**Title of Document : Software Requirement Specification**

**(SRS) for Display**

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**1 SCOPE**

**1.1 Identification**

This software Requirements Specifications (SRS) describes the requirements for SWInfra, CX, Display and CXXX Interface Computer Software Configuration Items (CSCIs) for GXXXXX on the MXX/HXX platform.

**1.2 System Overview**

An overview of the relevant system configuration is shown in Figure 1.

**Figure 1.1 : System Configuration**

The GXXXXX software comprises the following CSCIs:

* SWInfra CSCI in the Box (BOX) with the following capabilities:

1. Monitor Terminal (MT) on existing Avionics Bus (X-Mux)
2. I/O Management
3. System Services (SYS)
4. Error and Fault Management

The CSCI shall be executed under a real-time multi-tasking environment, which consists of three (3) different types of tasks, namely the synchronous tasks, asynchronous tasks and background tasks.

* CX CSCI in the Box (BOX) with the following capabilities:

1. Network and Radio Management (NET)
2. Entity Management System (EMS)
3. Message Management System (MSG)

* Display CSCI residing in the Display in the Tablet Toughbook with the following capabilities:

1. Process and display all HSD graphical symbols
2. Man-Machine Interface (MMI)
3. Digital map display
4. Track and Target Management
5. Image handling and processing

* CXXX Interface CSCI residing in the Display in the Tablet Toughbook:

1. Interface with CXXX

**1.3 Document Overview**

This document describes the functional requirements for the SWInfra, CX, Display and CXXX Interface CSCIs. It will be used as a basis for detailed CSCI design and testing.

Section 2 lists the documents referenced by this document. Section 3 defines the requirements of XXX software and requirements traceability. Section 4 describes preparation for delivery. Section 5 defines acronyms and abbreviations used in this document.

**2 REFERENCES**

Documents furnished by the Authority:

N/A

ST Documents:

Software Process Engineering Manual (SPEM/23) UML Standardization Rev -

Software Project Plan Rev - (866/ESW/SPP)

Software Configuration Management Plan Rev - (866/ESW/SCMP)

XX Interface Control Document for LRUA-2 Rev B (866/XXXX/XXX)

XX Operational Requirements Document for LRUA-2 Rev A (866/XXX/XX\_ORS)

Software Requirement Specification (SRS) for Project XX MC Rev - (872/XXX/XXX dated 16 August 2004)

**3 ENGINEERING REQUIREMENTS**

**CSCI External Interface Requirements**

The XXX software interfaces are shown in Figure 2. SWInfra CSCI use MIL-STD-1553B databus and discretes to exchange data with XXX CSCI and XXXXX.

Detailed data content for the external interfaces are contained in the Electrical Interface Control Document (EICD) and Interface Control Document (ICD).

