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**LETTER OF INTEREST**  
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Gatineau  
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K1A 0S5

<b>Title - Sujet</b> Maritime Surveillance System	
<b>Solicitation No. - N° de l'invitation</b> T8493-190015/B	<b>Date</b> 2020-07-23
<b>Client Reference No. - N° de référence du client</b> T8493-190015	<b>GETS Ref. No. - N° de réf. de SEAG</b> PW-\$CAG-005-27839
<b>File No. - N° de dossier</b> 005cag.T8493-190015	<b>CCC No./N° CCC - FMS No./N° VME</b>
<b>Solicitation Closes - L'invitation prend fin</b> <b>at - à 02:00 PM</b> <b>on - le 2020-08-04</b>	
<b>Time Zone</b> <b>Fuseau horaire</b> Eastern Daylight Saving Time EDT	
<b>F.O.B. - F.A.B.</b> <b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>	
<b>Address Enquiries to: - Adresser toutes questions à:</b> Wallingford, Carol	<b>Buyer Id - Id de l'acheteur</b> 005cag
<b>Telephone No. - N° de téléphone</b> (873) 469-3843 ( )	<b>FAX No. - N° de FAX</b> ( ) -
<b>Destination - of Goods, Services, and Construction:</b> <b>Destination - des biens, services et construction:</b> DEPARTMENT OF TRANSPORT 200 COMET PRIVATE AIRCRAFT SERVICES DIRECTORATE OTTAWA Ontario K1V9B2 Canada	

Instructions: See Herein

Instructions: Voir aux présentes

<b>Delivery Required - Livraison exigée</b> See Herein	<b>Delivery Offered - Livraison proposée</b>
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<b>Name and title of person authorized to sign on behalf of Vendor/Firm</b> <b>(type or print)</b> <b>Nom et titre de la personne autorisée à signer au nom du fournisseur/</b> <b>de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b>	
<b>Signature</b>	<b>Date</b>



Item Article	Description	Dest. Code Dest.	Inv. Code Fact.	Qty Qté	U. of I. U. de D.	Unit Price/Prix unitaire FOB/FAM Destination	Plant/Usine	Delivery Req. Livraison Req.	Del. Offered Liv. offerte
1	MSIMS Maritime Surveillance Integrated Mission System	T8493	T8561	1	Each	\$	\$	See Herein	

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T8493-190015/B  
Client Ref. No. - N° de réf. du client  
T8493-190015

Amd. No. - N° de la modif.  
File No. - N° du dossier  
005cag.T8493-190015

Buyer ID - Id de l'acheteur  
005cag  
CCC No./N° CCC - FMS No./N° VME

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**REQUEST FOR INFORMATION (RFI)**  
**Maritime Surveillance Integrated Mission System (MSIMS) and upgrading of three**  
**existing MSS6000 mission systems.**

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## **REQUEST FOR INFORMATION (RFI)**

### **Maritime Surveillance Integrated Mission System (MSIMS) and upgrading of three existing MSS6000 mission systems.**

#### **1.0 INTRODUCTION**

This RFI is issued by Public Services Procurement Canada (PSPC) on behalf of Transport Canada (TC) to gather information to assist with the definition of the technical requirements and the development of the procurement strategy for the acquisition of a new Maritime Surveillance Integrated Mission System (MSIMS) and the modification of three existing MSS6000 mission systems to support new Electro-Optical Infrared (EO/IR) High Definition Cameras Systems.

Through the Government of Canada's Oceans Protection Plan and the Whales Initiative, a De Havilland Dash 8 aircraft was recently acquired to increase the capacity of the National Aerial Surveillance Program (NASP). This Program's maritime surveillance missions include conducting pollution prevention patrols to protect the marine environment, responding to oil pollution incidents, conducting ice reconnaissance missions and monitoring endangered whale movements. Over the next two years, the Dash 8 aircraft will undergo modifications to become a maritime patrol aircraft as part of the NASP fleet. The recently acquired Dash-8 aircraft will be equipped with specialized mission equipment / sensors that will provide a similar capability to what is currently used on Transport Canada's existing fleet.

Initial Operational Capability (IOC) is planned for summer 2021, and Full Operational Capability (FOC) for summer 2022. Note that TC and PSPC are looking to expedite these timelines to the best of their abilities.

#### **2.0 OBJECTIVES OF THE RFI**

PSPC, on behalf of TC, is releasing this Request for Information (RFI) to inform Industry of this proposed competitive procurement and to solicit feedback from potential suppliers on the requirements detailed in the draft Annex "A" Statement of work (included) as well as to obtain feedback on the proposed bid evaluation.

This RFI process will ensure that the procurement process is carried out with fairness and transparency by providing all interested participants with the same information in advance of the Request for Proposal.

#### **3.0 FORMAT OF RESPONSES REQUESTED**

Respondents are requested to provide responses to the below questions in the following format:

##### **TITLE PAGE:**

The first page after the cover page should be the title page, which should contain the following information:

- 
- a. the title of the respondent's response and the volume number;
  - b. the name and address of the respondent;
  - c. the name, address and telephone number of the respondent's contact;
  - d. the date, and
  - e. the RFI's Solicitation Number.

Responses should be provided electronically in MS Word, MS Excel and/or PDF format to the Contracting Authority identified herein at section 8.0 Enquiries.

Only pertinent information in response to this request shall be submitted. The inclusion of general marketing or technical manuals is discouraged, unless they provide specific information that has been requested in this document.

Canada will not reimburse any organization for expenses incurred in responding to this RFI

#### 4.0 RFI QUESTIONS

##### **PART A: General Terms and Conditions**

Canada will use General Condition 2010A (2018-06-21) and 2010C (2018-06-21) for this requirement with Supplemental General Conditions 4006 (2010-08-16).

The General Conditions may be accessed at the following link:

<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/3>

##### **Question on Part A:**

1. Please advise if there are any issues or concerns with these terms and conditions as they will set the basis for the future contract for the MSIMS. Identifying your concerns now will expedite the process at a later date.

##### **PART B: Statement of Work at Annex A**

##### **Questions on Part B:**

1. Is the SOW as it is presented in this document realistic? Please identify any potential issues and advise how you feel Canada should approach the problems.
2. Are any clarifications required to the draft documents? If yes, please specify which section and page number.
3. For the scope of work identified in the SOW, are there missing elements that Canada should consider that would better describe the work? If yes, please specify.
4. Are there any elements within the draft document that would limit your ability to respond or perform the work outlined in the document? If yes, please specify the constraints and your proposed solution or alternative.
5. How much time would be required post contract award to develop the design for presentation at the Preliminary Design Review (PDR)? What delay shall we expect?
6. How much time would be required to develop the detailed design post PDR to be presented at the Critical Design Review (CDR)? What delay shall we expect?
7. Do you have any other recommendations that you would like Canada to consider? If yes, please specify.
8. Are the delivery times realistic and achievable?

##### **PART C: Bid Evaluation Criteria**

The basis of selection method that Canada proposes to use in this process is the Lowest evaluated price – Mandatory requirements and point-rated criteria.

