AIR TRAFFIC AND NAVIGATION SERVICES SOC. LTD

REPUBLIC OF SOUTH AFRICA

REQUIREMENTS FOR ELECTRONIC FLIGHT STRIPS MARKET ANALYSIS

REQUEST FOR MARKET ANALYSIS

MAY 2024

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1 PURPOSE

The requirement for Market Analysis for the Provision of Electronic Flight Strips (EFS) at the Wonderboom National Airport (FAWB).

2 SCOPE OF WORK

The main objective for this activity is to request the market analysis for Electronic Flight Progress Strips (ElecFPSs) at Non-Automated Airports (Regional Airports) with the intention to establish the pricing for supply, delivery, installation, configuration and training the Electronic Flight Strips (EFS) system at Wonderboom National Airport (FAWB). The ATNS FAWB Control Tower is considered for the market analysis of this project because it has different types of flights (i.e., Flight Plan based commercial flights, general flights and training flights) that they control in their operational environment. This document has been developed taking into consideration the current operations environment at the FAWB.

3 PROJECT SCOPE

Traditionally, paper flight progress strips have been used by air traffic controller (ATC) for the in the provision of air traffic services (ATS), i.e., to track a flight, to keep a record of the instructions that were issued by ATC, to allow other ATCs to instantly see what is happening and to pass this information to other ATCs who go on to control the flight. However, these paper flight progress strips are more prone to error, not efficient, and they present time consuming challenges in the way they are used statistically and kept. For these reasons, the scope of this activity is to conduct the market analysis for Electronic Flight Progress Strip (ElecFPS) at the Wonderboom National Airport. The scope is to trial EFS system which includes the supply, delivery, installation, configuration and training for an EFS system.

4 CURRENT SYSTEM ANALYSIS

Air Traffic Controllers should be unburdened from enduring non-critical activities by automating repetitive tasks, so that they can give their full attention to high priority tasks that ensure safety in the sky. In an aerodrome control tower environment caution must be taken that the implementation of automated systems (e.g., Electronic Flight Strip) does not result in an increase in heads-down time.

Currently, all thirteen (13) non-automated airports are using traditional/paper Flight Progress Strip system, with real time capturing of flight strip data. Most movements at the non-automated airports are not based on a filed flight plan and are significantly training flight movements in some of the airports. The system that is used currently consists of a large manual component with no automated integration into other ATNS systems and does not use a separate stand-alone electronic flight progress strip system.

The plan is to use the available technology (such as Electronic Flight Strips) to automate the repetitive activities (such as copying flight information from the computer screen onto the paper flight strip and typing flight information into the billing computer system) at all the non-automated airports (Regional airports). This will enhance the human capabilities in providing the air traffic management within the organisation.

NOTE:

- **It should be noted that this is a Research Trial Project, there may be a need for System (Electronic Flight Strip System) Reconfiguration and Customisation for testing purposes. The Reconfiguration and Customisation of the system may need/require the Original Equipment Manufacturer (OEM) to be involved if the Supplier is using a 3rd Party system.**

5 SYSTEM DESCRIPTION

The traditional/paper Flight Progress Strips (FPSs) are currently being used in all the non-automated airports (Regional airports) such as Wonderboom National Airport. The FPS have the following functionality that must be preserved when implementing the Electronic Flight Progress Strips (ElecFPS) at Wonderboom National Airport:

a) Displaying the aircraft call sign, type and equipage, transponder code, route of flight, cruise altitude, proposed departure time, and departure airport, arrival aerodrome, alternate aerodrome, runway used, time of first contact, joining clearance or type of approach, Actual Time of Departure (ATD) or Actual Time of Arrival (ATA), Calculated Take Off Time (CTOT), SAR requirements.

b) Changing the aircraft type, altitude, route, etc.

c) Recording the initial heading

d) Recording “ready to push” and departure times

e) Recording in-trail restrictions

f) Writing nonstandard taxi paths

g) Indicating a wake turbulence waiver

h) Indicating correct ATIS received by aircraft

i) Indicating a position-and-hold clearance

j) Recording any other nonstandard instructions

6 SYSTEM ARCHITECTURE

6.1 Current Flight Progress Strip and Flight Strip Board Architecture

The Figure 1 below shows the general design layout of the paper Flight Progress Strip (FPS) that is currently used at the Wonderboom National Airport. The strip design is used for both the Arrival, Departure, Local and Scheduled flights.

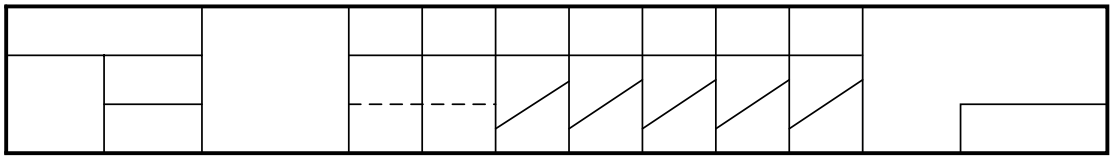

Figure 1: General Design of Flight Progress Strip

The paper FPS shown in Figure 1 above that is currently used at the Wonderboom National Airport (FAWB) is categorised into four types of strips as shown Figure 2, Figure 3 and Figure 4 below respectively, namely:

a) **SCHE** ≈ Schedule flight strips (SCHE). This strip is recognised by color "**BLUE or PINK"** depending on whether the **Arrival or Departure flight strip.**

