July 2017	Development of prototype	*Åke Wall*	Fredrik Bennison
July 2017	Validation plan including operator roles and airspace	*Mikael Björk* *Fredrik Bennison*	Åke Wall
August 2017	Traffic Scenario preparation	*Mikael Björk*	Åke Wall
October 2017	Narsim platform setup initial testing	*Mikael Björk*	Fredrik Bennison
October 2017	Data prep in all systems (airspace, flights etc.)	*Mikael Björk*	Fredrik Bennison
October 2017	Integrated platform testing	*Mikael Björk*	Fredrik Bennison

Table 1: Time plan for ACDM Lite Beta preparatory activities

4.2 Validation Execution and Demonstration planning

Planning for the Real Time Simulation (RTS) and demonstration can be seen in the following table:

Execution and Demonstration activities			
Date	**Activity**	***Resources***	**Responsible**
9 October 2017	Exercise Day 1 Techncial testing	*Mikael Björk* *Fredrik Bennison*	Åke Wall
10 October 2017	Exercise Day 2 Operational Full scale testing	*Mikael Björk* *Fredrik Bennison*	Åke Wall
11 October 2017	Exercise Day 3 Pictures / Video	*Mikael Björk*	Åke Wall
October 2017	Data collection		Mikael Björk
14 November 2017	Demonstration for SPARA2020 at Hemavan		Åke Wall
January 2018	Demonstration for Hemavan AFIS		Åke Wall
January 2018	Updates after feedback		Åke Wall
January 2018	Validation summary report		Åke Wall

Table 2: Time plan for validation of ACDM Lite Beta version

Presentation planned for the SPARA2020 community meeting in Hemavan (14 November 2017).
Demo of RTS Execution activities can be followed by demonstration to AFIS operators at Hemavan Airport (January 2018).

5 AFIS HEMAVAN NEW OPERATIONAL PROCEDURES AT

This section provide an example of developed coordination procedures with use of digital exchange of Flight data.

5.1 A-CDM elements for AFIS Hemavan

One way to address links to ATCC Stockholm and Network is to provide minimum information on progress of departure before Take-off.

Table of A-CDM milestones proposed to be used at smaller airports were departure (blue), turnaround (green) and arrivals (yellow) are marked;

NUMBER	MILESTONE	TIME REFERENCE	
MST3	**Take off from outstation** The flight departs from the Outstation.	**ATOT from outstation**	Milestone 16 at Outstation
	Estimated Landing Time Based on: 1. A-DPI Outstation 2. ATOT Outstation 3. Radar update	**ELDT**	
MST6	**Landing** The time that the flight touches down on the runway.	**ALDT**	
MST9	**TOBT update (prior to issue of TTOT)** The time which the AO/GH has to provide the most accurate TOBT, taking into account the operational situation.	**TOBT**	
MST14	**Start Up Approved** The time when the aircraft receives its Start Up approval from ATC.	**Input for setting of TTOT**	**Trigger for A-DPI**
	Issue of Target Take Off Time	**TTOT**	
MST16	**Actual Take Off Time** The time that the aircraft takes off from the runway.	**ATOT**	

Table 3: A-CDM Milestones for Hemavan Airport

For implementation of A-CDM procedures at smaller airports like Hemavan there is a need to follow a basic procedure and to minimise the number of updates. Information on arriving flights will not be included for A-CDM at Hemavan (will be addressed by the procedures for setup of the Beta test)

Main focus will be on;

- Pilot issue of TOBT
- AFIS issue of TTOT
- AFIS update of ATOT

5.2 New operational procedures

There are options to enhance information exchange on arriving flights to Hemavan Airport and also the dialogue between AFIS Hemavan and the En-route Controller at ATCC Stockholm.

5.2.1 Arriving flights to Hemavan Airport

Stockholm-Arlanda Airport have implemented A-CDM procedures and are linked to the Network in Brussels. The awareness on progress of pre-departing flights is high were TTOT will be set latest 20 minutes before Take-off.

Both TTOT and ATOT can together with Flight Trajectory information be input for calculation of estimated landing time at Hemavan.

Additionally, update of flight progress can be provided by access to a radar image displaying relevant flights for Hemavan and Vilhelmina. By use of LFV radar network and a web based display (the Beta version). The radar coverage is planned to be improved at remote areas and medium flight levels when Wide Area Multilateration (WAM) is operational, expected in summer 2017.

For flights from Stockholm-Arlanda making a turn-around in Vilhelmina before final leg to Hemavan a procedure with progress information prior Take-off can enhance awareness for AFIS Hemavan (based on procedures with the Beta version for departures).

- Note: These procedures/systems can show a way to provide information on estimated arrival times at Hemavan Airport also to Landside actors (Taxi, Buses, Hotel etc.)

5.2.2 Departing flights from Hemavan Airport

Hemavan Airport can by implementing a limited set of A-CDM elements provide accurate information on departing flight progress before Take-off. By receiving TOBT from Pilot and then AFIS calculate a TTOT, information can be sent to both En-route Controller and Network (with the Beta version for departures).

- AFIS Hemavan and En-route Controller at Stockholm ACC can in this way exchange information by silent coordination.
  - AFIS Hemavan need to receive SSR-code for departure flights

- AFIS Hemavan can update Network before Take-off to improve air traffic flow management.

There is an option to introduce similar procedures/system support for AFIS at Vilhelmina Airport to improve efficiency when coordination progress of departing flights with En-route Controller in Stockholm and AFIS at Hemavan Airport.

6 UPDATE OF TIME EVENTS AND MESSAGES

In the validation setup NARSIM will manage traffic events for a number of actors. Following chapter describe how a sequence of events to update the ACM Lite demonstrator.