1. To be declared responsive, a bid must:
  - a. comply with all of the requirements of the bid solicitation;
  - b. meet all mandatory criteria; and
  - c. obtain the required minimum of 160 points overall for the technical evaluation criteria which are subject to point rating. The rating is performed on a scale of 209 points.
2. Bids not meeting a, b and c will be declared non-responsive.
3. The selection will be based on the highest responsive combined rating of technical merit and price. The ratio will be 50 % for the technical merit and 50 % for the price.
4. To establish the technical merit score, the overall technical score for each responsive bid will be determined as follows: total number of points obtained / maximum number of points available multiplied by the ratio of 50 %.
5. To establish the pricing score, each responsive bid will be prorated against the lowest evaluated price and the ratio of 50 %.
6. For each responsive bid, the technical merit score and the pricing score will be added to determine its combined rating.
7. Neither the responsive bid obtaining the highest technical score nor the one with the lowest evaluated price will necessarily be accepted. The responsive bid with the highest combined rating of technical merit and price will be recommended for award of a contract.

**Questions on Part C:**

1. Are the Bid Evaluation Criteria as presented in Annex "B" of this document open and fair to all bids? Please identify any potential issues and advise how Canada should approach the problems.
2. Do you have any other recommendations for evaluation criteria that you would like Canada to consider? If yes, please specify.
3. Are the points assigned to each rated criteria adequate? If no, please advise how Canada should assign points to each rated criteria
4. Are there any requirements as presented in Annex "B" cost prohibitive?
5. If this is a new feature that requires Non-recurrent engineering, that could possibly increase delivery time, please state so.

**PART D: Financial Evaluation Criteria**

**Questions on Part D:**

1. Are the Financial Evaluation Criteria as presented in Annex "C" of this document open and fair to all bids? Please identify any potential issues and advise how Canada should approach the problems.

2. Do you have any other recommendations for financial evaluation criteria that you would like Canada to consider? If yes, please specify.
3. Are there any requirements as presented cost prohibitive?
4. If this is a new feature that requires Non-recurrent engineering, that could possibly increase delivery time, please state so.

## **PART E: Basis of Payment**

### **Questions on Part E:**

1. Is the Basis of Payment as presented in Annex "D" of this document open and fair to all bids? Please identify any potential issues and advise how Canada should approach the problems.
2. Do you have any other recommendations for financial evaluation criteria that you would like Canada to consider? If yes, please specify.

## **5.0 NOTE TO RESPONDENTS**

The publication of this RFI must not be construed as a commitment on Canada's part to issue a subsequent "Request for Proposal" and no Contract or other form of commitment will be entered into with any suppliers based on responses to this RFI. Canada will not be bound by anything stated herein. As a result, potential suppliers of any good or services described in this RFI should not reserve stock or facilities, nor allocate resources, as a result of any information contained in this RFI.

Respondents are requested to provide their comments, concerns and recommendations regarding how the requirements or objectives described in this RFI could be satisfied. Responses will not be used for competitive or comparative evaluation purposes, and thus the response format is not as rigorously defined as would normally be for an RFP. However, for ease of use and in order for the greatest value be gained from responses, Canada requests that respondents follow the structure outlined in section 3.0 - Format of Responses.

Any information submitted to PSPC in response to this RFI may be used in the development of a subsequent solicitation. Potential suppliers will not be bound by any aspect of their response to this RFI. All responses to this RFI will be held by PSPC on a confidential basis (subject to applicable legislation) and remain the property of PSPC once they have been received.

Participation in this RFI is encouraged but is not mandatory. There will be no short-listing of potential firms for the purposes of undertaking any future work as a result of this RFI. Similarly, participation in this RFI is not a condition or prerequisite for the participation in any potential subsequent solicitations. The responses from industry will enable Canada to evaluate the strategy to be taken, if any, in regards to issuing a solicitation for the required goods and services.

Changes to this RFI may occur and will be advertised on the Government Electronic Tendering System. Canada asks Respondents to visit [Buyandsell.gc.ca](http://Buyandsell.gc.ca) regularly to check for changes, if any.

The information provided is for consultation purposes only and is subject to change.

## **6.0 TREATMENT OF RESPONSE**



Use of Responses: Responses will not be evaluated. However, the responses received may be used by Canada to develop or modify the procurement approach. Canada will review all responses received by the RFI closing date and may, at its discretion, review responses received after the RFI closing date.

Review Team: A review team composed of representatives of TC and PSPC will review the responses. Canada reserves the right to hire any independent consultant(s) or to use any Government of Canada (GC) resources that it considers necessary to review any response. Not all members of the review team will necessarily review all responses.

Confidentiality: Respondents should mark any portions of their response that they consider proprietary or confidential. Responses will be handled in accordance with the provisions of various legislations including the Access to Information Act (R.S. 1985, c. A-1) the Privacy Act (R.S., 1985, c. P-21), and the Defence Production Act (R.S. 1985, c. D-1).

Clarifications: Canada may, at its discretion, contact any respondents to follow up with additional questions or for clarification of any aspect of a response or for one-on-one meetings. Request for clarification will be submitted in writing (by email) and a response will be requested from the respondent within three (3) working days of the transmission of the clarification questions.

Late Response: Canada may, at its discretion, review responses received after the RFI Response Request Date specified on page 1.

**The consultation period will conclude with the release of the final RFP or when the Contract Authority notifies, whichever is sooner.**

## **7.0 OFFICIAL LANGUAGES**

Responses may be submitted in French or English, at the preference of the respondent.

## **8.0 ENQUIRIES**

All enquiries and other communications related to this RFI shall be directed exclusively to the PSPC Contracting Authority. Since this is not a bid solicitation, Canada will not necessarily respond to enquiries in writing or by circulating answers to all respondents.

Respondents with questions regarding this RFI may direct their enquiries to:

Carol Wallingford  
Supply Specialist  
Public Service and Procurement Canada  
Acquisitions Branch  
Aerospace Equipment Program Directorate  
11 Laurier Street, Place du Portage, Phase III, 7C2  
Gatineau, QC K1A 0S5

E-mail address: [Carol.Wallingford@tpsgc-pwgsc.gc.ca](mailto:Carol.Wallingford@tpsgc-pwgsc.gc.ca)

The use of email to communicate is mandatory. Please ensure the subject line states: **T8493-190015/B – RFI Maritime Surveillance Integrated Mission System (MSIMS)**

**Enquiries Containing Sensitive Information:** Suppliers **must not email** any enquiries that contain protected or classified information. If an enquiry must contain protected, classified information or Controlled Goods, suppliers must contact the Contracting Authority and wait for direction as the question(s) must be hand delivered to the Contracting Authority.

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**005cag.T8493-190015**

Buyer ID - Id de l'acheteur  
**005cag**  
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**T8493-190015/B**

**ANNEX “A”**

**DRAFT STATEMENT OF WORK**

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## **ANNEX A**

### **STATEMENT OF WORK**

#### **1 TITLE**

Acquisition of a Maritime Surveillance Integrated Mission System (MSIMS) and the upgrading of three existing MSS6000 mission systems to incorporate new high definition MX 15HDi Electro-Optical Infrared (EO/IR) Camera Systems.

#### **2 INTRODUCTION**

Transport Canada (TC) requires a new Maritime Surveillance Integrated Mission System for its fourth National Aerial Surveillance Program (NASP) aircraft which will integrate some existing sensors and system components already in TC inventory, plus some new system components and sensors which will be provided by the Contractor, which includes a Maritime Surveillance Radar.