b) **LOCAL** ≈ VFR/IFR flights and VFR/IFR over flight strips (General Aviation Training and Over- Flight). This strip is recognised by color "**WHITE"**

c) **DEP** ≈ Departure flight strips. This strip is recognised by color "**BLUE"**

d) **ARR** ≈ Arrival flight strips. This strip is recognised by color "**PINK"**

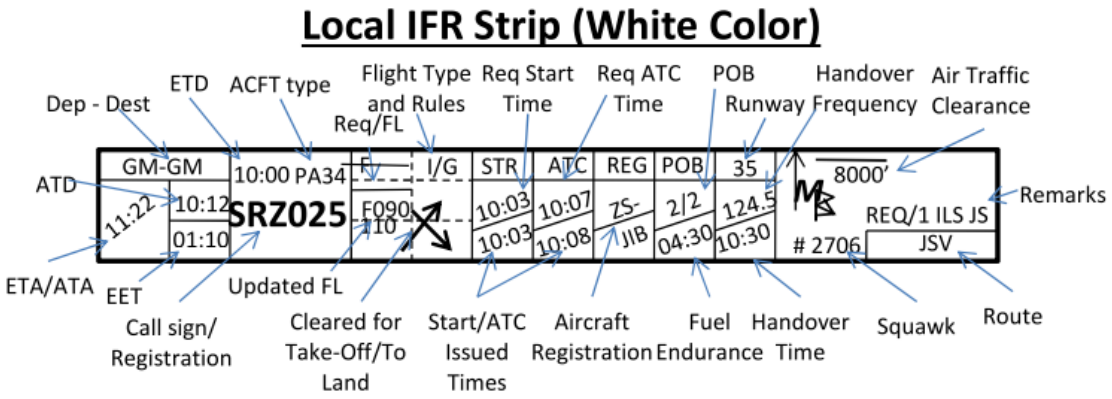

Figure 2: Local Paper Flight Progress Strips (FPSs) used at Wonderboom National Airport

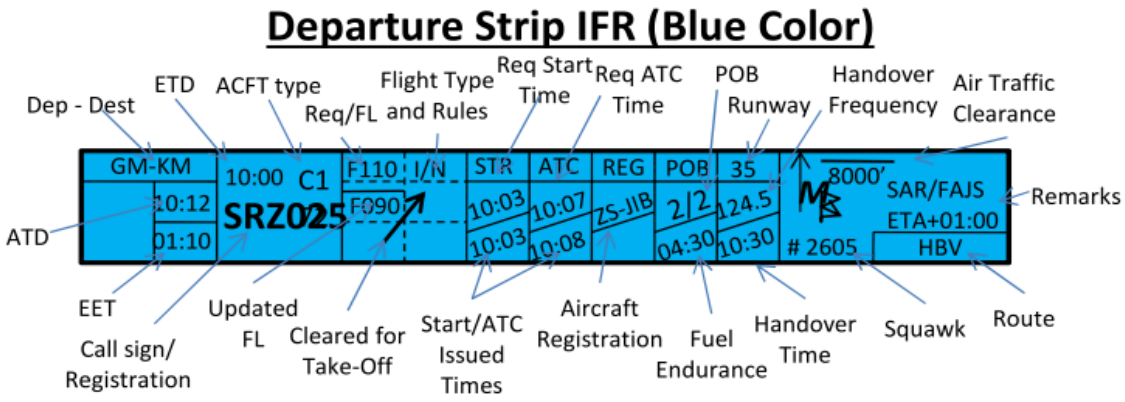

Figure 3: Departure Paper Flight Progress Strips (FPSs) used at Wonderboom National Airport

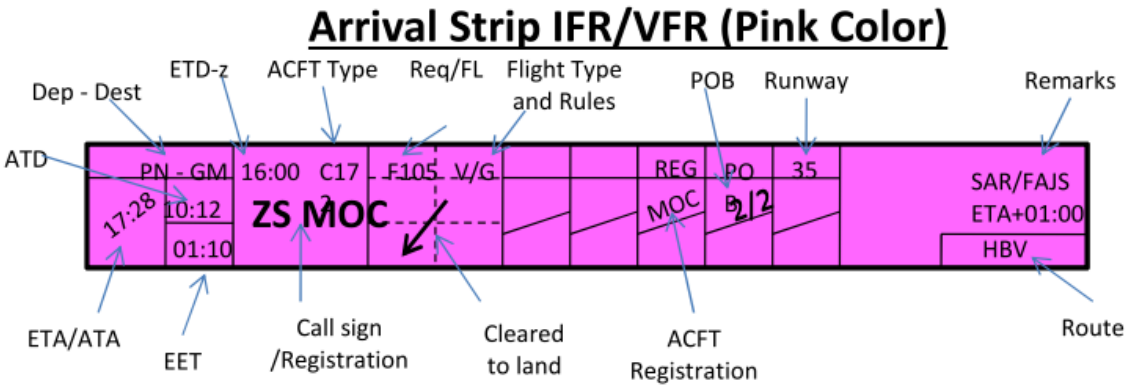

Figure 4: Arrival Paper Flight Progress Strips (FPSs) used at Wonderboom National Airport

The strips shown above are placed on the Flight Progress Strip Board (FPSB) shown in the Figure 5 below. The FPSB layout that is currently used at the Wonderboom National Airport is divided into three (3) Strip Bays that are used to hold the FPSs.

Figure 5: Wonderboom National Airport Flight Strip Board Layout.