Arrival flight from Stockholm-Arlanda to Hemavan				
Flight event at Arlanda	**Actor**	**Arlanda A-CDM**	**Network B2B**	**ACDM Lite tool Hemavan**
The aircraft pushes back/vacates the stand position.	Arlanda Tower Ground controller input start-up to e-Strip.	Trigger A-DPI Milestone 15	Network use time event to calculate ELDT	Display of ELDT based on A-DPI
The flight departs from Arlanda. Actual Take off	Arlanda Tower Runway controller radar update into e-Strip.	Actual Take off present Milestone 16	Network use time event to update ELDT	Display of updated ELDT

Table 4: Arrival flight to Hemavan Airport

Departure flight from Hemavan to Stockholm-Arlanda				
Flight event at Hemavan	**Actor Hemavan ACDM Lite tool**	**Hemavan A-CDM**	**ATCC Stockholm**	**Network B2B**
Flight Crew Confirm TOBT	Hemavan AFIS input of TOBT	Milestone 9		Network updated on flight progress
	Reception of SSR Code directly from ECTL			ECTL Provide SSR Code (by CCAMS)
Planned Take Off time	Hemavan AFIS input of TTOT		En-route Sector K TopSky Departure list updated	Network updated on flight progress
The flight departs from Hemavan. Actual Take off	Hemavan AFIS input of ATOT	Actual Take off present Milestone 16	En-route Sector K TopSky updated with ATOT (possible update flight departure time)	Network updated on airborne flight

Table 5: Departure flight from Hemavan Airport

7 VIEW ON DIGITAL AIR TRAFFIC SOLUTION FOR HEMAVAN

Description of technical options for communication between stakeholders will be provided in a separate document. In this chapter experience from other research activities will be presented to show example of ways for development of digital solution for Hemavan Airport.

7.1 Departure from Hemavan Airport

Overview example of a departing flight from Hemavan Airport planned into Network and ATCC Stockholm before Take-off;

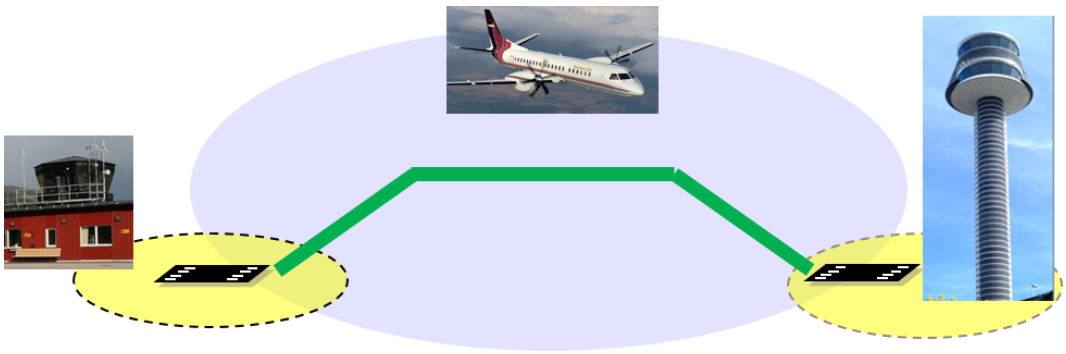


Figure 22: Departure from Hemavan Airport

1. **AFIS** get ready time (from Airline/Flight Crew) for Start-Up from Airline (TOBT)
2. **AFIS** set **TTOT** (Target Take-off Time) in system (sent to NETWORK and ATCC)
    - AFIS to receive SSR-code
3. When (if) **AFIS** receive **CTOT** from Network, TWR will **update TTOT**

7.2 Arrival to Hemavan Airport

Overview example of a flight from Stockholm-Arlanda arriving to Hemavan Airport;

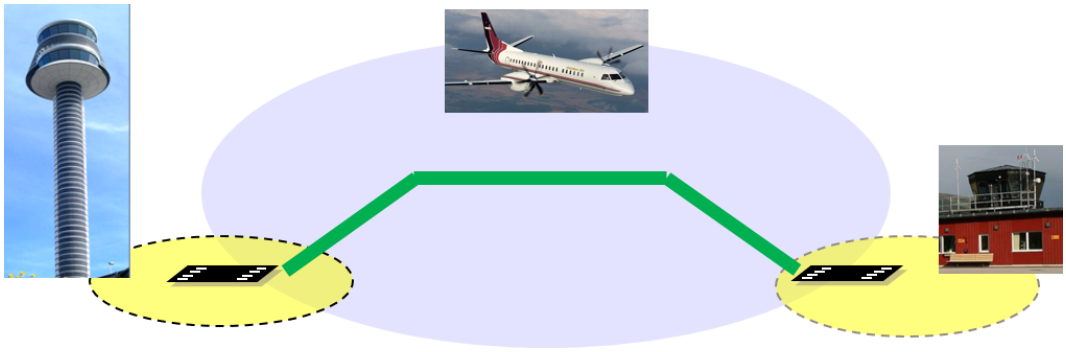


Figure 23: Arrival to Hemavan Airport

1. **Arlanda TWR** provide TTOT (Target Take-off Time)
2. DPI message as base for calculation of Estimated Landing Time ELDT at Hemavan
3. **Arlanda TWR** provide ATOT (Actual Take-off Time)
4. DPI message as base for updated calculation of Estimated Landing Time (ELDT)

8 EUROPEAN NETWORK MANAGEMENT

European Network have defined three types of airports with different links to the Network.

- **CDM Airports,** are airports that have implemented the A-CDM process and provide the full set of DPI messages to Network.
- **Advanced ATC TWR Airports,** are airports that have not implemented or not fully implemented the CDM process but still would like to integrate into the ATM Network using a limited set of DPI messages.
    - Note: An Advanced ATC TWR Airport provides;
        - Target Take-Off Time (TTOT) estimations as well as
        - Variable Taxi-Times (VTTs) and
        - Standard Instrument Departure (SID) to the NMOC.