Upgrading three existing MSS6000 mission systems and associated ground stations is also required to support the full functionality and capabilities of newly acquired MX15HDi EO/IR Camera Systems.

Lastly, TC requires the options, if so exercised by Canada, for spares, training, and engineering support during the installation of the MSIMS by TC in calendar year 2021.

#### **3 BACKGROUND**

TC owns, operates and maintains a fleet of aircraft across Canada which supports TC's operations, including those of other federal departments and agencies. TC is the lead federal department responsible for preventing pollution from ships and one of the main pillars of its pollution prevention program is the NASP.

TC has three aircraft strategically located across Canada to provide aerial services in support of the NASP. The aircraft are located in Vancouver, BC, Ottawa, ON, and Moncton, NB. A fourth Dash 8 was recently acquired to augment the NASP fleet and as such TC is seeking to procure an MSIMS to prepare it for future NASP missions.

The three NASP aircraft currently in operation are equipped with an MSS6000 mission system that integrates and controls all of the sensors using an Operator friendly, graphical user interface (GUI). The Contractor must upgrade the existing three systems to integrate the MX15HDi EO/IR Camera systems or alternatively the Contractor may offer three new mission systems that meet the same specification as the solution being provided as part of this Contract.

#### 4 ACRONYMS and DEFINITIONS

Terms	Acronym	Definition
Airworthiness Engineering Organization	AEO	
Airborne Automatic Identification System	AIS	
Aircraft Services Directorate	ASD	
Above Sea Level	ASL	
Aids to Navigation	AtoN	AIS land or fixed buoy transmitters used in assisting vessels with pilotage to inland harbours and mooring points.
Bonn Agreement Oil Appearance Code	BAOAC	The Bonn Agreement Oil Appearance Code (BAOAC) is a series of five categories or 'Codes' that describe the relationship between the appearances of oil on the sea surface to the thickness of the oil layer.
Critical Design Review	CDR	
Contacts		They are represented by symbols/icons that may be auto-detected and generated by the MSIMS sensors (i.e. Surveillance Radar and AIS) or manually created by the Operator.
Dead Recon	DR	
Decibel Watt	dBW	
Direction Finder	DF	
Electro-optical Infrared	EO/IR	
Electro-optical Narrow	EON	



Electro-optical Wide	EOW	
False Colour		Refers to a group of color rendering methods used to display images in color which were recorded in the visible or non-visible parts of the electromagnetic spectrum. A false-color image is an image that depicts an object in colors that differ from those a photograph would show.
Factory Acceptance Test	FAT	
Flight Acceptance Test Plan	FLT-AT	
Flight Management System	FMS	
Frames per second	FPS	
Geographical Information System	GIS	
Government Furnished Equipment	GFE	
Ground Moving Target Indicator	GMTI	
Global Positioning System	GPS	
Greyscale		A range of shades of gray without apparent color. The darkest possible shade is black, which is the total absence of transmitted or reflected light. The lightest possible shade is white, the total transmission or reflection of light at all visible wavelengths.
Graphical User Interface	GUI	
Icon Strategy		Refers to the mission system's strategy for visually expressing objects and actions to the Operator. They should be shown on the display in a clear and

		intuitive manner.
High Performance General Purpose Graphics Processing Unit	HPGPGU	
Interface control document	ICD	
Image (geospatial image format)	IMG	
International Maritime Organization	IMO	
International Association of Marine Aids to Navigation & Lighthouse Authorities	IALA	
Infrared	IR	
Infrared/Ultraviolet	IR/UV	
Inverse Synthetic Aperture Radar	ISAR	
Innovation, Science, and Economic Development Canada's	ISED	
Intelligence, Surveillance and Reconnaissance	ISR	
Joint Photographic Experts Group (image file format)	JPG	
Keyhole Markup Language (geospatial data format)	KML	
Local Area Network	LAN	
Maximum Unambiguous Range		The maximum unambiguous range ( $R_{max}$ ) is the longest range to which a transmitted pulse can travel out and back again between consecutive transmitted pulses. In other words, $R_{max}$ is the maximum distance radar energy can travel round trip between pulses and still produce

		reliable information.
Months After Contract Award	MACA	
Mission Display Unit	MDU	
Micrometer	µm	
Motion Imagery Standards Board	MISB	
Maritime Mobile Service Identity	MMSI	
Maritime Surveillance Integrated Mission System	MSIMS	<p>The Maritime Surveillance Integrated Mission System (MSIMS) is the integrated sensor suite that is used by the Operator to conduct various missions. The MSIMS consists of all mission system sensors, the means used to transport their data, the data integration systems, the permanent and temporary data storage, the human-machine interfaces, and the interfaces with other aircraft systems (both physical and digital) as applicable or required.</p> <p>Specifically, the MSIMS includes:</p> <ul style="list-style-type: none"> <li>a. A Surveillance Radar subsystem;</li> <li>b. An Electro-optical/Infrared (EO/IR) subsystem;</li> <li>c. An Automatic Identification System (AIS) subsystem;</li> <li>d. Mission Workstations (MWS), including their displays and input devices;</li> <li>e. A Mission data recording capability; and</li> <li>f. All associated components, hardware, software and data</li> </ul>

		buses.
Maritime Pollution Surveillance Equipment	MPSE	
Mission Workstation	MWS	<p>The MWS is envisioned to at least include the following:</p> <ul style="list-style-type: none"><li>a. The Sensor Operator Displays;</li><li>b. The Sensor Operator Controls;</li><li>c. The Physical Consoles; and</li><li>d. Associated Peripherals and connections.</li></ul>
Nautical Mile	nm	
National Aerial Surveillance Program	NASP	
Object		<p>Refers to any item, either in the physical or virtual world. For example, a ship is considered an object in the physical world. In the virtual world, a document, file, folder, icon, targets, events, images, graphical aids, etc., are all considered objects.</p>
Open Geospatial Consortium	OGC	
Portable Document Format	PDF	
Polygon Target		<p>A figure with three or more sides, and lying on one plane. The polygon target is used to represent the shape and location of different types of data associated with generic and oil spill polygon targets. This data can include, the first marked corner of a polygon target, the area estimation, position of other corners of the target, date and time of creation, estimated oil volume, etc.</p>

Preliminary Design Review	PDR	
Pre-Ground Acceptance Test	Pre-FLT GAT	
Press to Talk	PTT	
Rate of Turn	ROT	
Satellite Communications	SATCOM	
Synthetic Aperture Radar	SAR	
Search and Rescue Transponder	SART	
Still Camera Image	SCI	
Shape file (geospatial data format)	SHP	
Side Looking Airborne Radar	SLAR	
Systems Requirement Review	SSR	
Sensitivity Time Control	STC	
Statement of Work	SOW	
To Be Determined	TBD	
Transport Canada	TC	
Transport Canada Civil Aviation	TCCA	
Track While Scan	TWS	
Coordinated Universal Time	UTC	

## 5 OBJECTIVE AND SCOPE

The Contractor must provide:

- An MSIMS, which will be integrate all the components and sensors specified in the SOW. This MSIMS will be installed on TC's Dash 8, Serial Number 17, by TC or its delegate in the future.
- An upgrade to three existing MSS6000 mission systems to support the full functionality and capabilities of newly acquired MX15Hdi EO/IR Camera Systems (GFE). If it is more cost effective, the Contractor may propose to replace the three existing MSS6000 mission systems with the solution being provided within this contract which integrates and utilizes all existing sensors, meeting the requirements within this SOW and integrates the new MX15Hdi.
- A new Ground Station for the new MSIMS and upgrading of four other existing Ground Stations to fully support the new MX15Hdi camera systems.
- A software upgrade to all MSS6000 systems, if the live streaming solution is different for the new MSIMS, the same solution must be deployed across to all four aircraft.
- Options for:
  - an Operator training course
  - a Maintenance training course
  - spare parts as defined in this SOW.
  - the provision of engineering support on an hourly rate to assist TC ASD with the installation on the aircraft in 2021.
  - two additional fully integrated Maritime Surveillance Radars.