**Figure 3.1: XXX Software Interface Diagram**

**3.2 CSCI Capability** **Requirements**

**3.2.1 Actors**



**Figure 3.2: Actor List**

**3.2.1.1 System User Actor List**



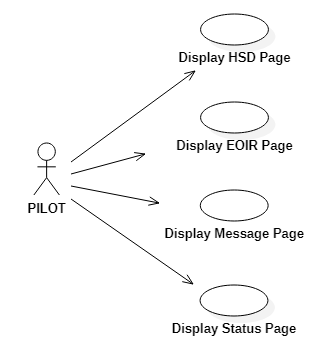
**Figure 3.3: System User Actor List**

**3.2.1.2 Subsystem User Actor List**

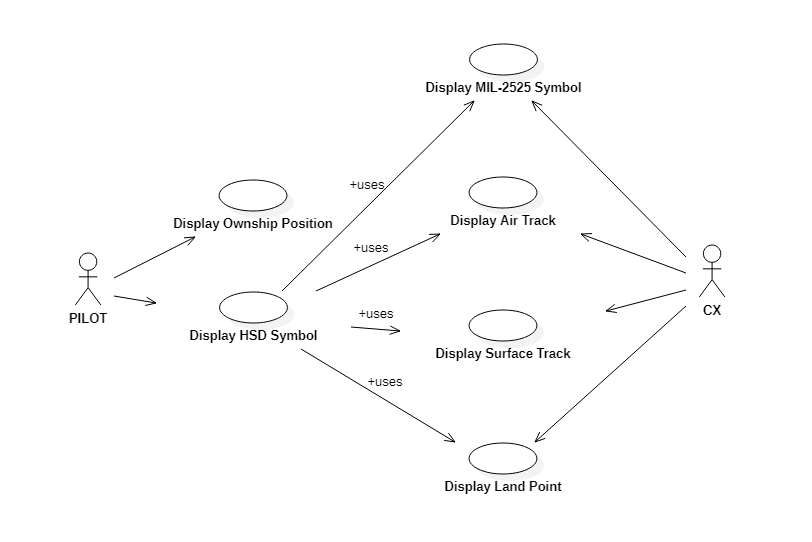


**Figure 3.4: Subsystem Actor List**

### **3.2.2** **Display Use Case View**



**3.2.2.1 Handle HSD Page**

****

**3.2.2.1.1 Use Case Name: Display Ownship Position**

This use case describes the process by which the HSD Page displays ownship position received from the Avionics System.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when pilot enters into HSD page via OSB B1: HSD

Basic Path

1. BOXA shall monitor the A/C position message (TBD) on the EX bus or ARINC429 (TBD).
2. BOXA shall decode the message and transmit (ICD–1?) on the Ethernet through a Multicast message to the Displays and CX.
3. Display shall receive the Multicast message (ICD-1?) and use it to set ownship position.

The use case ends when ownship position is displayed on the HSD page.

**3.2.2.1.2 Use Case Name: Display HSD Symbol**

This use case describes the process by which the HSD Page displays HSD symbols received from the CX. Symbols are classified as the following:

1. MIL-2525
2. Air Tracks
3. Surface Tracks
4. Land Point/Tracks

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when pilot enters into HSD page via OSB B1: HSD

Basic Path

1. CX shall transmit periodic symbol messages (TBD) 6.25Hz on the Ethernet through multicast messages(TBD) to the Display.
2. Display shall receive the Multicast messages (ICD-1?), decode and display relevant symbols as below:
   1. MIL-2525 symbols:
   2. Air Tracks:
   3. Surface Tracks:
   4. Land Point/Tracks:
3. Display shall remove the symbols when it’s symbol message is not received for 3 cycles.

The use case ends when HSD symbols received are displayed on the HSD page.

* + - 1. **Handle EOIR Page**

**<TODO: Draw & insert UML diagrams using StarUML>**

**3.2.2.2.1 Use Case Name: Display EOIR image**

This use case describes the process by which the EOIR Page displays image received from the Avionics System. The Display can only display up to 100 EOIR images.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

Pilot had initiated an image capture using the cockpit controls.

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when pilot enters into EOIR page via OSB B3: EO

Basic Path: Less than 100 images are stored by Display

1. SW Infra App shall transmit image message (TBD) on the Ethernet through multicast message to the Display after pilot had initiated image capture and an image is successfully captured.
2. Display shall receive the Multicast messages (ICD-1?), decode and store the new image filename into its image database in a FIFO manner.
3. Display shall show newly received EOIR image.

Alternate Path: 100 images are already stored by Display

1. CX shall transmit image message (TBD) on the Ethernet through multicast message to the Display after pilot had initiated image capture and an image is successfully captured.
2. Display shall receive the Multicast messages (ICD-1?) & decode the image.
3. Display shall delete the first oldest image from in its image database and store the new image   
   in a FIFO manner.
4. Display shall show newly received EOIR image.

The use case ends when the EOIR image is displayed on the EOIR page.

**3.2.2.2.2 Use Case Name: Scroll Up/Down EOIR images**

This use case describes the process by which the EOIR Page handles the UP / DOWN OSB input from the Pilot.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when EOIR page is displayed and Pilot presses the OSB R3: UP or   
OSB R4: DOWN.

Basic Path: Press OSB R3: UP

1. Display shall show the previous EOIR image in the saved database when Pilot presses OSB R3: UP.
2. If the current EOIR image is the first image (e.g. image 1 of 9), Display shall show the last image (image 9 of 9).

Alternate Path: Press OSB R4: DOWN

1. Display shall show the next EOIR image in the saved database when Pilot presses OSB R4: DOWN.
2. If the current EOIR image is the last image (e.g. image 9 of 9), Display shall show the first image (image 1 of 9).

The use case ends when the previous / next EOIR image is shown on the EOIR page.

**3.2.2.2.3 Use Case Name: Select different EOIR image from thumbnails**

This use case describes the process by which the EOIR Page handles image selection when thumbnails are displayed.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

No new image is received while the Pilot is viewing the EOIR page

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when EOIR page is displayed and Pilot presses OSB R1: VIEW ALL

Basic Path: Active full size image is image 1 prior to OSB R1 press

1. Display shall show a thumbnail view that contains up to 4 EOIR images (e.g. image 1 to 4)
2. Display shall highlight the current active image 1 with a green border
3. When the Pilot has selected a different image, Display shall change the green highlight to the selected image.
4. Display shall expand the selected image to full size.
5. Display shall update the image number.

