

KARI PROPRIETARY

Technical Specifications of *Engineering Services for ATC Subsystems*



June 17, 2016

Korea Aerospace Research Institute

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Table of Contents

1. GENERAL	1
1.1 Background	1
1.2 Qualification of Bidders	1
2. TECHNICAL REQUIREMENTS.....	2
2.1 System Requirements.....	2
2.1.1 FDPS	2
2.1.2 FDO	3
2.1.3 CWP	3
2.1.4 TSS	5
2.1.5 PLT	6
2.1.6 DRS (+ DRS Client).....	6
2.1.7 HASW	7
2.1.8 Others	7
2.2 Description of Tasks	7
2.2.1 Technical Data Transfer	7
2.2.2 Training	8
2.2.3 Technical Support	8
2.3 Deliverables and Schedule	9
3. REFERENCED DOCUMENTS	10

1. General

1.1 Background

The “Management on Integrated operations of Departure, Arrival, and Surface” (MIDAS) project is a Korean government funded R&D project and the Korea Aerospace Research Institute (KARI) is the main contractor of that. The purpose of the MIDAS project is to acquire advanced air traffic management technologies to increase both efficiency and safety in terminal and airport. The scope of the project includes not only the development of core technologies and decision support tools such as AMAN/DMAN (Arrival Manager/Departure Manager) but also the validation of them through Human-In-the-Loop (HITL) simulation.

The objective of this RFP is to select “contractor” which is capable of providing engineering services for the air traffic control (ATC) subsystems, which will be parts of HITL simulation systems. The tasks of engineering services consist of technical data transfer, training and technical support on the system. (Refer to the 2.2 Description of Tasks for the details.)

1.2 Qualification of Bidders

The bidders shall be ISO 9001 certified. The bidders shall have experience in developing both ATC systems and ATC simulation systems for at least five years and there shall be more than one relevant system in operation.

2. Technical Requirements

2.1 System Requirements

The ATC subsystems consist of the followings.

- Flight Data Processing System (FDPS)
- Flight Data Operator (FDO) Position
- Controller Working Position (CWP)
- Traffic Simulation System (TSS)
- Pseudo Pilot (PLT)
- Data Recoding/Playback System (DRS)
- High Availability Processing Software (HASW)

The subsystems above shall be capable of being interfaced with Surveillance Data Processing System (SDPS) and AMAN/DMAN developed by KARI. The subsystems except TSS and PLT shall be capable of being used for real ATC operations.

All subsystems shall be able to be run at linux operating system (Redhat 7.x or higher, CentOS 7.x or higher)

The detail requirements for each are described in the following sections.

2.1.1 FDPS

Flight Data Processing System shall have the following functionality

- ATS messages handling in accordance with [ICAO 4444], [ICAO 4444 – 1]
- System Flight Plan (SFPL) handling in accordance with [FDPD_AREA], [FDPD_APPROACH]
- Trajectory prediction (4D TP) with meteorological data processing, BADA based on EUROCONTROL Total Energy Model (TEM), Airspace structure in accordance with [TP]
- Flight Data Processing and Distribution (FDPD) in accordance with [FDPD_AREA], [FDPD_APPROACH]
- System Support Coordination (SYSCO) - AIDC/OLDI in accordance with [ICAO 4444], [OLDI]
- SSR code management (ORCAM) in accordance with [ORCAM]
- RPL(Repetitive Flight Plan) data handling

- Flight plan and track correlation (COR) in accordance with [FDPD_AREA], [FDPD_APPROACH]
- Monitoring Aids (MONA) in accordance with [MONA]
- Medium Term Conflict Detection (MTCD) in accordance with [MTCD]
- Flight Plan Track (FPL Track) in accordance with [FDPD_AREA], [FDPD_APPROACH]

Flight Data Processing System shall have the following capacity

- Number of passive FPLs: 4000
- Number of Active FPLs: 500

2.1.2 FDO

Flight Data Officer Working Position shall have the following functionality:

- FDO shall display the following lists of ATS messages:
 - List of received ATS messages
 - List of sent ATS messages
 - List of received ATS messages with errors
- FDO shall display the list of Flight Plans (both active and passive)

Flight Data Officer Working Position shall have the following capacity

- Number of received/sent messages per a day: 10000

2.1.3 CWP

Controllers Working Position shall have the following functionality:

- CWP shall display surveillance data obtained from SDPS and surveillance sensors:
 - System tracks from SDPS
 - Plots and mono sensor tracks from PSR, SSR, MLAT/WAM and ADS-B
 - Ground tracks from ASDE
- CWP shall receive System FPLs from FDPS and combine System FPLs with System Tracks based on SFPLs and System Track numbers.
- CWP shall receive and present SNET, MONA and MTCD warnings in a track labels.