      These are provided from the moment that the aircraft leaves the blocks.

- **Standard Airports,** are not integrated into the network via the transmission of DPI messages.

Stockholm-Arlanda Airport is a *CDM Airport* providing a full set of DPI messages and is directly linked to the Network.

Hemavan Airport presently providing *Aerodrome Flight Information Service (AFIS)* and can if linked to the Network be seen as an additional new airport category type.

- This new type of airport linked to Network could be defined as an *"Advanced AFIS Airport" (TBD)* and providing only a limited set of DPI.

8.1 Departure Planning Information and Flight Update Messages

Departure Planning Information (DPI) with improved accuracy of flight information, serves to improve Network traffic predictions and consequently, the effectiveness of the measures to be taken.

Airport situational information is in general collected from the TWR system in order to update the real-time flight situation, prior to take-off, in the Network Operations systems.

The main benefits for the ATM Network with increased use of DPI messages prior Take-off are improved;

- Traffic predictability for Flow Management Positions in En-route Area Control Center.
- Supply the Network with updated information concerning a departure flight at the airport.

The objective of the Flight Update Message (FUM) is to provide the airport with an accurate estimated landing time of arriving flights for improved predictability and efficient planning of airport services.

- The Network Management Operations Center (NMOC) send Flight Update Messages (FUM) to the airports concerned, providing information of the flight status, the estimated landing times, etc.
- Situational awareness for Airline Operators when landing time estimates for Airports of Destination via the Network service for airports (Flight Update Message-FUM).

8.2 Network B2B Service

The Network Management B2B Web Services is an interface provided by the EUROCONTROL Network Manager (NM) for system-to-system access to its services and data, allowing NM customers to retrieve and use the NM information in their own systems, according to their business needs.

The NM B2B Web Services enable the automatic exchange of digital information, supporting network wide collaborative processes integrated seamlessly with the local processes. Benefits such as data quality and accuracy, timeliness of the information, simplification of processes, cost reduction and safety result from this automatic information exchange.

This Open ATM Digital Collaborative Environment will;

- Enable real-time situational awareness and support CDM processes
- Increase operational efficiency of the ATM stakeholders

Following figure describe the Customer segmentation for Network B2B Web Services;

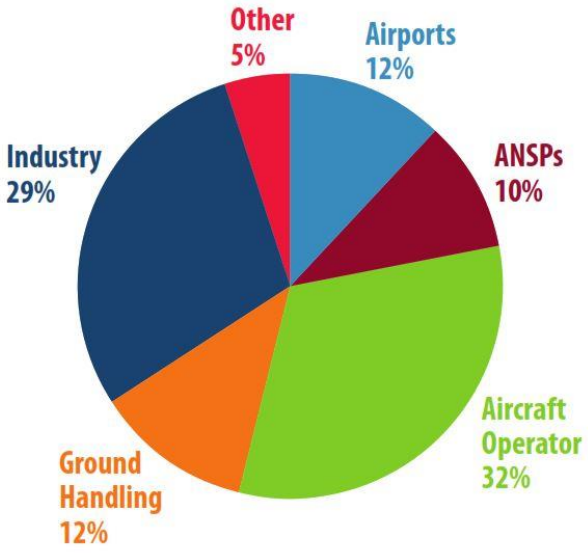


Figure 23: NM B2B Web Services - Customer segmentation

8.3 Network Centralised SSR Code Assignment

The Network Manager designed to take over the responsibility for the assignment and management of SSR codes from a large number of European ANSPs.

The main goal for the Centralised Code Assignment and Management System (CCAMS) is to optimise the efficiency of European SSR code management by centrally selecting an SSR code for each flight within its area of applicability using an intelligent algorithm and distributing it to the appropriate ATS unit.

CCAMS will:

- Automatically select and send a code to all the units along the route of the flight, based on the information available from other Network Operations systems;
- Respond to code requests received from ATC units

CCAMS is designed to work fully automated with no human user
Input during normal operations.

The Centralised Code Assignment and Management System CCAMS

9 AIR TRAFFIC CONTROL AT STOCKHOLM-ARLANDA

Description of process and systems for ATC Control Tower at Arlanda (SA TWR) and Air Traffic Control Center (ATCC Stockholm).

Stockholm-Arlanda Tower Runway Controllers' areas of responsibility.

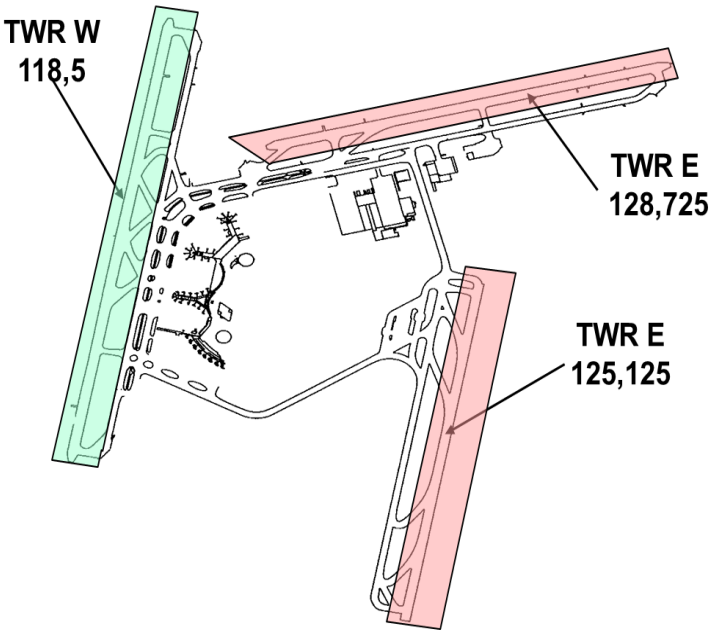


Figure 16: Stockholm-Arlanda runway layout

Stockholm-Arlanda Tower Ground Controllers' areas of responsibility.