Alternate Path: Active full size image is image 15 prior to OSB R1 press

1. Display shall show a thumbnail view that contains up to 4 EOIR images (e.g. image 10 to 13)
2. Display shall highlight the current active image 12 with a green border
3. When the Pilot has selected a different image, Display shall change the green highlight to the selected image.
4. Display shall expand the selected image to full size.
5. Display shall update the image number.

The use case ends after the selected EOIR image has expanded to full size on the EOIR page.

**3.2.2.2.4 Use Case Name: Scroll Left/Right of EOIR thumbnail pages**

This use case describes the process by which the EOIR thumbnail page handle switching of pages.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

No new image is received while the Pilot is viewing the EOIR page

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when EOIR page is displayed and Pilot presses OSB R1: VIEW ALL

Basic Path: Active full size image is image 1 prior to OSB R1 press

1. Display shall show a thumbnail view that contains up to 4 EOIR images (e.g. image 1 to 4)
2. Display shall highlight the current active image 1 with a green border
3. When the Pilot has selected a different image, Display shall change the green highlight to the selected image.
4. Pilot press OSB B# (Right).
5. Display shall display another set of 4 thumbnail images that are available.
6. Display shall update the image number.

Alternate Path: Active full size image is image 15 prior to OSB R1 press

1. Display shall show a thumbnail view that contains up to 4 EOIR images (e.g. image 1 to 4)
2. Display shall highlight the current active image 1 with a green border
3. When the Pilot has selected a different image, Display shall change the green highlight to the selected image.
4. Pilot press OSB B# (Left).
5. Display shall display the previous set of 4 thumbnail images that are available.
6. Display shall update the image number.

The use case ends after the selected EOIR thumbnail image has been displayed.

**3.2.2.2.5 Use Case Name: Capture new EOIR image when in EO Page**

This use case describes the process by which the EOIR Page show a new image received from the Avionics System. The Display can only display up to 100 EOIR images.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

Pilot had initiated an image capture using the cockpit controls.

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when pilot enters into EOIR page via OSB B3: EO

Basic Path: Pilot triggered a new image capture (less than 100 images)

1. SW Infra App shall transmit image message (TBD) on the Ethernet through multicast message to the Display after pilot had initiated image capture and an image is successfully captured.
2. Display shall receive the Multicast messages (ICD-1?).
3. Display shall show an EO NEW button highlighted in yellow in OSB B#.
4. Pilot pressed on OSB B#, Display shall decode and store the new image filename into its image database in a FIFO manner.
5. Display shall show newly received EOIR image.

Alternate Path: 100 images are already stored by Display

1. SW Infra App shall transmit image message (TBD) on the Ethernet through multicast message to the Display after pilot had initiated image capture and an image is successfully captured.
2. Display shall receive the Multicast messages (ICD-1?), decode and store the new image filename into its image database in a FIFO manner.
3. Display shall show an EO NEW button highlighted in yellow in OSB B#.
4. Pilot pressed on OSB B#, Display shall delete the first oldest image from in its image database and store the new image in a FIFO manner.
5. Display shall show newly received EOIR image.

The use case ends when the EOIR image is displayed on the EOIR page.

**3.2.2.2.6 Use Case Name: View most recent EOIR image (TBD)**

This use case describes the process by which the EOIR Page handles the display of the most recent EOIR image. The assumption here is that the most recent EOIR image is always stored as image 1.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when EOIR page is displayed and Pilot presses OSB R2: LAST

Basic Path: Active full size image is image 9 prior to OSB R2 press

1. Display shall show image 1 and update the image number.

Alternate Path: Active full size image is image 1 prior to OSB R2 press

1. Display shall ignore the OSB R2: LAST command.

The use case ends after image 1 is displayed on the EOIR page.

**3.2.2.2.7 Use Case Name: Delete EOIR images from thumbnail (TBD)**

This use case describes the process by which the EOIR Page handles the deletion of images when commanded by the Pilot.

**Actors**

BOXA

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins after Pilot presses OSB R5: DEL while thumbnail images are displayed in EOIR page.