6.2 Current Processes for capturing Flight Progress Strip at the Wonderboom National Airport.

The ATCs are able to access the FPSs that are recorded (populated) from any of the two ways listed below, namely:

a) Assistant Air Traffic Controller populate the general information from the Topsky or Amatis Messaging System on the strip. The information populated came from the users (pilots) who filed the flight plan.

b) User (Pilot) calling in to ATC. The ATC will populate the information on the flight strip before using the strip.

The Figure 6 and Figure 7 below respectively shows the current processes of recording/accessing the FPS at the Wonderboom National Airport.

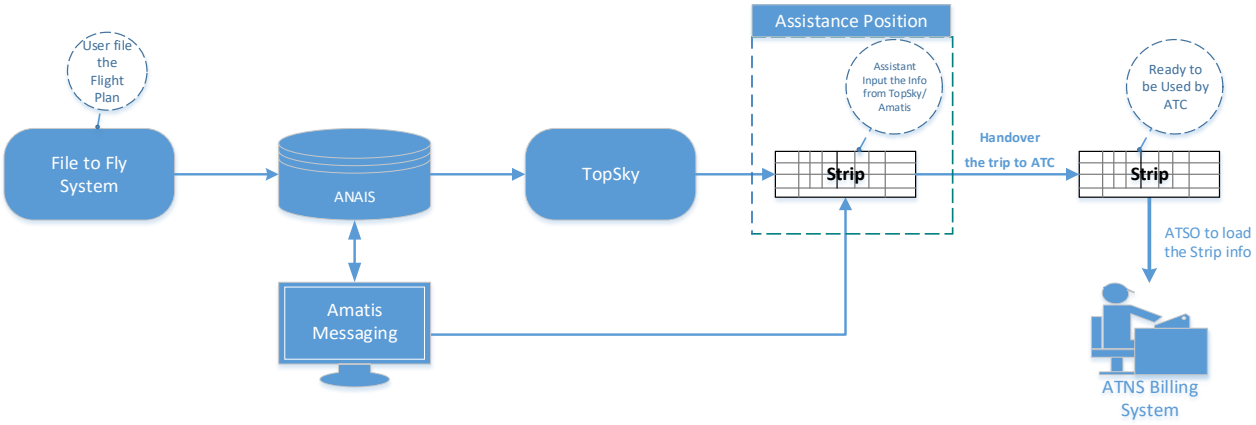

Figure 6: FPS processes from Flight Plan (File to Fly system).

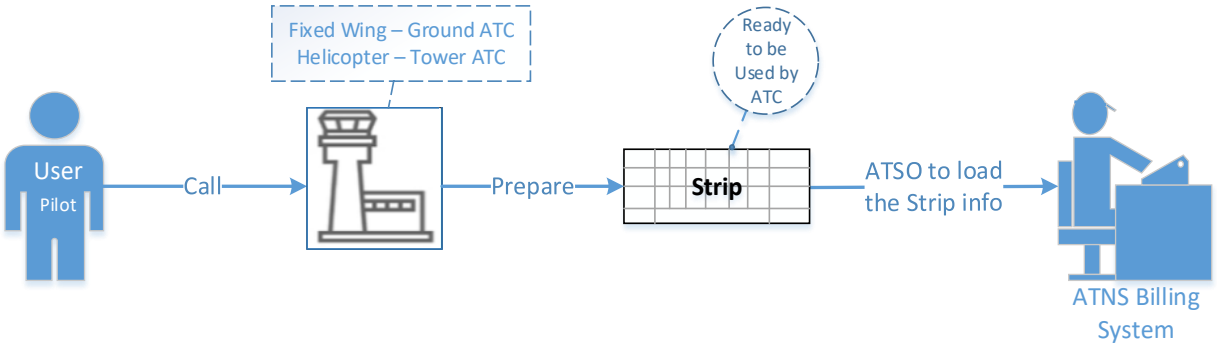

Figure 7: FPS processes from the User calling to the ATC

6.3 Electronic Flight Progress Strips and Electronic Flight Strip Board Design Architecture

The designs for Electronic Flight Progress Strips (ElecFPSs) shall meet all the requirements as shown in Figure 2, Figure 3, Figure 4 and Figure 5 above The ElecFPS shall be intuitive, and representative of the FPS shown in Figure 1 above and FPSB shown in **Error! Reference source not found.** layouts above. The designed strip shall be used for both the Scheduled flights, Departure flights, Arrival flights, and General Aviation Training and Over-flights. The generic ElecFPS templates for both categories of flights (namely: Scheduled, Arrival, Departure and General Aviation Training and Over-Flight) shall be included in the design of the system and preloaded to the Electronic Flight Strip Board (EFSB). The ElecFPS background colour shall be marked/formatted by relevant colours (i.e. White, Blue, Pink, Red) as defined in FAWB Station Standing Instruction (SSI) document (Reference Appendix A).

The Figure 8 below shows the design architecture of the Electronic Flight Strip Board (EFSB). The EFSB design shall be configured such that it displays three (3) Strip Bays as shown in Figure 8 below. The ElecFPSs shall be configured such that they are able to move from one strip bay to another. The EFSB design configuration shall include the strip push (strip transfer) button. The strip push (strip transfer) button on the EFSB shall be used to push/transfer the strip from one Position (Sector) to another. The pop-up message shall be displayed on the receiving Position (Sector) indicating that the strip has been delivered from another Position (Sector). The ATC sitting in the receiving position shall be required to acknowledge the message (delivery of the strip to her/his position).