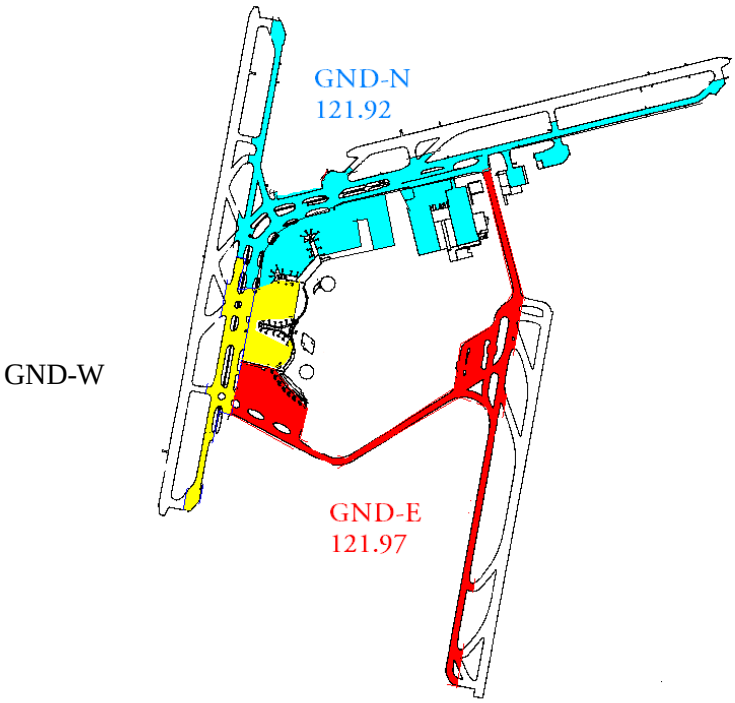


Figure 17: Stockholm-Arlanda taxiway layout

Picture of Ground Controller workingposition in Arlanda TWR;

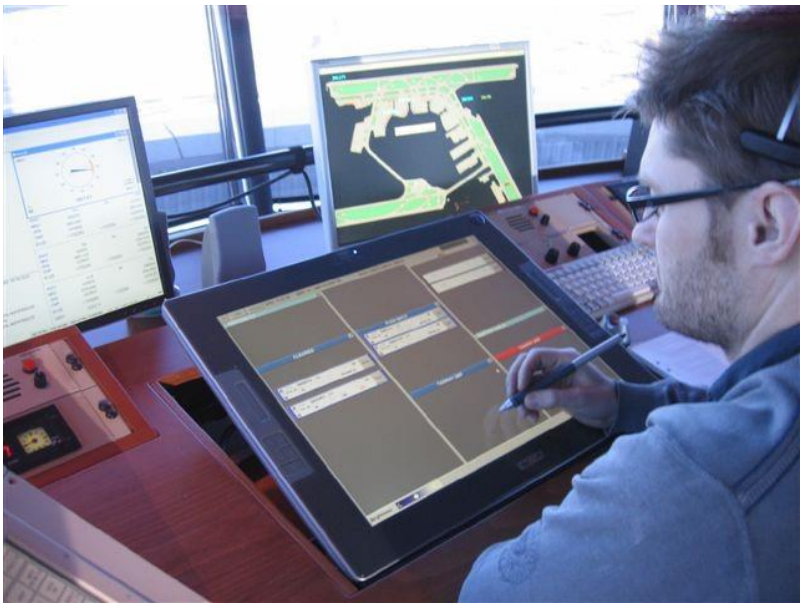


Figure 18: Stockholm-Arlanda Ground Controller

At Stockholm-Arlanda an e-Strip system is used in the Tower for presentation of flight information and used for progressive clearances. See example with departing flights, with TSAT and TTOT;

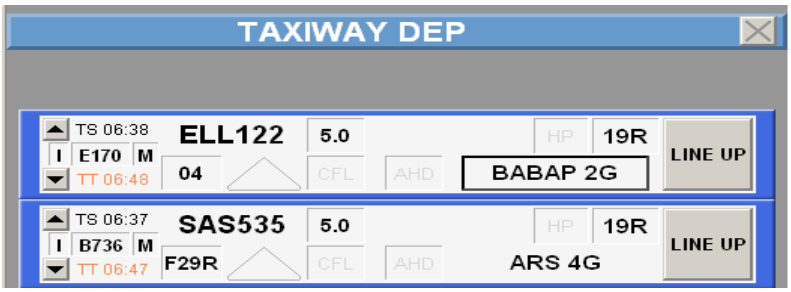


Figure 19: TWR Electronic Flight Strips

9.1 ATCC Stockholm

The airspace in Sweden is large and traffic density is low in general. Summary of specifics:

- Stockholm-Arlanda is the only hub airport in a wide area. The Departure/Arrival routings are expected to be close to the optimal routings, regarding flight-efficiency and environment. The most likely direct

constraints are the possible interaction of arriving and departing flights to/from Bromma, the city airport of Stockholm.

- The Sweden Flight Information Region (FIR) is controlled by LFV/NUAC and covers the national territory of Sweden.
    - En-route sectors in Airspace Sweden (SUECIA CTA/UTA)
        - Sector K manage the northern part of Sweden

In the northern part of Swedish airspace there is a large mix of traffic and activities. Occasions with dense military activity with Swedish Airforce and exercises with neighbouring countries. Crossing intercontinental flights mixed with flights from the northern regions to/from Arlanda.