- CWP shall display AIP information in a graphical form.
- CWP shall adapt and display airport configuration in a graphical form for airport controllers.
- CWP shall be able to be used for not only enroute/approach controllers but also airport controllers.
- CWP shall display airport configuration map using KARI data format.
- CWP shall have a functionality to attach and detach labels(callsign to track data) manually at ground targets.
- CWP shall have a functionality to add information to the data block without source code modification.
- CWP shall present SFPL's route in a graphical form. It shall be possible to change a route with a help of a mouse manipulator.
- CWP shall also display SFPLs as a formatted string in a list or as an Electronic Strip.
- CWP shall display the following type of SFPLs lists:
 - Pending list
 - Control list
 - Terminated
 - Departure list
 - Arrival list
- CWP shall receive and present data from AMAN/DMAN systems. These data shall be presented in a track label. It shall be possible to display any text data received from AMAN/DMAN at any field of track label based on adaptation parameter. If AMAN or DMAN send advisories in the form of routes, CWP shall display them.
- Label anti-overlap functions shall be compatible with [LABEL ANTI-OVERLAP]
- CWP shall present air situation picture in a 3D space in accordance with WGS-84 model of the Earth.

Controllers Working Position shall have the following capacity

- Number of System Tracks: 1200
- Number of Active SFPLs: 500

2.1.4 TSS

Traffic Simulation System shall have the following functionality:

- TSS shall simulate trajectories of the aircraft based on corresponding Flight Plans organized in exercises.
- Aircraft dynamics shall be based on BADA performance model.
- It shall be possible to change flight level, the route or the dynamics of the aircraft from the PLT working position.
- The following procedures shall be simulated:
 - Flying along the route
 - Parallel offset
 - Orbit, Holding
 - SID/STAR/Approach procedures
 - Missed approach
 - ILS approach
 - PBN approach
- TSS shall simulate surveillance system and shall send corresponding plots to the replica of an ATC system. (to SDPS)
- Plots for a surveillance system shall include:
 - flights in enroute and approach area
 - flights on the ground
- TSS shall simulate FPL messages and shall send these messages to the replica of an ATC system. (to FDPS)
- TSS shall simulate aircraft operational database(AODB) system and shall send corresponding data to DMAN system.
- TSS shall send simulated time to the replica of an ATC system
- TSS shall replay the recorded data in the form of KARI format as well as standard data formats such as ASTERIX and ICAO ATS message.

Traffic Simulation System shall have the following capacity

- Maximum number of simulated aircraft in one exercise: 500
- Number of Exercise: shall be limited by capacity of HDD, but not less than 1200
- Maximum number of simulated surveillance sensors: 30

2.1.5 PLT

Pseudo-Pilot Working Position shall provide the following control functions:

- Control Assigned Aircraft
- Change Aircraft Heading (with selectable rate of change)
- Change Aircraft Altitude (with selectable rate of change)
- Change Aircraft Ground Speed, Indicated Air Speed, Mach Number (with selectable rate of change)
- Change SSR Code
- Squawk IDENT/Standby
- Simulate Complete or Intermittent Transponder Failure
- Execute ILS Approach
- Execute GLS Approach
- Execute Missed Approach Procedures
- Execute Conventional/RNAV SID/STAR
- Execute Holding Patterns(including orbits)
- Proceed toward a Navigational Fix
- Resume Own Navigation (to a fix)
- Remove Aircraft or Flight Plan
- Transfer or Accept Control of Flight to or from other Pseudo-Pilots
- Transmit Special Codes (e.g. A7500, A7600, A7700)

Pseudo-Pilot Working Position shall have the following capacity

- Maximum number of simulated aircraft in one exercise: 500

2.1.6 DRS (+ DRS Client)

Digital Recording System shall have the following functionality:

- DRS shall record all digital information (surveillance plots, system tracks, SFPLs, SNET, MONA and MTCD messages, messages from AMAN/DMAN) transmitted in the internal LAN.
- DRS Client (installed on CWP) shall make screen capture of monitors (4 times per a second) and store them in a standard file format (*.avi or compatible).
- It shall be possible to playback the recorded data based on the simulated time.

Digital Recording System shall have the following capacity

- DRS shall keep recorded data for 31 days.

2.1.7 HASW

High Availability Processing Software shall have the following functionality:

- HASW shall support triple redundancy (active – hot standby – hot standby).
- HASW shall be independent of applications.
- HASW shall be configurable using adaptation files.
- HASW shall have a functionality to display the current state of each application.
- HASW shall have a functionality to start, stop and restart each application.

2.1.8 Others

- Interface and output data shall be configurable by users without source code modification.
- Airport configuration and AIP information shall be configurable by users without source code modification.

2.2 Description of Tasks

The contractor shall provide engineering services for the ATC subsystems whose requirements are described in section 2.1. The followings are the services to be supplied by the contractor.