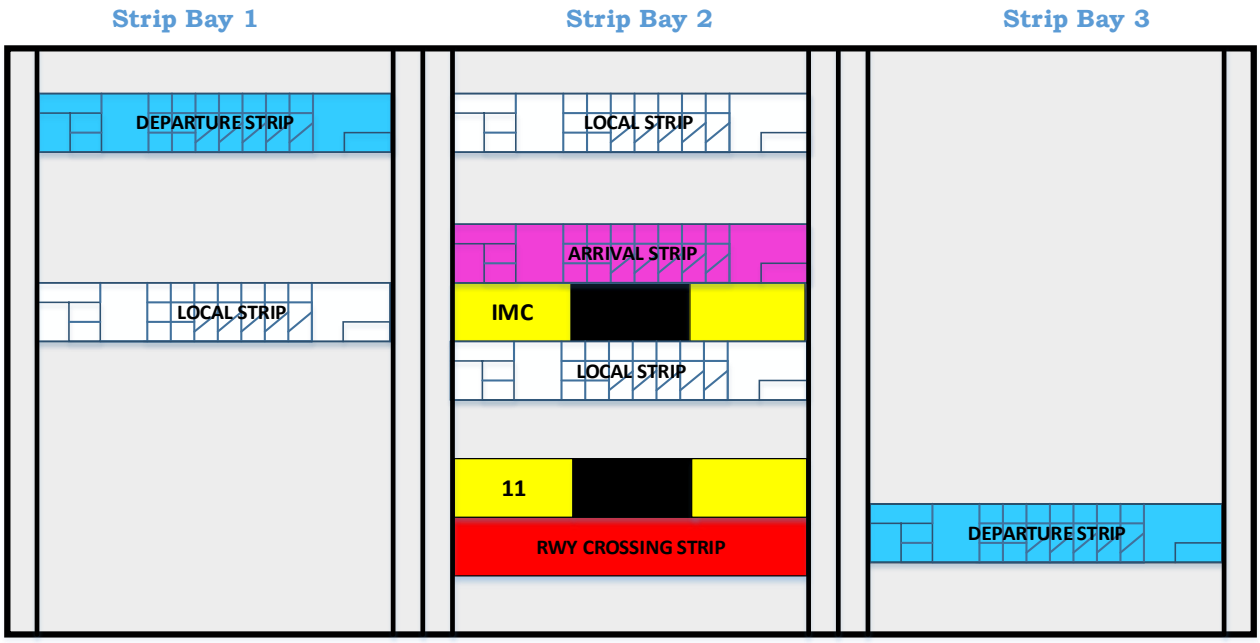

Figure 8: New Design Architecture of Electronic Flight Strip Board.

The Figure 9 below show the predefined standard strips that are currently used at the Wonderboom National Airport (FAWB). There are four (4) runways (RWYs) represented by Yellow strips (i.e. RWY 06, RWY 11, RWY 24 and RWY 29), crossing strips represented by Red strips (i.e. RWY Crossing, RWY Inspection, RWY Blocking, etc.) and special strips represented by Green strips (i.e. search and rescue (SAR), special roles west or east (SRW/SRE), and pending strip (GF1/GF2). In each RWY, separate roles apply in line with the airport's current weather conditions (i.e. instrument meteorological condition (IMC) or virtual meteorological condition (VMC)). The Electronic Flight Progress Strip system shall be configured to have the predefined standard strips that may be used for example, to mark the Runway Crossing, Vehicle Inspection, etc. The colours for these strips are to be configured as shown in Figure 9 below.

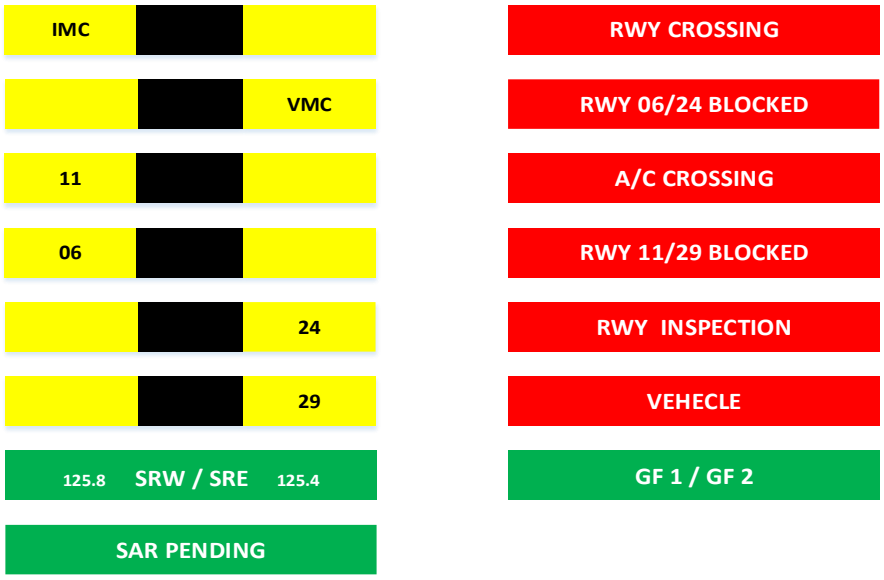

Figure 9: Standards Runway Crossing and Runway Bar Strip

The Figure 10 and Figure 11 below shows the proposed overall integrated system design architecture and interface protocol for ElecFPS with other systems at FAWB. The Electronic Flight Progress Strip (ElecFPS) system is interconnected to the ANAIS system and the Billing system.