Map of Sweden FIR with northern En-route sectors;

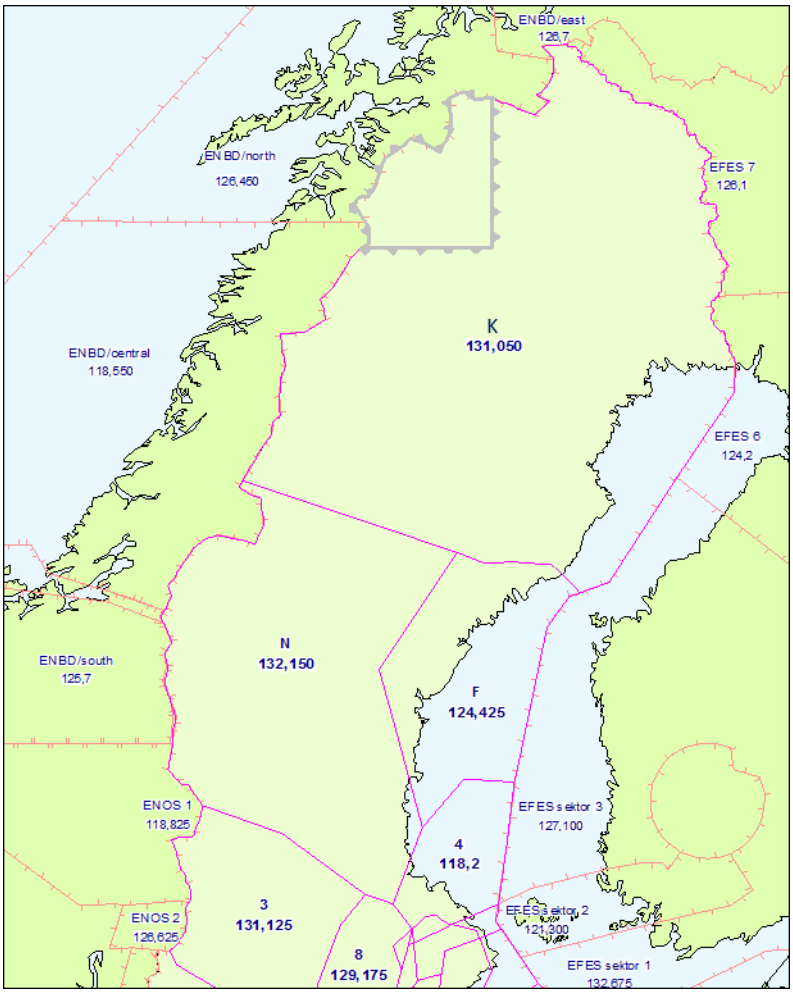


Figure 20: Stockholm ATCC En-route sectors northern Sweden

The Stockholm Area Control “En-route sector K” manage airspace in the area over Hemavan Airport. Estimated landing times are told by telephone to Hemavan AFIS. Departing traffic is coordinated before Take-off were Hemavan TWR calls Sector K and receive clearance with SSR-code. Radar coverage in this region is

down to FL 120, during summer 2017 LFV plan to implement Wide Area Multilateration (WAM) with improved coverage down to 8 000 feet.

Map of Stockholm TMA with Approach sectors;