Basic Path

1. Display shall update the text of OSB R5 to “CONFIRM DEL”
2. When the Pilot selects the images for deletion, Display shall
   * Highlight the selected images with a red border
   * Update the “X/Y SELECTED” text
3. When the Pilot presses OSB R5: CONFIRM DEL, Display shall
   * Delete the selected images from the saved database
   * Update the text of OSB R5 to “DEL”
   * Refresh the thumbnail images on the current page

The use case ends after the thumbnail images are refreshed on the EOIR page.

**3.2.2.2.8 Use Case Name: Send EOIR image**

This use case describes the process by which the EOIR Page handles the sending of image when commanded by the Pilot. If necessary, the Pilot can also choose to add a unique message to the image prior to sending.

**Actors**

BOXA

CXXX

Display

**Pre-conditions**

BOXA is in operation

CXXX is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when Pilot is viewing a full size image in EOIR page

Basic Path: Send image only

1. When the Pilot presses OSB L1: SEND, the Display shall update OSB L1 text to SENDING in green color and highlight OSB L1 with a green border.
2. Display shall send the image filename to CX via Ethernet through TCP unicast messages (TBD).
3. When the transmission is completed, Display shall update “SENT” status in T1 textbox (Row 3). The status shall display for 5 secs. Display shall update OSB L1 text to SEND in white color and remove the green border.
4. CX shall transmit the image to CXXX via Ethernet through multicast messages (TBD).
5. CXXX shall forward the image to the other CXXX for processing (TBD).

Alternate Path: Send image with attached message (TBD)

1. When the Pilot presses OSB L2: ADD MSG, the Display shall shrink the current image to the top left corner & display a QWERTY keypad UI interface (with keypad at bottom half, text output at top right) for the Pilot to type a message.
2. The Pilot shall type a message using the QWERTY keypad & the text output shall be reflected in real-time for preview purposes.
3. When the Pilot presses OSB L1: SEND, the Display shall
   * Remove the QWERTY keypad UI
   * Expand the sizes of both image & text output
   * Update OSB L1 text to SENDING in green color and highlight OSB L1 with a green border
4. Display shall send the image & attached message to BOXA via Ethernet through multicast messages (TBD).
5. When the transmission is completed, Display shall update OSB L1 text to SEND in white color and remove the green border.
6. BOXA shall transmit the image & attached message to CXXX via Ethernet through multicast messages (TBD).
7. CXXX shall forward the image & attached message to the other CXXX for processing (TBD).

The use case ends after the image & attached message (if applicable) is sent to the CXXX.

**3.2.2.3 Handle Text Page**

**<TODO: UML for Text Page>**

**3.2.2.3.1 Use Case Name: Using Keyboard to enter Free Text**

This use case describes the process by which the TEXT Page displays a Keyboard and the usage of entering free text message.

**Actors**

Display

**Pre-conditions**

BOXA is in operation

Display is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when pilot enters into TEXT page via OSB BX: TEXT

Basic Path

1. Pilot can enter free text into the Textbox in the TEXT page by pressing on the corresponding keypress.

The use case ends when the Pilot press T1 to send the message or press B1 to exit the Page.

* + - 1. **Handle SYSTEM Page**

**<TODO: UML for SYSTEM Page>**

**3.2.2.4.1 Use Case Name: Display SYSTEM Page**

This use case describes the process by which the SYSTEM page show the status of G and its associated MFL(s).

**Actors**

BOXA

BOXB #1

BOXB #2

**Pre-conditions**

BOXA is in operation

BOXB #1 is in operation

BOXB #2 is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins when pilot enters into SYSTEM page via OSB B5: SYS

Basic Path

1. BOXA, BOXB #1 and BOXB #2 shall perform own CBIT & transmit CBIT status message (TBD) on the Ethernet through multicast messages (TBD) to CX periodically at X Hz (TBD).
2. CX shall consolidate all the different CBIT status into the same consolidated CBIT status message (TBD).
3. CX shall transmit consolidated CBIT status message on the Ethernet through multicast messages (TBD) to the Display periodically at X Hz (TBD).
4. Display shall receive the Multicast messages (ICD-1?), decode and store the new status into its database.
5. Display shall show the CBIT results of BOXA, BOXB #1 and BOXB #2 within the STATUS box with the following color representation
   * Green color – operational
   * Yellow color – degraded
   * Red color – fail
   * White color – offline (IBIT is in progress)
6. Display shall show MFLs in the MFL box (up to X number).
7. Display shall show “RTN”, “IBIT”, “SW VER” & “ZERO” OSBs at the bottom of the page.

The use case ends when the status of G and associated MFLs are displayed on the SYSTEM page.