2.2.1 Technical Data Transfer

- “Technical data” means software packages and technical documents to be supplied by the contractor to KARI.
- Software packages shall include software executables, libraries, and adaptations. The subsystems which the software packages are targeted are as follows.
 - FDPS
 - FDO
 - CWP
 - TSS

- PLT
- DRS
- HASW
- Technical documents for the system and/or each software shall include the followings.
 - System/Subsystem Specifications
 - Interface Control Document(or Interface Requirement Specification)
 - Adaptation File Descriptions
 - Test Procedures and Reports
 - User/Maintenance Manuals
- The technical data to be delivered shall be compatible or above the requirements specified in section 2.1.

2.2.2 Training

- “Training” means the training service to be supplied by the contractor.
- The contractor shall supply a full training program which deals with all of the technical data to be delivered by the contractor.
- The bidder shall establish a training program plan for the training courses to execute the training for the trainees from KARI.
- The training program plan for each training course shall include the following contents and shall be described in the SOW in the proposal.
 - Training Purpose
 - Detail Contents of Training
 - Training Place
 - Training Duration
 - Trainer’s Career
 - Training Aids
 - Number of Trainees

2.2.3 Technical Support

- “Technical Support” means the services of contractor’s engineers to assist the KARI’s engineers for the designated period in Korea or outside Korea.

- The technical supports that the contractor shall serve include, but are not limited to the followings.
 - Software adaptation for air traffic control environment of Korea
 - Software installation and integration
 - Software updates needed to integrate AMAN/DMAN of KARI
 - Technical support via e-mail and telephone line during working hours
- For the whole period of the contract, the contractor shall provide technical support via e-mail and telephone with no limit.
- KARI may visit contractor's site for technical support and discussions at KARI's own expense and the contractor shall support the visits.
- The details of the technical support, such as number of technical assistants, man hours, how and where to support and so on shall be proposed in the SOW in the proposal by the bidder.

2.3 Deliverables and Schedule

- The deliverables and schedule are as follows.
- The deliverables should be delivered using online service such as web, FTP or e-mail.
- The Year 1 and 2 in the table are defined as follows.
 - Year 1: Contract – Feb. 28, 2017
 - Year 2: Mar. 1, 2017 – Feb. 28, 2018

No.	Deliverables/Activities	Schedule
1	FDPS Software Package	Year 1
2	FDO Software Package	Year 1
3	CWP Software Package	Year 1
4	TSS Software Package	Year 1
5	PLT Software Package	Year 2*
6	DRS Software Package	Year 2*
7	HASW Software Package	Year 2*
8	Technical Documents for the System (ex. ICD)	Year 1
9	Technical Documents for FDPS, FDO, CWP, and TSS	Year 1
10	Technical Documents for PLT, DRS, and HASW	Year 2*
11	Training	Year 1 and 2

12	Technical Support	Year 1 and 2
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* No. 4, 5, 6, and 10 shall be delivered “early” Year 2.

- The detail schedule for the deliverables shall be proposed by the bidder.

3. Referenced documents

Reference	Document
[FDPD_AREA]	OPERATIONAL REQUIREMENTS FOR FLIGHT DATA PROCESSING AND DISTRIBUTION CORE FUNCTIONS (AREA Control) // OPR.ET1.ST03.1000-ORD-01-00
[FDPD_APPROACH]	Operational Requirements for Flight Data Processing and Distribution Core Functions (Aerodrome and Approach Control) // OPR.ET1.ST03.2000-ORD-01-00
[ICAO 4444 - 1]	Amendment No. 1 to [4444]
[ICAO 4444]	ICAO Doc 4444 Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM), fifteenth (15) edition.
[LABEL ANTI-OVERLAP]	Requirements for the Implementation of Automatic and Manual Label Anti-Overlap Functions. EEC Note No.21/00. Project HRS/HSP 006 (Core Requirements for ATM Working Positions)
[MONA]	Operational Requirements Document for EATCHIP Phase III ATM Added Functions Volume 1 - Monitoring Aids, EUROCONTROL Document OPR.ET1.ST04.DEL01.1 Edition 2.0
[MTCD]	Operational Requirements Document for EATCHIP Phase III ATM Added Functions Volume 5 - Medium Term Conflict Detection, EUROCONTROL Document OPR.ET1.ST04.DEL01.5 Edition 2.0
[OLDI]	EUROCONTROL Specification for On-Line Data Interchange (OLDI). EUROCONTROL-SPEC-0106. Edition 4.1. Edition date 16.01.2008.
[ORCAM]	Originating Region SSR Code Assignment Method (ORCAM) Improvement Study. Edition 1.0. Edition date 30.09.2004.
[TP]	EUROCONTROL Specification for Trajectory Prediction// EUROCONTROL-SPEC-0143

“End of Documents”