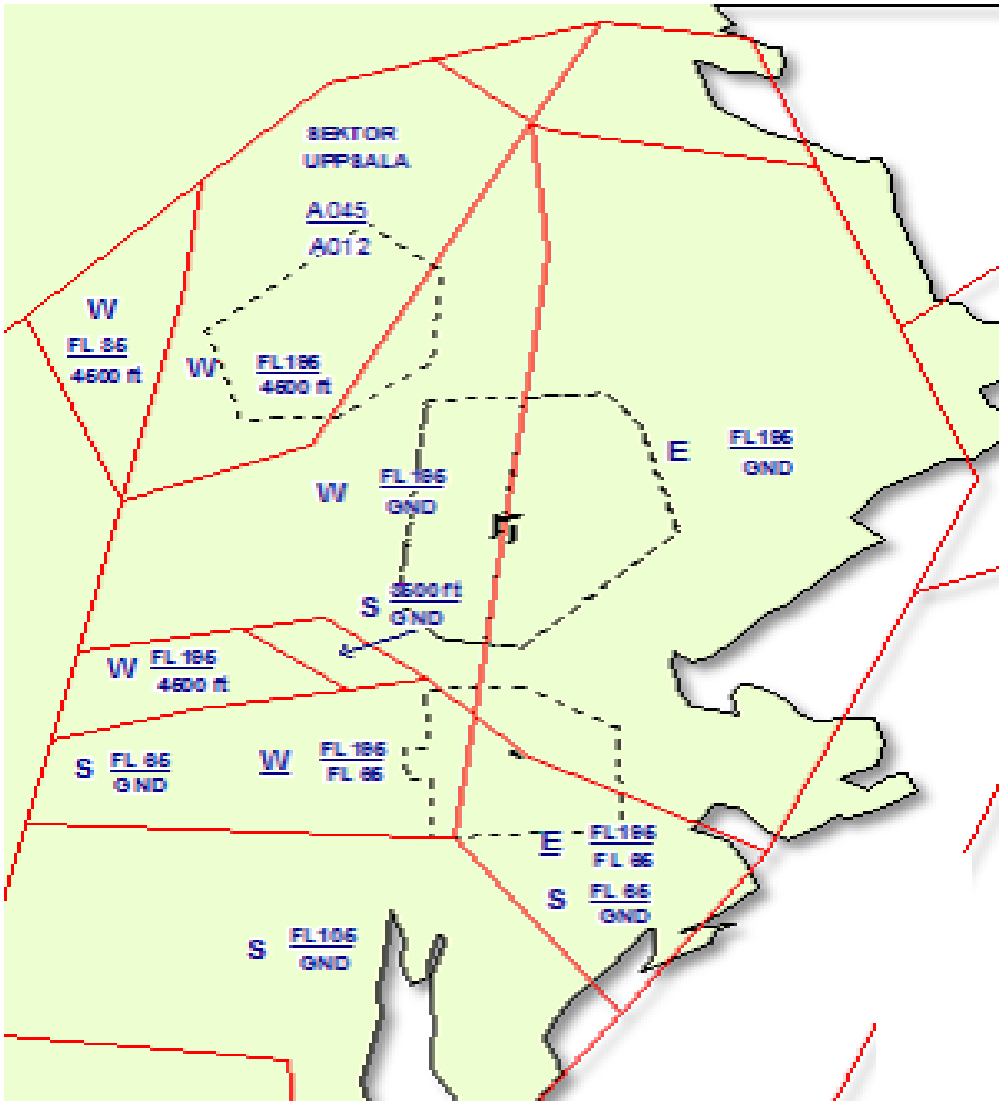


Figure 20: Stockholm ATCC TMA with Approach sectors

Departing flights will after Take-off and initial climb out be transferred from Tower to the Approach sector. Approach will manage both arrival and departure flights in predefined TMA airspace sectors.

10 AFIS TOWER ELECTRONIC FLIGHT INFORMATION

Digital information sharing of flight progress information for improved collaboration and increased awareness.

ACDM Lite Beta tool, with web interface for coordination of arrival and departure flights (departures before Take-off).

Overview of the main display elements;

- Arrival list
  - Display of Flight progress
    - NTJ772A with an ELDT at Vilhelmina
    - NTJ662 with information on Arlanda TTOT
    - NTJ772B with flight plan data Vilhelmina to Hemmavan

ANKOMMANDE

CALLSIGN	ACTYPE	REG	SSR	ADEP	ADES	TTOT	ATOT	ELDT
NTJ772A	SF34	SELJS	2001	ESSA	ESNV	09:05	09:06	10:18
NTJ662	ATP	SEMEX	2002	ESSA	ESUT	09:14		
NTJ772B	SF34	SELJS	2004	ESNV	ESUT			

Figure 24: Beta tool – Arrival list

- Air situation display (radar)
  - Display of flights for selected airports
    - NTJ662 from Arlanda to Hemavan

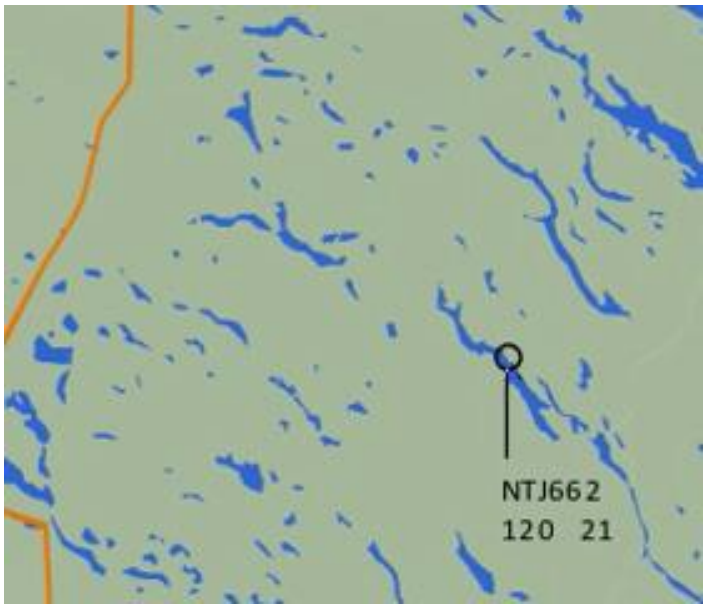


Figure 25: Beta tool – Radar display

- Departure list
  - Sequence of events for flight NTJ665 departing from Hemavan
    - Setting of TOBT
    - Setting of TTOT
    - Flight airborne

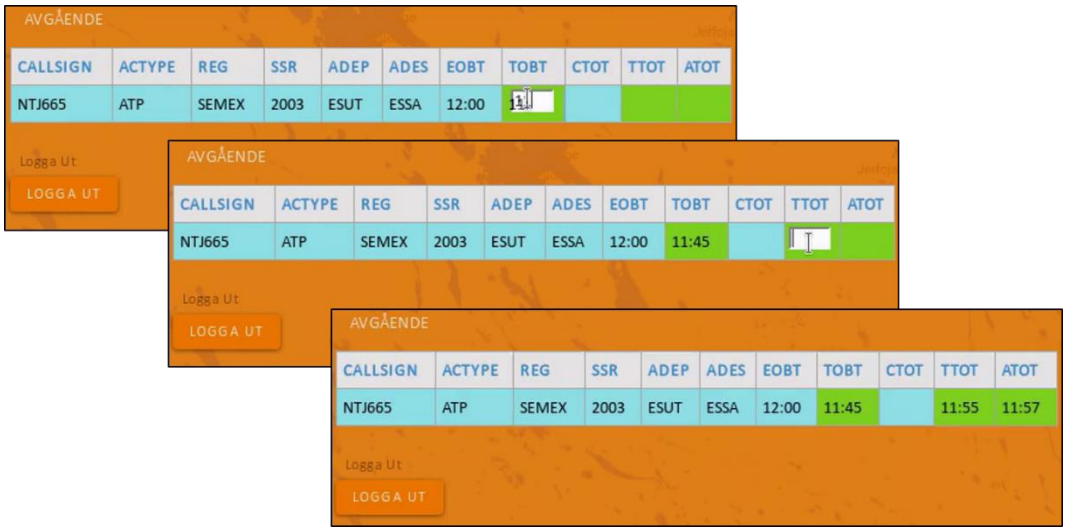


Figure 26: Beta tool – Departure list

10.1 Technical interface options

For enhanced information exchange of estimated arrival and departure times at Hemavan Airport can support both AFIS, Airside users (Airport Operator, Ground Handler, Security) and Landside users (Taxi, Buses, Hotel etc.).