## 6 REQUIREMENTS

### 6.1 Components Overview

The Contractor must provide an MSIMS in accordance with the requirements specified in this document. For commonality of training, engineering design, maintenance support and spare parts, the high level, main components are listed in the table below.

All components must be integrated in the MSIMS. Components indicated with a “Yes” in the table’s GFE column are Government Furnished Equipment, and those indicate with a “No” must be provided by the Contractor and integrated in the MSIMS.

System Components	Description	Government Furnished Equipment (GFE)	Quantity	Part #
<b>Maritime Surveillance Integrated Mission System (MSIMS)</b>	The MSIMS is an integrated sensor suite. It will consist of two Mission Workstations (MWS) that will be used by the Operators to conduct surveillance and pollution missions. The MSIMS controls all mission system sensors (GFE and non-GFE), the means to display their data, the integration of the sensor systems, and the permanent and temporary storage of data, the human-machine interfaces, and the interfaces with other aircraft systems (both physical and digital) as required.	No	1	TBD

<b>Ericsson Side Looking Airborne Radar (SLAR) Antennae</b>	This is the system's primary sensor for detecting pollution. It is a strip map, dual-sided airborne radar, which is used to detect oil-like signatures (anomalies) on the ocean's surface.	Yes	2	103 01/5
<b>Ericsson SLAR Transmit Receive Units</b>	These units transmit and receive the radar signal through the SLAR antennas.	No	2	UFA 10241
<b>SLAR Waveguide Kit</b>	These sets of conduits are required to connect the antennae to the SLAR transmit receive units.	Yes	1	QTL 16-20975 QTL 16-21114
<b>Maritime Surveillance Radar</b>	The MSIMS must include a fully integrated Maritime Surveillance radar with synthetic aperture radar capability, 360 degree capability to identify targets at far standoff distances.	No	1	TBD
<b>Infrared/Ultraviolet (IR/UV) Sensor – Scanner Head</b>	This sensor is used to analyze and map the extent of an oil spill and supports oil volume estimation. It also helps to identify false positives.	Yes	1	MPDS 11819
<b>Infrared/Ultraviolet (IR/UV) Sensor – Controller</b>	This sensor is used to analyze and map the extent of an oil spill and supports oil volume estimation. It also	Yes	1	AB 433M3



	helps to identify false positives.			
<b>Digital Still Cameras</b>	<p>These optical cameras are crucial in capturing evidence, which will be used later by enforcement personnel during investigations.</p> <p>These systems are geo-referenced as each image must retain its metadata and the images will be annotated with mission information.</p> <p>Body: Nikon D5 Lens: AF-S Nikon 24-70mm.</p>	Yes	2	048
<b>Airborne Automatic Identification System (AIS)</b>	<p>This system component is used to obtain vessel identity and voyage information. The AIS information must be integrated with the onboard Geographic Information System (GIS).</p>	No	1	TBD
<b>Onboard Geographical Information System (GIS)</b>	<p>The GIS will allow geospatial data management and visualization of geo-referenced data.</p>	No	1	N/A

<b>MX15HDi – Electro-Optical Infra-red (EO/IR) Camera System</b>	This system component is used to maintain Operators situational awareness, to conduct long-range identification of ships and record evidence of incidents. It can be used during difficult conditions such as hours of darkness or reduced visibility.	Yes	1	49370-48
<b>MX15HDi Hand Controller</b>	Two hand controllers will be provided to operate the MX15HDi.	Yes	2	203760-01
<b>MX15HDi Laser Arming Panel</b>	Two Laser Arming panels will be provided to be integrated in the MWS for operating the laser illuminator	Yes	2	TBD
<b>Satellite Communications Systems</b>	This will allow the NASP to receive mission critical information and transfer email or via FTP evidence directly to enforcement personnel. This will expedite the investigation process and strengthen Canada's position against those suspected polluting the marine environment.	Yes	1	TBD
<b>Satellite Communications (SATCOM) Systems AMT</b>	Antenna required to operate the SATCOM.	Yes	1	1242-A-0010-02 S/N 419

<b>3800 Antenna</b>				
<b>HSD 400 SATCOM Communication Terminal</b>	Communications terminal for the Satcom.	Yes	1	TBD
<b>SATCOM Gateway Router</b>	Cabin Router required for communications on the aircraft.	Yes	1	TBD
<b>Local Area Network (LAN)</b>	LAN must have 10/100/1000 Mbps supporting gigabit Ethernet.	Yes	1	TBD
<b>Dual Mission Workstations (MWS)</b>	The system will include a dual MWS that will integrate all data inputs to ensure maximum efficiency during both routine and emergency operations. One console must be capable of being installed on the left and the other must be capable of being installed on the right side of the Dash-8-100 aircraft standard seat rails.	No	2	TBD
<b>Portable Ground Station</b>	A laptop that will enable the Operators to review, replay, analyze and process mission data in the office and the field environments.	No	1	TBD
<b>Data Processor / server</b>	A data processor, which interfaces the systems sensors (i.e. SLAR, SAR, IR/UV, AIS, Still camera, EO/IR, DF and Audio	No	1	N/A

	recordings) and navigation systems and generates end user outputs.			
<b>Data Storage / Server</b>	A data server for saving and accessing mission data must be provided as part of the MSIMS.	No	1	N/A
<b>Graphical User Interface</b>	A Graphical User Interface (GUI) based solution for Operators interface and data management. It must be compatible with Microsoft Office tools. Data reported from the aircraft must be capable of being read on a Microsoft Windows based computer.	No	1	N/A
<b>Technical Documentation</b>	Electronic versions of all documentation must be provided.	No	1	N/A
<b>MSIMS Global Positioning System (GPS)</b>	The MSIMS is required to have its own GPS and its own dedicated antenna. The Contractor is required to provide antenna specifications to ASD once the GPS has been ordered.	No	1	TBD
<b>Digital Voice Recording</b>	The MSIMS must be capable of digitally recording all voice communications when activated by the Operator(s).	No	1	N/A

<b>Portable Mission Display Units (MDU)</b>	Two portable MDUs must be supplied and be able to be run concurrently with both Operator consoles.	No	2	TBD
<b>Direction Finder (DF)</b>	A DF system must be fully-integrated in the MSIMS.	No	1	TBD
<b>Stand-alone Video Recording device for MX-15HDi</b>	Curtiss-Wright VRDV7000 Dual Channel HD Video Recorder will be integrated into the MWS by TC ASD at a later date to enable direct recording of the MX15HDi data.	Yes	1	VRDV7000

## 6.2 Detailed Technical Requirements

### 6.2.1 General

The MSIMS is an integrated sensor suite which must consist of two MWSs that will be used by Operators to conduct both surveillance and pollution missions. The MSIMS controls all mission system sensors (GFE and non-GFE), the means to display their data, the integration of the sensor systems, the permanent and temporary storage of data, the human-machine interfaces, and the interfaces with other aircraft systems (both physical and digital) as required.