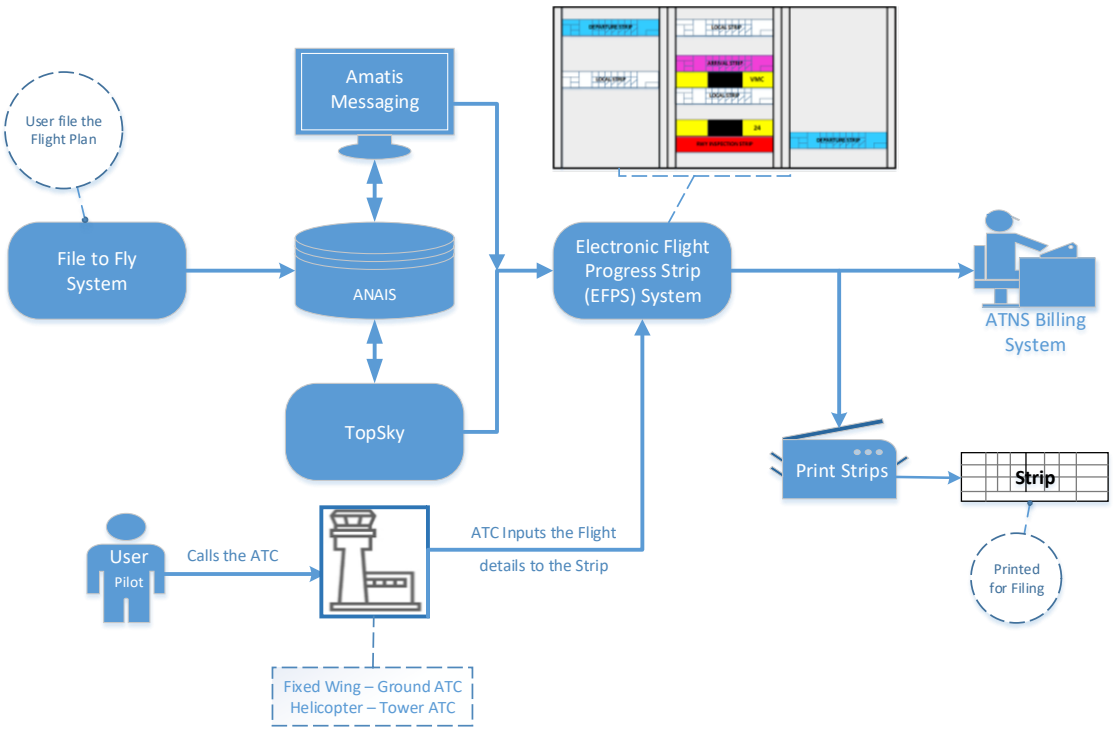

Figure 10: Proposed overall Integrated System Design Architecture at the Wonderboom National Airport

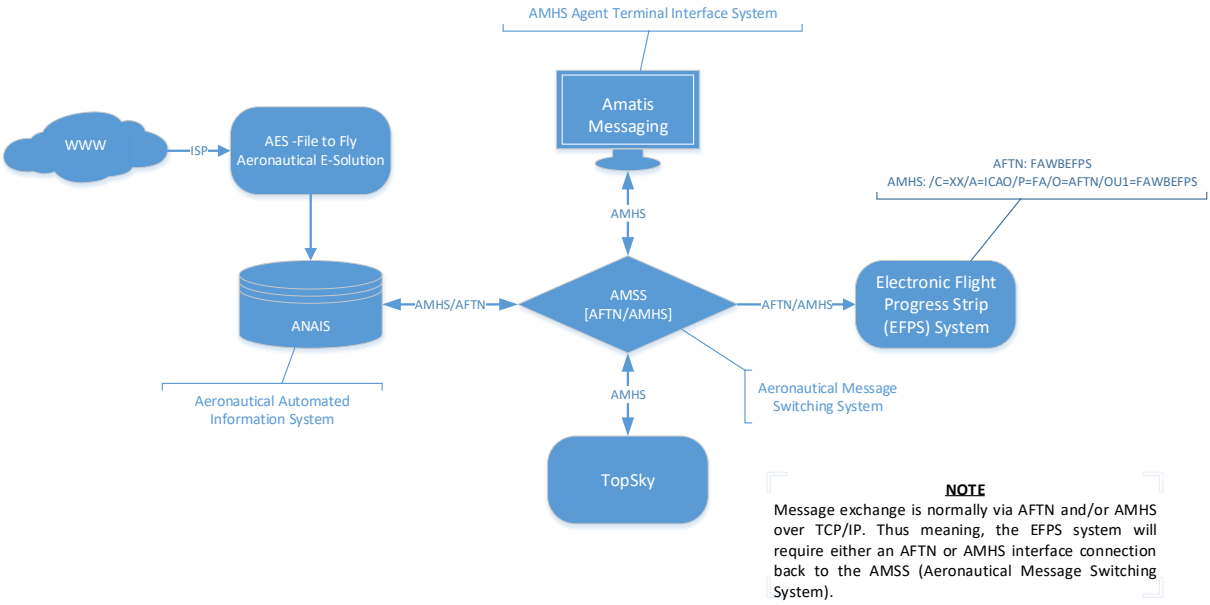

Figure 11: Integrated System Design Interfaces Protocols at the Wonderboom National Airport

7 OPERATING ENVIRONMENT

The Wonderboom National Airport (FAWB) is divided into two (2) controller positions or sectors (i.e. ground control position and tower control position) and one (1) Assistant position. Both positions (sectors) are located at the Control Tower. The ground controller positions control all the activities on the ground (i.e. aircraft taxiing, ground vehicle operations, etc.) whereas the tower controller positions control the aircraft departing, arriving, over flight, etc. The assistant position is used for receiving all the external calls to the tower and for assisting with completing the flight plan information onto the strips. The two controller positions (sectors) use the Flight Progress Strips (FPSs) that are moved (pushed) from one position to another by the air traffic controllers (ATCs).