By development of a web based solution a large number of stakeholders can be given access to relevant information. In this way the variation of user equipment (mobile, tablet, computer) can be supported by the same web interface.

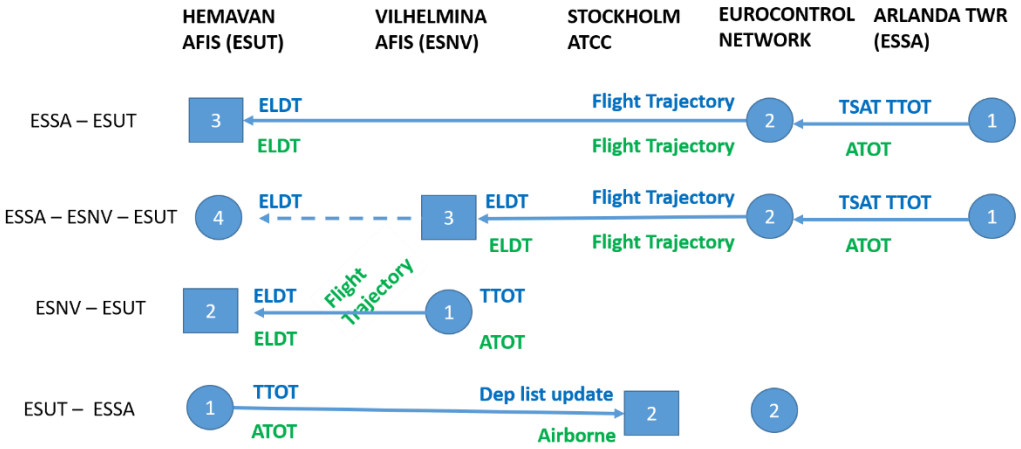
In a separate *ACDM Lite* document the options of technical solution and interfaces are described.

11 FLIGHT EVENTS AND ACTORS

The validation and verification has been performed at LFV Real Time Simulator at Malmö using the NARSIM platform with integrated Beta version. The following actors and time events have been used;

HEMAVAN AFIS (Beta)	VILHELMINA AFIS (Beta)	STOCKHOLM ATCC (NARSIM)	EUROCONTROL NETWORK (NARSIM)	ARLANDA TWR (NARSIM)
ACDM Lite Beta version	ACDM Lite Beta version	EN-ROUTE ACC Sector K	A-CDM DPI & Flight progress	ARN CDM Platform TWR e-Strip
TOBT TTOT ATOT ELDT ALDT	TOBT TTOT ATOT ELDT ALDT	Departure list	Flight Info Service Radar Flight Trajectory	TOBT (TSAT) TTOT ATOT

Overview of flight legs used during the validation;

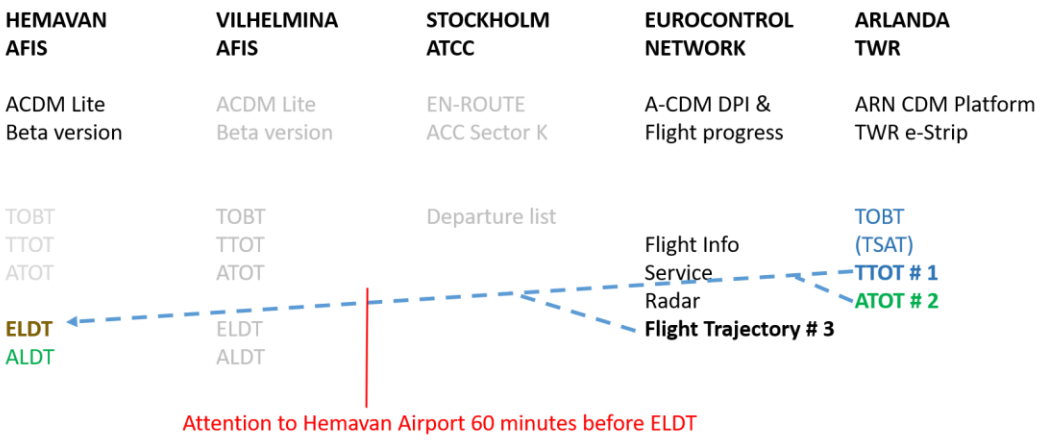


11.1 Flights between Arlanda and Hemavan

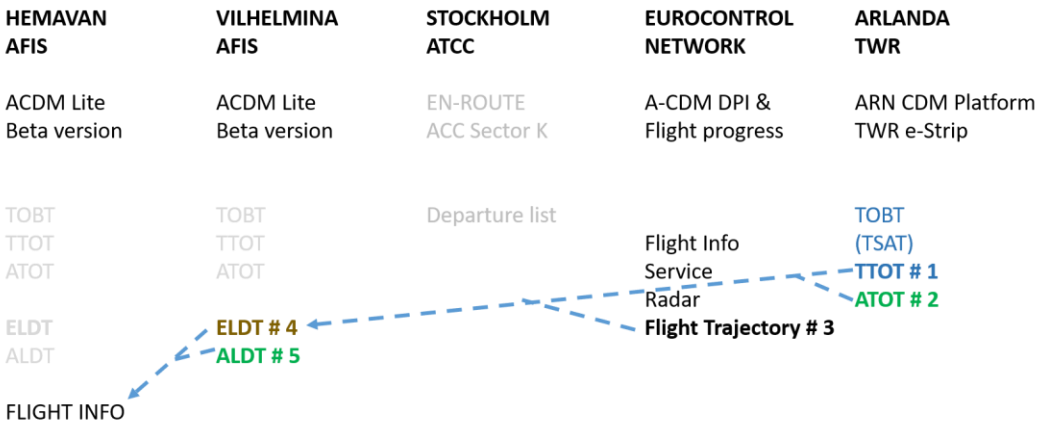
The validation assessed flight between Arlanda direct to Hemavan and also flight from Arlanda performing a stop in Vilhelmina followed by a flight leg to Hemavan. Finally, a flight departing at Hemavan to Arlanda is presented.