The MSIMS must integrate and control:

- An Ericsson dual-sided side-looking airborne radar (SLAR)
- A Maritime Surveillance Radar;
- An MX15HDi EO/IR Camera System;
- An Automatic Identification System (AIS);
- A Daedalus IR/UV Line Scanner;
- Two MWSs, including their displays, input and output devices;
- A Mission data recording capability;
- A Direction Finder;
- A Satellite Communications (SATCOM) System; and
- All associated software components, hardware, and data buses as defined by this SOW.

When the term “Operator” is used it applies equally to both Operators and their

respective MWS, unless otherwise specified.

While the intent is for a single Operator to normally control all of the MSIMS sensor systems, the MSIMS will be designed to allow two Operators to use the system simultaneously.

The Mission System must be in accordance with the following requirements.

- REQ 1. -** The MSIMS must have already achieved a Technology readiness level of 9 in accordance with Innovation, Science, and Economic Development Canada's (ISED) definition. <https://www.ic.gc.ca/eic/site/080.nsf/eng/00002.html>
- REQ 2. -** Controls for the MSIMS's mission sensors must be provided at each Mission Work Station.
- REQ 3. -** The MSIMS installations being special operations equipment may require integration to aircraft systems. Where integration occurs, the design must have no effect on the continued airworthiness and operation of the NASP aircraft.
- REQ 4. -** The MSIMS must provide a standardized architecture for operation, functionality and user interface across the NASP fleet of aircraft allowing interoperability of Surveillance Officers with only one training and standards program.
- REQ 5. -** The Contractor must ensure the system design and materials used to construct the MSIMS, including its sensors and subsystems ensure bonding and Electromagnetic Compatibility between the systems and the aircraft.
- REQ 6. -** Desirable Requirement - The MSIMS, except the Surveillance Radar, should be delivered 7 months after Contract Award. The Contractor must demonstrate the project timeline in their project management plan.
- REQ 7. -** Desirable Requirement - The Surveillance Radar should be delivered 14 months after Contract Award. The Contractor must demonstrate the project timeline in their project management plan.

### **6.2.2 System Operating Environment**

The MSIMS and its associated sensors will be subjected to varying environmental conditions.

- REQ 8. -** The MSIMS, including its sensors and subsystems, must be constructed to operate, at a minimum, within the following environmental conditions:
  - a) Interior temperature:
    - i. + 10 °C to + 30 °C (operating);
    - ii. - 30 °C to + 35 °C (non-operating); and
    - iii. - 40 °C to + 70 °C (extreme non-operating).

- b) Exterior temperature:
  - i. – 65 °C to + 70 °C (extreme operating).

- REQ 9. -** All equipment (interior and exterior) will be subjected to the vibration and shock environment of the aircraft and must meet the shock and vibration standards in accordance with RTCA-DO160G.
- REQ 10. -** All equipment (interior and exterior) will be exposed to humidity and must meet standards in accordance with RTCA-DO160G
- REQ 11. -** The Contractor must document and provide the environmental limits of components, systems and sub-systems to include:
- a) The actual known environmental limits;
  - b) Indicate the limits that are unknown; and
  - c) Identify any special operational procedures to be included in the System Operations Manual in order to protect the system from various environmental conditions.

### 6.2.3 System Requirements

#### Information

The requirement at REQ-12 is intended to mean that at most 3 Operator actions starting from the top-level menu(s) can be used to activate, deactivate or modify any function of the MSIMS. This means that from the highest menu(s), a maximum of 2 levels of sub-menus can be used, as the 3rd Operator action will be used for manipulation of functions.

- REQ 12. -** The MSIMS Operator-machine interface architecture must enable the Operator to access all sensor controls and recording functions within a maximum three level hierarchy, including the top-level menu(s).
- REQ 13. -** Unless otherwise specified, the MSIMS must provide at each MWS all the functions necessary to control and monitor the sensors and any associated systems.
- REQ 14. -** The MSIMS must allow either of the MWS's to exercise full control over individually selected sensors and their associated systems.
- REQ 15. -** The MSIMS must provide the Operator with a means to selectively display any selected mission and sensor system's video and data at each MWS.
- REQ 16. -** The MSIMS must allow the Operator to display and temporarily remove from display, any combination of the following individual windows at each MWS:
- a) Moving Map;

- b) Electro-optical Narrow;
- c) Electro-optical Wide;
- d) IR sensor;
- e) SLAR;
- f) Surveillance Radar;
  - i. ISAR;
  - ii. SAR; and
- g) IR/UV.

Note: The intent is to display a), b), c), d), e), f) and g) as individual windows. Surveillance Radar display at f) could be displayed as individual windows or as a single window with only one display enabled at any one time. As such the Operator will be able to individually select from 1 to a maximum of 7 or 9 windows.

- REQ 17. -** The MSIMS must run on Windows 10 operating system, with a GUI for the Operator's control and management of data.
- REQ 18. -** The MSIMS must provide the capability for Canada to install the Microsoft Office suite.
- REQ 19. -** The MSIMS must provide the Operator with the means to export reports from the system in Portable Document Format (PDF) and in a Microsoft Word and Excel.
- REQ 20. -** The MSIMS must have its own dedicated GPS and the specification of the unit chosen by the Contractor will be discussed and approved at the Preliminary Design Review (PDR) and Critical Design Review (CDR) meetings.
- REQ 21. -** All data must be geo-rectified and geo-referenced to allow for accurate mapping and spatial relation of mission data. The frequency of sampling must be high enough to allow for a correct geographical representation of the sensor data.
- REQ 22. -** The maximum weight of the MSIMS and MWS (all units) must not exceed 1050 lbs. (477 kg).
- REQ 23. -** The system must not exceed power available on the aircraft, estimated to be:
- a) 60 HZ 115V AC Power = 1000 VA; and
  - b) 28 VDC Power = 250 Amps per side.

#### 6.2.4 Airframe and Flight Envelope

- REQ 24. -** The MSIMS must be capable of operating within the following flight parameters:
- a) Ground speed                      110 knots to 300 knots (ground speed)
  - b) Altitude                              200 feet to 25,000 feet (above sea level)



## 6.2.5 Sensor Requirements

The following outlines the requirements associated to each of the sensors to be integrated into the MSIMS.

### 6.2.5.1 *Ericsson Side-Looking Airborne Radar (SLAR)*

#### Information

The Ericsson SLAR is the NASP's primary sensor for large swath monitoring of the oceans' surface. It is a proven sensor that is already installed on three of the NASP's maritime patrol aircraft. The Ericsson SLAR is a strip map, dual-sided airborne radar that displays solid targets and sea-clutter. Dampening of sea-clutter indicates the potential for a hydrocarbon on the surface requiring further investigation. The SLAR is also used to analyze and map the extent of marine pollution and link to a potential source.

The Contractor will not be required to provide the SLAR antennae as they will be provided and installed by TC ASD. The Contractor will be required to provide the two transmit receive units and the associated software to operate the SLAR.