Note:

i). The three positions (GND, TWR and Assistant) are fixed position. The Approach position should be able to be configured on both the GND and TWR position. Whereas the Coordinator and Supervisor positions should be able to be configured on the Assistance position.

ii). The distance from the control tower cab to the TWR equipment room is roughly 30 Meters.

7.1 System Usage

The Electronic Flight Progress Strip (ElecFPS) system shall be used by the Air Traffic Controller (ATC) when controlling the flights. The ElecFPS system shall also be used for both

the Tower and Ground positions (sectors). The Air Traffic Service Officer (ATSO) will use the printed Flight Progress Strip to input the strip information to the Billing system or verify the strip information on the Billing system.

7.2 System Restrictions

No system restrictions are identified in this project.

7.3 System Interfaces

The Electronic Flight Progress Strip system shall provide for interfaces with the following existing systems: AIS System (ANAIS & AMHS), ATFM System (CAMU tool), ATNS Billing System (defined as input or output or both) as shown in Figure 10 and Figure 11 above. Depending on system design and configuration, the system may be required to interface Display System (TopSky-ATC). The system will be required to support the following communication protocols, namely:

a) Transmission Control Protocol/Internet Protocol (TCP/IP)

b) File Transfer Protocol (FTP)

c) E-Mail

7.4 Detailed System Requirements

7.4.1 General Requirements

The following are Electronic Flight Strips (EFS) system general requirements:

a) The Electronic Flight Strip Board (EFSB) referred to as Touch Screen Computer Display shown in Figure 10 above shall be touch-screen sensitive.
b) The Electronic Flight Progress Strip (ElecFPS) shall not be moved by the merely touching the screen. The touch screen shall remain stable after a touch from a user.
c) The EFSB shall be configured to allow the use of both handwriting and stylus when editing the strips.
d) The EFSB shall be configured in such that it does not go on standby mode and shall be clearly visible in all weather conditions.
e) The EFSB shall be configured to include the strips templates, i.e. Arrival strip, Departure strip, VFR flights and VFR over flight strips (General Aviation Training and Over- Flight), Runway (RWY) crossing strip, Vehicle movement strip, Pending search and rescue (SAR) strip, etc. All the strip templates shall be colour coded (i.e. Blue, Pink, White, Red, Green, etc.) as defined in FAWB Station Standing Instruction (SSI) document (Reference Annexure A).
f) The EFSB shall be configured to have the buttons that allows the controller to change the strip types (e.g. changing the Departure strip to Arrival Strip or Local Strip or vice versa).

g) The EFSB shall be configured such that the fix indicator of the Runway Bar can be expandable based on the number of strips i.e. the RWY Bar design should be able to be moved or expanded to both up and down directions.
h) The RWY Bar shall be configured to include the capability of Frequency and RWY changes. The RWY and Radar marking shall be fixed, only the RWY number and Frequency band shall be changed on the RWY Bar (See Figure 9).
i) The EFSB shall be configured to have three (3) buttons (i.e. the Tower Position button, Ground Position button and Billing Position (ATSO) button). The buttons are to be used to push/transfer the strips between the positions. For example, the ATC at Ground position (sector), will select the strip and push the Tower button to push/transfer the strip from the Ground position to Tower position and vice versa. Alternatively, once one controller provides an instruction that releases the aircraft from their area of controller (position) the system should automatically transfer that specific FPS to the relevant ATC position. **Note: The Billing position refers to the Assistant position**
j) The system at the Billing Position (ATSO) shall be configured to be able to Display and Save the strip received from the ATCs. The ATSO will be required to verify and confirm the information saved in the billing system with the information on the strip and edit accordingly should there be a discrepancy.
k) The EFSB shall be required to have the adjustable stand/leg so that the ATC can be able to adjust the screen to comfortable angle and position.
l) The EFS system configuration shall be monitored and upgraded remotely. The system shall allow for the system administrator to reconfigure or adjust the design of strips or display lay-outs as well as update remote nodes from a central location in South Africa without having to visit the specific location. Software upgrades shall also be done from a central location to all relevant systems.
m) ATNS should ensure that the communication network and the power supply backup (UPS) is adequate and sufficient to allow the implementation of an ElecFPS to the required availability and reliability.
n) RWY Inspection strip should be configured to have an option to change what the vehicle is doing on the RWY (e.g. R2, R1, FTI, MV1 and APM)