11.1.1 Flight from Arlanda direct to Hemavan

Actors and events not used are greyed out.

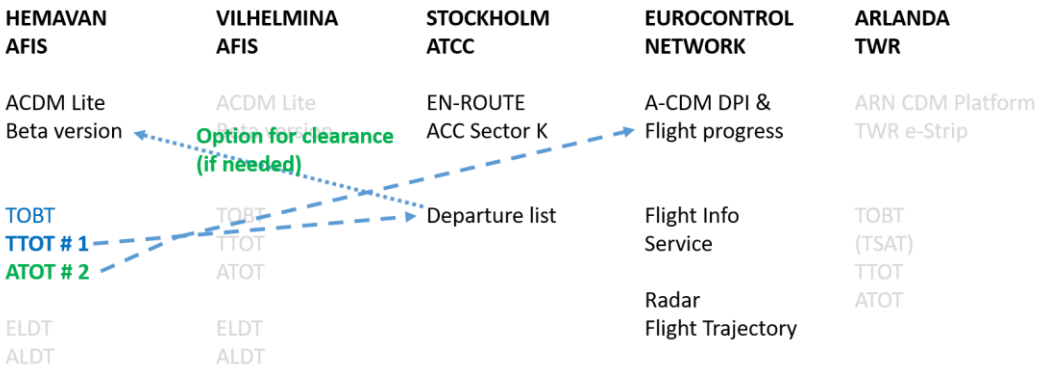


11.1.2 Flight from Arlanda to Vilhelmina



11.1.3 Flight from Vilhelmina to Hemavan

11.1.4 Flight from Hemavan to Arlanda



12 GLOSSARY OF TERMS

A definition of terms used in this document is given below;

Term	Definition
AOBT	Actual Off-Block Time is the actual date and time the aircraft has vacated the parking position (pushed back or on its own power).
ATOT	Actual Take off Time is the time that an aircraft takes off from the runway (Equivalent to ATC ATD–Actual Time of Departure, ACARS = OFF).
CTOT	The Calculated Take Off Time (CTOT) is a time calculated and issued by the Central Flow Management unit, as a result of tactical slot allocation, at which a flight is expected to become airborne. (ICAO Doc 7030/4 – EUR, Table 7).
ELDT	Estimated Landing Time is the estimated time that an aircraft will touchdown on the runway. (Equivalent to ATC ETA – Estimated Time of Arrival = landing).
EOBT	The Estimated Off-Block Time (EOBT) is the estimated time at which the aircraft will start movement associated with departure (ICAO).
ETOT	Estimated Take-Off Time is the forecast of time when aircraft will become airborne taking into account the EOBT plus EXOT.
TLDT	The Target Landing Time is the targeted time from the Arrival management process at the threshold, taking runway sequence and constraints into account. It is not a constraint but a progressively refined planning time used to coordinate between arrival and departure management processes.
TOBT	The Target Off-Block Time is the time that an aircraft operator / handling agent estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle present, ready to start up / push back immediately upon reception of clearance from the TWR.
TSAT	The Target Start Up Approval Time is the time provided by ATC taking into account TOBT, CTOT and/or the traffic situation that an aircraft can expect to receive start-up / push back approval.
TTOT	The Target Take-Off Time is the time taking into account the Target Start Up Approval Time (TSAT) plus the Estimated Taxi-Out Time (EXOT).

13 ACRONYMS AND TERMINOLOGY

Term	Definition
A-CDM	Airport Collaborative Decision Making
AFIS	Aerodrome Flight Information Service
AMAN	Arrival Manager
AOBT	Actual Off-Block Time
ASAT	Actual Start Up Approval Time
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATM	Air Traffic Management
ATOT	Actual Take Off Time
CCAMS	Centralised Code Assignment and Management System
CD	Tower Clearance Delivery Controller
CWP	Controller Working Position
DMAN	Departure Manager
EFS	Electronic Flight Strip
EOBT	Estimated Off-Block Time
EXOT	Estimated Taxi-Out Time
FMS	Flight Management System
GND	Tower Ground Controller
HMV	Hemavan Airport
HMI	Human-Machine Interface
Network	European ATM Network (former CFMU Central Flow Management Unit)
NMOC	Network Manager Operations Centre (evolved from CFMU Central Flow Management Unit)
RWY	Runway
SESAR	Single European Sky ATM Research Programme
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SID	Standard Instrument Departure
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SSR	Secondary Surveillance Radar
STAR	Standard Arrival Route
TIA	Traffic Information Area

Term	Definition
TIZ	Traffic Information Zone
TLDT	Target Landing Time
TMA	Terminal Control Area
TOBT	Target Off-Block Time
TSAT	Target Start Up Approval Time
TTOT	Target Take Off Time
TWR	Tower Control Unit (Aerodrome Control Tower)
WS	Airport Tower Watch Supervisor
VHM	Vilhelmina Airport

14 REFERENCE DOCUMENTS

Doc Ref 1: EUROCONTROL Advanced ATC TWR Implementation Guide Edition 1.300, author Hans Koolen, dated 25/11/2016

Doc Ref 2: DPI Implementation Guide, URB/USD/DPI_Impl_Guide, edition 2.000, author Hans Koolen, dated 25/11/2016

Doc Ref 3: DPI and FUM Implementation RoadMap URB/USD/DPI_FUM_Impl_RM, Edition 1.800, author Hans Koolen, dated 25/11/2016.

Doc Ref 4: European A-CDM Manual 2017 edition v5

Doc Ref 5: Network: CCAMS USER MANUAL

Doc Ref 5: Network: Advanced ATC TWR Implementation Guide