#### 6.2.5.1.1 Ericsson SLAR Performance Requirements

**REQ 25. -** The MSIMS must integrate two Ericsson SLAR antennas, part number 103 01/5 to produce a dual-sided, strip-map radar image with the following specifications:

- |                               |                            |
|-------------------------------|----------------------------|
| a) Frequency                  | X-band;                    |
| b) Polarization               | VV;                        |
| c) Antenna Azimuth Beam width | < 0.7°;                    |
| d) Range resolution           | < 90 m at all slant ranges |

**REQ 26. -** Deleted Requirement

**REQ 27. -** The SLAR processing software must be capable of producing imagery with ground range swath width of 80 km or greater per side in the dual-sided configuration and with a minimum pixel resolution of 60 m x 60 m.

**REQ 28. -** All SLAR data must be recorded automatically when the sensor is operating.

**REQ 29. -** The SLAR must record a new line of data, at a minimum, every 60 m of flight over ground.

#### 6.2.5.1.2 SLAR Properties and Controls

**REQ 30. -** The MSIMS must provide a means for the Operator to control the SLAR functions including, at a minimum, selecting:

- a) SLAR window visible or not;

- b) between Operate and Standby modes; and
- c) Which antennae can be used at any point in time with the options being: both, right or left.

- REQ 31. -** The MSIMS must provide the Operator with a means to independently adjust the SLAR gain (amplification of the signal) on each antennae receiver with at least the following functionality:
- a) Adjust the gain applies the changes to the raw SLAR imagery;
  - b) Change in gain are in increments of one percent from 0 - 100%;
  - c) SLAR gain adjustments are controlled by a GUI with the trackball and by dials; and
  - d) Gain settings are displayed on the GUI.
- REQ 32. -** The MSIMS must provide the Operator with a means to independently adjust the Sensitivity Time Constant (STC) on the raw SLAR data for each antennae with the following states: Low, Medium and High.
- REQ 33. -** The SLAR, under normal operation, will not be operated on the ground. The MSIMS must provide a means for Canada to transmit the SLAR on the ground for maintenance checks.

#### **6.2.5.1.3 SLAR Display and Annotation**

- REQ 34. -** The SLAR must produce continuous strips of imagery in the form of a waterfall display with the most recent data at the top of the window.
- REQ 35. -** The SLAR data must be reviewable by scrolling backward in time freezing the display of real-time data.
- REQ 36. -** The MSIMS must allow the Operator to scroll through the SLAR data using the Multi-axis joystick, the keyboard arrow keys on the keyboard and using the cursor to move a scroll bar.
- REQ 37. -** The SLAR display zoom level must be controlled by the Operator using a Multi-Axis Joystick Controller and keyboard functionality (i.e +/- keys)
- REQ 38. -** The MSIMS must provide Operator control over the zoom level of the SLAR display with, at a minimum, the following predefined zoom levels:
- a) 25% - 86 nm;
  - b) 33% - 86 nm;
  - c) 50% - 86 nm;
  - d) 100% - 42 nm;
  - e) 200% - 20 nm;
  - f) 300% - 14 nm;
  - g) 400% - 10 nm;

- h) 500% - 8 nm;
- i) 600% - 6 nm; and
- j) 700% - 5 nm.

- REQ 39.** - The MSIMS must allow the Operator to pan side to side in the SLAR window using the Multi-axis joystick, the keyboard functionality and using the cursor to move a scroll bar.
- REQ 40.** - When SLAR data is being reviewed by an Operator, new data must be simultaneously acquired and stored but not shown on the display until the Operator selects to return to the live data stream using a single function key or Multi-axis joystick button control.
- REQ 41.** - The SLAR display distance markers must be displayed on the SLAR imagery at fixed increments of 5 nm, regardless of zoom level.
- REQ 42.** - The Operator must have a means to select and deselect the display of SLAR distance markers.
- REQ 43.** - The MSIMS must continuously display the numeric values of zoom level and marker distance on the SLAR window.
- REQ 44.** - The MSIMS must provide the Operator with a means to adjust the contrast and brightness of the SLAR display that can be used both on the aircraft and on the Ground Station.
- REQ 45.** - The MSIMS must provide the Operator with a means to independently adjust the SLAR Contrast and Brightness with at least the following functionality:
- a) Changes in Contrast are in increments of one percent from 0 - 100%;
  - b) Changes in Brightness are in increments of one percent from 0 - 100%;
  - c) The Contrast and Brightness default values are both 50%;
  - d) Adjustments of Contrast and Brightness are controlled by a GUI with the trackball and by dials;
  - e) Changes apply to the displayed SLAR imagery in the SLAR window and to the Georeferenced SLAR imagery on the Moving Map;
  - f) Contrast and Brightness settings are displayed on the GUI.
- REQ 46.** - Adjusting the contrast and brightness of the SLAR display must not affect the raw SLAR data only the display in the SLAR window and the georeferenced SLAR data on the moving map.
- REQ 47.** - The SLAR display must default to grey scale.
- REQ 48.** - The MSIMS must provide a means to apply a false color to the SLAR display.
- REQ 49.** - The MSIMS must provide a means to invert the grey and color scale of the SLAR display.

- REQ 50. -** Each line of SLAR recorded data must be annotated and displayed with, at a minimum, the following information:
- a) Mission number;
  - b) Date (year, month, day);
  - c) Time (UTC);
  - d) Aircraft position information (latitude, longitude);
  - e) Altitude;
  - f) Ground speed;
  - g) Course;
  - h) Sensor settings including Left and Right SLAR:
    - i) Gain; and
    - ii) STC.
  - i) Contrast and brightness display settings.
- REQ 51. -** The MSIMS's internal GPS must be used to annotate SLAR recorded data with the following information:
- a) Date (year, month, day);
  - b) Time (UTC);
  - c) Aircraft position information (latitude, longitude);
  - d) Course;
  - e) Altitude; and
  - f) Ground speed.

#### **6.2.5.2      *Infrared / Ultraviolet (IR/UV) Sensor***

##### **Information**

The IR/UV Sensor is used to analyze and map the extent of surface phenomenon. It is primarily used to map marine pollution, but also flood and fire activity. The IR/UV Sensor plays a key role in mapping the extent of oil spill, determining the location of the thickest parts and supporting the calculation of volume of oil estimates. It is used to link vessels to marine pollution through the mapping of the cold water plume and helps to identify false positives.

The Contractor will not be required to provide the IR/UV Sensor as it will be provided and installed by TC ASD. The Contractor will be required to provide the associated software to operate the IR/UV.

##### **6.2.5.2.1      IR/UV Performance Requirements**

- REQ 52. -** The MSIMS must integrate a GFE IR/UV Sensor that must be integrated with the MSIMS GPS to produce two-dimensional imagery in a line-by-line process with a typical image angle of up to 40° to each side of the aircraft centerline (resulting in > 80° total field of view).
- REQ 53. -** The MSIMS must have a data sampling frequency that ensures data overlap with

no gaps between lines for the IR/UV Sensor.