7.4.2 Functions and Capabilities Requirements

The functionalities that are currently present in paper Flight Progress Strip (FPS) that must be preserved in the Electronic Flight Progress Strip (ElecFPS) system includes the following:

a) Displaying the aircraft call sign, type and equipage, transponder code, route of flight, cruise altitude, proposed departure time, and departure airport;
b) Changing the aircraft type, altitude, route, etc.;
c) Recording the initial heading;
d) Recording “ready to push” and departure times;
e) Recording in-trail restrictions; “During the trail, a user to be able to define rules or restrictions on the system based on operational needs or configuration. E.g. If two aircraft could not occupy the same taxiway at the same time, for whatever reason, or if the assumed separation for take-off cannot be less than 5 minutes. The system shall be capable to assist in defining these rules or restrictions and provide warnings when such restrictions are violated”.

f) Writing nonstandard taxi paths;
g) Indicating a wake turbulence waiver;
h) Indicating correct ATIS received by aircraft;
i) Indicating a position-and-hold clearance, (For example, when an aircraft is holding on the ground, the ElecFPS shall indicate the “Hold for Release” and The **Position** of the aircraft that requested the **Hold)**; and
j) Recording any other nonstandard instructions.

7.4.3 Core Functions

The Electronic Flight Progress Strip (ElecFPS) system shall cater for the functionality, capturing of actions, information and data as presented in a paper flights progress strip environment, as a minimum requirement. This in no way implies the way it must be performed or limits the capability of the ElecFPS system,

The system shall support the following functionalities or actions to the strip:

a) Editing;
b) Save;
c) Copying;
d) Paste;
e) Undo;
f) Redo;
g) Zoom in and Zoom out;
h) Print;
i) Strip Insert;
j) Strip Share;
k) Automatic recording of time;
l) Flipping; (For example, the ATCO can use the Flipping functionality to add/view more information on the flight strip should there be a need to do so).
m) Marking;
n) Watermarks; (For example, the ATCO can use the watermark functionality to mark or distinguish flight strips should there be a need to do so);
o) Filtering; (Note, Filtering any types of strips. For example: Filtering the Departure Strips only or Local Strips);
p) Sorting;
q) Runway Selection;
r) History;
s) Strip forwarding;
t) Strip send; and
u) Strip archive.

The system shall in addition provide for:

a) Runway changes and closure;
b) Aircraft formation, splitting and integration;
c) Training circuits;

d) Strip transfer (Strip push);
e) Built-in work flows;
f) Strips Template (for example: Arrival, Departure, VFR flights and VFR over flight strips (General Aviation Training and Over- Flight), Runway crossing, Vehicle movement strip, Pending Search and Rescue (SAR), etc);
g) Strip Bays; and
h) Workflow rules.

7.4.4 System Functionality

The Electronic Flight Progress Strips (ElecFPS) system shall meet the following system functionalities:

a) Automatic time stamp functionality is required, although editing or re-aligning the time stamp should be possible. Time stamp functionality – one-click in block and time is inserted automatically.
b) The system shall provide a database of registrations/call signs and associated aircraft types. It shall be an active database that is automatically updated (based on a validation process) as new information is captured on the Flight Plan.
c) Indication of call signs (Police/Netcare/Netstar) and South Africa Air Force (SAAF) aircraft with tail numbers not on Flight Plan. This implies the call sign on the ElecFPS must be editable and linked to the registration number for billing purposes.
d) The system shall cater for multiple/cross Runway (RWY) operations. The system shall be required to support configuration capability to display more than one RWY Bay.
e) In order to improve safety, the system shall incorporate warnings and alarms to alert the controller of illegal operations and RWY incursions or conditional clearances (e.g. line up and wait behind). The system shall incorporate error trapping and logic testing. The system shall make provision for the use and inclusion of blocking card (crossing strip) (i.e. RWY Crossing Strip). The blocking card or crossing strip can be used in case the RWY is not clear and it indicate that the RWY cannot be given to landing or departing aircraft.
f) The system shall be configured to have the handover/sharing capabilities between the Ground Controllers, Tower Controllers and Billing System.
g) The system shall be required to have configurable bays. This is to enable user to select and deselect desired bays associated with the role allocation. For example, where operational configuration requires combined roles i.e. Ground (GND), Tower (TWR) and Clearance Delivery Control (CDC), always combined.
h) The system should allow for a strip transfer from one frequency/position to another at the same unit, catering for those units with more than one frequency/position.
i) To prevent the number of bays limitation for multiple strips to be displayed even when all strips are reduced, the system shall have selectable menu where a user can select which bays to be displayed as per the operational need, however, when some of the bays not be required and therefore should not active (selected).

j) The system shall be configured to have the capabilities to combine Positions (Sectors). For example, combining the Ground and Tower Position (Sector) in to one Position, i.e. role definition and functionality – being able to combine positions.
k) Billing interface is required. Station specific billing to be sent to airport authorities for their billing purposes.
l) Search and Rescue (SAR) indication and signalling (alarm/warning) when overdue.
m) System shall allow combination of functions/sectors and roles and responsibilities.
n) System shall cater for infrastructure and service status indicator such as service strips and should provide warning if rule is breached; (Note: This requirement addresses the need to flag some portions of the aerodrome that are unusable due to either infrastructure problems or maintenance service. E.g. Should a taxiway become unusable due to maintenance activities, there should be a specific service flight strip that the ATC could use to flag these activities. Should they supposedly forget about this maintenance activities and try to route traffic through the unusable taxiway, the system shall provide them with a warning).
o) Recording of what the controller's interaction with the system/screen was and what was displayed. This should be available for minimum of 3 months on the system. The system shall cater for export capabilities.
p) The ElecFPS shall be kept for 3 months in archives.
q) Interface to Aeronautical Fixed Telecommunication Network (AFTN) / Aeronautical Telecommunication Network (ATN) shall be mandatory
r) Interface to other systems to be indicated.
s) The system should be able to handle overflowing strip bays.