**3.2.2.4.2 Use Case Name: Perform IBIT**

This use case describes the process by which the pilot triggers the IBIT functions.

**Actors**

BOXA

BOXB #1

BOXB #2

**Pre-conditions**

BOXA is in operation

BOXB #1 is in operation

BOXB #2 is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins after pilot presses OSB B4: IBIT in the SYSTEM Page.

Basic Path : Perform IBIT

1. Display shall show “RTN”, “BOX A”, “BOX B#1” and “BOX B#2” OSBs at the bottom of the page.
2. When the pilot presses “BOX A”, “BOX B#1” or “BOX B#2” OSB
   * The respective OSB shall be highlighted in green with black text
   * The color of the respective text in the STATUS box shall turn white

to represent IBIT is in progress.

1. When IBIT is completed, the color of the respective OSBs shall revert back to white text with black background.
2. Display shall update the text color in the STATUS box to reflect the latest status.
   * Green color – operational
   * Yellow color – degraded
   * Red color – fail
3. Display shall show MFLs in the MFL box (up to X number).

Alternate Path : Do not perform IBIT

1. Display shall show “RTN”, “BOX A”, “BOX B#1” and “BOX B#2” OSBs at the bottom of the page.
2. When pilot presses “RTN”, Display shall show “RTN”, “IBIT”, “SW VER” and “ZERO” OSBs at the bottom of the page.

The use case ends when the status of G and associated MFLs are displayed on the SYSTEM page.

**3.2.2.4.3 Use Case Name: View Software Version**

This use case describes the process by which the pilot attempts to view the software version of G.

**Actors**

BOXA

BOXB #1

BOXB #2

**Pre-conditions**

BOXA is in operation

BOXB #1 is in operation

BOXB #2 is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins after pilot presses OSB B6: SW VER in the SYSTEM Page.

Basic Path

1. Display shall show “RTN” OSB at the bottom of the page.
2. Display shall show the software version numbers of BOX A, BOX B #1 and BOX B #2 in green text.
   * The version number shall be in the format of VXXXX

The use case ends when the software version numbers are displayed on the SYSTEM page.

**3.2.2.4.4 Use Case Name: Perform Zeroise**

This use case describes the process by which the pilot performs zeroise of G.

**Actors**

BOXA

BOXB #1

BOXB #2

**Pre-conditions**

BOXA is in operation

BOXB #1 is in operation

BOXB #2 is in operation

**Post-conditions**

Refer to Event Flow

**“Used” Use Cases**

**Traceability**

**Event Flow**

This use case begins after pilot presses OSB B9: ZERO in the SYSTEM Page.

Basic Path : Confirm zeroise

1. Display shall show “RTN” OSB at the bottom of the page.
2. Display shall show “CONFIRM ZEROISE”, “YES” and “NO” in the middle of the page.
3. Pilot presses “YES”
4. Display shall show “DATA AND KEYS ZEROISE” and remove all OSBs from the page

Alternate Path : Do not confirm zeroise

1. Display shall show “RTN” OSB at the bottom of the page.
2. Display shall show “CONFIRM ZEROISE”, “YES” and “NO” in the middle of the page.
3. Pilot presses “NO”
4. Display shall show “RTN”, “IBIT”, “SW VER” and “ZERO” OSBs at the bottom of the page.
5. Display shall show STATUS box and MFL box with the relevant information.

The use case ends after the appropriate information is shown after “YES” or “NO” is selected.

**3.3 Requirement Traceability**

**3.3.1 ORS to SRS Traceability**

The following matrix is based on XX Operational Requirement Specifications for XXXXXX.

| **ORS Section No** | **SRS Section No** |
| --- | --- |
| 1 | Info |
| 1.1 | Info |
| 1.2 | Info |

**3.3.2 SRS to ORS Traceability**

The following matrix is based on XX Operational Requirement Specifications for XXXXX.

| **SRS Section No** | **ORS Section No** |
| --- | --- |
| 3.2.2.1.1 | 7.4.1 |
| 3.2.2.1.1 | 7.4.1.1 |
| 3.2.2.1.1 | 7.4.1.11 |
| 3.2.2.1.1 | 7.4.1.12 |

**4 PREPARATION FOR DELIVERY**

Version Description Document (VDD) will be prepared to describe the contents of the XXX software.

**5 NOTES**

**5.1 ACRONYMS AND ABBREVIATION**

| **S/N** | **Acronym** | **Definition** |
| --- | --- | --- |
|  | A-S | Air-to-Surface |
|  | A-A | Air-to-Air |