- REQ 54. -** The IR/UV Sensor processing must automatically compensate for aircraft ground speed to ensure the image is at the same scale along the width and length of the image.
- REQ 55. -** The IR/UV imagery must have a ground range swath width and pixel resolution that varies with altitudes between 200 feet and 25,000 feet.
- REQ 56. -** The MSIMS must provide a minimum IR/UV ground swath width of 750 m and minimum pixel resolution of 3 m x 3 m when positioned at 1500 feet above sea level (ASL).
- REQ 57. -** The MSIMS must automatically record all IR/UV Sensor data when the sensor is operating.
- REQ 58. -** The MSIMS must record IR/UV scan lines at a corrected frequency to ensure each line of data corresponds to the resolution on ground.

#### **6.2.5.2.2 IR/UV Controls**

- REQ 59. -** The MSIMS must provide a means for the Operator to control the IR/UV functions including, selecting:
  - a) IR/UV window as displayed on the screen or not;
  - b) IR/UV sensor as active or not; and
  - c) Operate or Standby mode
- REQ 60. -** The IR/UV Sensor Operator controls must provide direct GAIN and LEVEL control to the sensor using the GUI with trackball control and by separate dials.
- REQ 61. -** The IR and UV GAIN and LEVEL controls must allow the Operator to independently adjust each from 0 - 100% in increments of 1%.
- REQ 62. -** The GAIN and LEVEL settings must be displayed in the sensor control GUI and on the annotation block of the IR/UV imagery.

#### **6.2.5.2.3 IR/UV Display and Data Annotation**

- REQ 63. -** The MSIMS must produce a continuous strip of IR/UV imagery in the form of a waterfall display with most recent data at the top of the window.
- REQ 64. -** The MSIMS must display IR imagery on the left and UV imagery on the right of the display window with a reference colour bar separating the two images.
- REQ 65. -** The IR/UV Sensor data must be reviewable by scrolling backward in time freezing the display of real-time data.

- REQ 66. -** The MSIMS must allow the Operator to scroll through the IR/UV data using the Multi-axis joystick, the keyboard functionality (i.e arrow keys) on the keyboard and using the cursor to move a scroll bar.
- REQ 67. -** When IR/UV Sensor data is being reviewed by an Operator, new data must be simultaneously acquired and stored but not shown on the display until the Operator selects to return to the live data stream using a single function key and / or the Multi-axis Joystick Control button.
- REQ 68. -** The IR/UV Sensor display zoom level must be controlled by the Operator using a Multi-Axis Joystick Controller and keyboard functionality (i.e +/- keys).
- REQ 69. -** As the IR/UV Sensor ground swath wide increases with altitude, the displayed distance markers must auto-adjust to compensate while providing the same predefined zoom levels as below.
- REQ 70. -** The MSIMS must provide display IR/UV Sensor window with predefined zoom levels and marker distances with, at a minimum, the following for the Sensor positioned at 1500ft ASL:
- a) 25%, 1 distance marker at 500m on each sensor;
  - b) 33%, 1 distance marker at 500m on each sensor;
  - c) 50%, 3 distance markers at 200m on each sensor;
  - d) 100%, 7 distance markers at 100m on each sensor;
  - e) 200%, 15 distance markers at 50m on each sensor;
  - f) 300%, 15 distance markers at 50m on each sensor;
  - g) 400%, 37 distance markers at 20m on each sensor;
  - h) 500%, 37 distance markers at 20m on each sensor;
  - i) 600%, 37 distance markers at 20m on each sensor;
  - j) 700%, 37 distance markers at 20m on each sensor; and
  - k) 800%, 37 distance markers at 20m on each sensor.
- REQ 71. -** The MSIMS must allow the Operator to pan side to side in the IR/UV window using the Multi-axis joystick, keyboard functionality (i.e arrow keys) and using the cursor to move a scroll bar.
- REQ 72. -** The IR/UV display must default to grey scale with black at the bottom of the reference bar and white at the top.
- REQ 73. -** The MSIMS must provide a means to for the Operator to selectively apply a false color to the IR/UV display.
- REQ 74. -** When Targets are created in either the IR or UV sensors, they must be displayed in both the IR and UV sensor displays.
- REQ 75. -** Each line of IR/UV Sensor data must be annotated and displayed with, at a minimum, the following information:

- a) Mission number;
- b) Date (year, month, day);
- c) Time (UTC);
- d) Aircraft position information (latitude, longitude);
- e) Altitude;
- f) Ground speed;
- g) Heading;
- h) Sensor settings including the IR and UV:
  - i) GAIN; and
  - ii) LEVEL;
- i) Display settings of contrast and brightness

- REQ 76. -** The MSIMS's internal GPS must be used to annotate IR/UV recorded data with the following information:
- a) Date (year, month, day);
  - b) Time (UTC);
  - c) Aircraft position information (latitude, longitude);
  - d) Course;
  - e) Altitude; and
  - f) Ground speed.
- REQ 77. -** The MSIMS must display distance markers on the IR/UV that auto-adjust as the zoom level is changed by the Operator.
- REQ 78. -** The MSIMS must continuously display the numeric values of zoom level and marker distance on the IR/UV window.
- REQ 79. -** The MSIMS must provide the Operator with a means to adjust the contrast and brightness of the IR/UV display that can be used both on the aircraft and on the Ground Station.
- REQ 80. -** The MSIMS must provide the Operator with a means to independently adjust the IR/UV Contrast and Brightness with, at a minimum, the following parameters:
- a) Changes in Brightness are in increments of one percent from 0 - 100%;
  - b) Changes in Contrast are in increments of one percent from 0 - 100%;
  - c) The Contrast and Brightness default values are both 50%;
  - d) Adjustments of Contrast and Brightness are controlled by a GUI with the trackball and by dials;
  - e) Changes apply to the displayed IR/UV imagery in the SLAR window and to the Georeferenced IR/UV imagery on the Moving Map;
  - f) Contrast and Brightness settings are displayed on the GUI.
- REQ 81. -** Adjusting the Contrast and Brightness of the IR/UV Sensor display must not affect the raw IR/UV data only the display in the IR/UV window and on the georeferenced IR/UV data on the Moving Map.

- REQ 82. -** The MSIMS must provide the Operator with a means to control, at a minimum, the following IR/UV display functions:
- a) Select image colouring on and off;
  - b) Select distance markers on and off; and
  - c) Return to the default display using a single button click.

### **6.2.5.3      *Digital Still Image Camera System***

#### **Information**

Two Digital Still Image Camera Systems will be carried on the aircraft at all times. One camera will be used at all times and the second camera will serve as a spare, which means that both cameras need to be modified to be able to be hard wired to the MSIMS. The Contractor will not be required to provide the cameras as they will be provided and installed by TC ASD. The Contractor will be required to provide the data annotation and the associated software to operate the still camera systems as part of the MSIMS.

- REQ 83. -** The Digital Still Image Camera System must be integrated into the MSIMS using a hardwired plug-in system.
- REQ 84. -** Two Digital Still Image Camera connection boxes for data link and power supply must be provided by the Contractor for installation in the aircraft by Canada.
- REQ 85. -** The Digital Still Image Camera hardwired plug-in system must provide the following:
- a) Power to the Digital Still Image Camera System;
  - b) Data transfer between the Digital Still Camera and the MSIMS;
  - c) A cable long enough to allow the observer to take photos from the port and starboard positions without unplugging the camera;
  - d) The ability to unplug the digital camera so it can be stored for takeoff landing; and
  - e) Automatically transmit “raw” images to the MSIMS.
- REQ 86. -** The MSIMS must store all digital full resolution “raw” images.
- REQ 87. -** The MSIMS must create and store a copy of each digital “raw” image with an annotation block at the top of the image that includes, at a minimum, the following information:
- a) Mission ID number;
  - b) Object ID number;
  - c) Date (year, month, day) when the image was captured;
  - d) Time (UTC) when the image was captured;
  - e) Aircraft position (Latitude/Longitude) when the image was captured;
  - f) Aircraft course, speed and altitude when the image was captured;
  - g) Connection point source (port/starboard observer station); and
  - h) Image number.