7.4.5 Screen Display Configuration

The Electronic Flight Strips Board (Touch Screen Display) will include the following configuration settings:

a) The current Query Nautical Height (QNH) value (i.e. Sea-level pressure);
b) The current synchronized UTC time; and
c) The status of the system.

7.4.6 System Subsystems/Components

The following are the Electronic Flight Progress Strip system components:

a) Server for strip storage.
b) Electronic Flight Strip Board (Touch-Screen sensitive computer display);
c) Uninterruptible Power Supply (UPS) (Note: ATNS will ensure power supply backup via UPS. As such, the UPS is not part of deliverables on this project); and
d) Printer for printing the strips.

7.4.7 System Interfaces

As shown in Figure 10 above the Electronic Flight Progress Strip (ElecFPS) system shall provide for interfaces with the following existing systems: AIS System (ANAIS & AMHS), ATFM System (CAMU tool), ATNS Billing System (defined as input or output or both).

Depending on system design and configuration, the system may be required to interface Display System (TopSky-ATC).

Note:

i) **The system shall accommodate both the AFTN and AMHS.**

ii) **The interface to CAMU will be required in case there is a need for centralised scheduling of flight strips for flights. The details and configuration requirement will be provided to the winning bidder.**

7.4.8 Controller Environment Configuration

The controller environment configuration positions (sectors) will allow for the selection of different controller roles, with the associated and pre-configured workspace environment presented on the screen display to the controller.

The following controller roles will be available at any position (sectors):

a) Clearance Delivery;
b) Tower Position 1 & 2;
c) Ground Position 1& 2;
d) Combined Tower and Ground position in one workstation;
e) Procedural Approach 1;
f) Coordinator / Assistant; and
g) Supervisor.

The strips presented at a workstation (position) will depend on the role selected for the controller at that position.

7.4.9 System Performance

The system shall meet the following mandatory system performances:

a) The system shall cater for sufficient redundancy / back-up to ensure that the service is not interrupted due to a component (e.g. screen) failure in the system.
b) Recovery time in case of a system failure shall be agreed upon between ATNS and Supplier and shall be mandatory.
c) In the event of the total system failure, the system shall allow the use of the paper flight progress strip and this will require an approval by the regulator (SACAA).

7.4.10 Reliability and Availability

The system shall have the same level of reliability and redundancy as that available for the ATNS ATM system deployed.

The operational requirements will consist of the following items:

a) Reliability: 98.9%
b) Availability: 99.98%

8 LOGISTIC REQUIREMENTS

8.1 Training Requirements

Formal training of staff shall be required on the Electronic Flight Progress Strip (ElecFPS) system and provision must be made for at least two (2) maintenance personnel, three (3) ATCs and two (2) ATSO. The training will be done at the ATNS centres (the training plan and dates shall be provided at least six (6) weeks in advance) to the organisation. Supplier/Service Provider shall indicate during the request for proposal (RFP) what the training prerequisites are for this trial purposes. Supplier shall, depending on the extent of the training, provide training plan required for the trial project.

8.2 Software Training

The software shall be configured in such a way that after the system has been commissioned for trial, experienced and qualified programmers will not be required for the operation and maintenance of the system. O-level and I-level training is required to enable ATNS technical personnel to check and rectify the system parameter settings for the duration of trial.

8.3 Spares Plan

Spares required for the duration of system trial will be required to be delivered as part of the system. The supplier shall indicate what spares will be required to meet the required system availability for the duration of trial. An itemized spares plan is required from the supplier. The plan is to be based on maintaining the required availability and reliability figures for the period of 12 months (trial period).

8.4 Software Licenses

Supplier should indicate what software licenses will be required for the system for the duration of trial.

8.5 Warrantee

A one-year period of warrantee starting at the date of site acceptance shall cover all repairs and replacements of hardware, as well as all corrections or modifications to software required for reasons of non-compliance with specifications or errors not detected during acceptance tests. System operation will be monitored and evaluated at set intervals during the warrantee period.

Supplier shall be committed to the evaluation process. Supplier shall indicate what support is offered during the warrantee period.

8.6 Testing and Verification

A test and verification procedure will be required to illustrate to ATNS that the system performs according to specifications. The report detailing the performance of the system shall be required after the trial.

9 SUPPORT

A support contract for software is required from the supplier during the trial of the system. A proposal is required before the order is placed clearly detailing the present-day costs.

9.1 Maintenance Support and Tools

Supplier shall provide maintenance support for the system for the duration of the trial. Any required specific maintenance tools will be delivered as part of the system unless existing tools are available that can be utilised.

9.2 Installation and Transitioning

Supplier shall supply, delivery, installation, configuration and provide training for EFS system as per requirement for the system.

9.3 Documentation

All user manuals documents will be required as part of this trial project.

9.4 General and Project Requirements

The supplier shall not sub-contract any portion of the installation without prior approval of ATNS.

All equipment installed shall remain the sole property of ATNS unless agreed beforehand by the two parties.

All hardware and software (including operating system) required to make programming changes to the systems supplied shall be included with the system. Hard copies of all licenses shall be provided. **Note: ATNS shall need everything that is required to make both the configuration and programming changes.**

The Supplier shall repair at no cost to ATNS, any equipment or structures damaged by the execution of their contract to its original condition.