- REQ 88. -** The MSIMS must assign a unique image ID number to each Still Camera Image (SCI).
- REQ 89. -** When an Operator is editing a SCI, the MSIMS must:
- a) Automatically save a copy of the image when editing is initiated;
  - b) Open the copied image in standard image editing software (e.g. MS Paint);
  - c) Provide a separate SCI number for the edited image;
  - d) Allow the edited image to be, at a minimum:
    - i) Reviewed;
    - ii) Re-edited;
    - iii) Emailed; and
    - iv) Deleted.
- REQ 90. -** Metadata and properties of the SCIs must be maintained in Exchangeable Image File Format.
- REQ 91. -** Raw digital images must contain the following metadata from the camera and MSIMS:
- a) Camera model;
  - b) F-stop;
  - c) Exposure time;
  - d) ISO speed;
  - e) Exposure Bias;
  - f) Focal length;
  - g) Max aperture;
  - h) Metering Mode;
  - i) Image details: Dimensions, Width, Height, Horizontal; Resolution, Vertical Resolution, BITS depth, Colour Representation; and
  - j) Position geocoding including all dynamics with precision equal to GPS/GNSS capabilities.
- REQ 92. -** Desirable Requirement - Annotated images generated from the “raw” image should contain the same metadata as the raw digital images.

#### **6.2.5.4      *MX-15HDi EO/IR Camera System***

##### **Information**

The MX-15HDi Camera System plays a key role in Intelligence, Surveillance and Reconnaissance (ISR) by providing long-range surveillance capability as well as the acquisition, tracking, classification and identification of targets. In the pollution role the MX-15HDi Camera System is used to locate, assess and document oil spills and sea surface anomalies.

The Contractor will not be required to provide the MX 15HDi Camera Systems as they will

be provided as GFE and installed by TC ASD. The Contractor will be required to provide the software to fully integrate the MX 15 HDi Camera Systems.

- REQ 93.** - The MSIMS must fully integrate and support functionality of the MX-15HDi EO/IR Camera System which will be furnished by Canada as GFE. Canada will also provide an Interface Control Document for EO/IR integration into the MSIMS and the cables for the EO/IR System as GFE.
- REQ 94.** - The MX-15HDi EO/IR Camera System must be able to operate standalone if the MSIMS becomes unserviceable. This includes the recording features associated with the Curtiss-Wright VRDV-7000.
- REQ 95.** - The primary control of the MX-15HDi EO/IR Camera System must be through the MX-15HDi hand controller (GFE).
- REQ 96.** - Desirable Requirement - The MSIMS should utilize the MX-15HDi RCS interface for transmitting commands from the MSIMS to the MX-15HDi and for receiving status messages.
- REQ 97.** - Desirable Requirement - The MSIMS MX-15HDi EO/IR Camera System should have an Operator-selectable tool for assessing an objects size on the GUI.
- REQ 98.** - Desirable Requirement - The MSIMS MX-15HDi EO/IR Camera System should have an Operator-selectable tool for assessing the distance between targets on the GUI.
- REQ 99.** - The MSIMS must provide a means to transfer the coordinates of any selected Object to allow Operator-initiated slewing of the MX-15HDi EO/IR Camera System.
- REQ 100.** - The MX-15HDi EO/IR Camera System's line of sight must be continuously displayed on the Moving Map.
- REQ 101.** - The MSIMS must provide the Operator with the means to select and deselect the display of the MX-15HDi EO/IR Camera System's line of sight on the Moving Map.
- REQ 102.** - The MSIMS MX-15HDi EO/IR Camera System must generate a reticle within its imagery showing the location of the sensor's optical centerline.
- REQ 103.** - The MSIMS must provide a means for the Operator to display and control the MX-15HDi EO/IR Camera System's graphical overlays which includes, at a minimum, the following:
- a) Graphical representation of turret orientation for aiming and steering;
  - b) System alerts and warning messages;
  - c) Status information about the:
    - i) Turret; and

- ii) Payload sensors.
- d) Geographic positional information for the:
  - i) Aircraft; and
  - ii) Target.

- REQ 104.** - The MSIMS must provide the Operator with a means to create a target from the MX-15HDi EO/IR Camera System's target coordinates by selecting a single button or function.
- REQ 105.** - The Moving Map must be able to be centred on the line of sight of the MX15HDi EO/IR Camera System.
- REQ 106.** - The MSIMS must terrain compensate the MX-15HDi EO/IR Camera System's target and line of sight positions using digital terrain elevation data available for all of Canada.
- REQ 107.** - The target position from the MX-15HDi EO/IR Camera System displayed on the Moving Map must be terrain compensated.

#### **6.2.5.5      *Automatic Identification System (AIS)***

##### **Information**

The AIS is used to acquire vessel identity and voyage information from ships equipped with AIS transponders.

An AIS Aid to Navigation (AtoN) is a digital aid to navigation that is broadcast by an authorized service provider using the AIS Message that is displayed on the Moving Map and Radar. An AIS AtoN can represent a physical or virtual AIS AtoN.

The Contractor will be required to provide the AIS hardware and associated software to integrate the AIS with the other sensors and the MSIMS.

- REQ 108.** - The MSIMS must include a line-of-sight AIS receiver.
- REQ 109.** - The AIS must conform to International Association of Marine Aids to Navigation & Lighthouse Authorities (IALA) and International Maritime Organization (IMO) Standards.
- REQ 110.** - The AIS must have dual parallel receivers capable of monitoring VHF channel 87 (161.975 MHz) and channel 88 (162.025 MHz) simultaneously.
- REQ 111.** - All AIS contacts must be automatically imported into the MSIMS with the following attributes:
- a) Category of target (AIS);
  - b) Type (i.e vessel or other);

- c) Time (UTC);
- d) Position – latitude/longitude;
- e) Course (degrees – true);
- f) Speed (knots);
- g) Vessel type – AIS A or B;
- h) Name;
- i) Call Sign;
- j) IMO number;
- k) Port of Call;
- l) Destination;
- m) ETA;
- n) Ship/cargo type;
- o) Length/Width;
- p) True heading;
- q) ROT (degrees/min);
- r) Max draught;
- s) Nav status;
- t) Maritime Mobile Service Identity (MMSI) number; and
- u) Status (active or inactive signal).

**REQ 112.** - The MSIMS must provide the Operator with a means to display AIS contacts properties including, at a minimum, the following:

- a) Category of target (AIS);
- b) Type (i.e vessel or other);
- c) Time (UTC);
- d) Position – latitude/longitude;
- e) Course (degrees – true);
- f) Speed (knots);
- g) Vessel type – AIS A or B;
- h) Name;
- i) Call Sign;
- j) IMO number;
- k) Port of Call;
- l) Destination;
- m) ETA;
- n) Ship/cargo type;
- o) Length/Width;
- p) True heading;
- q) ROT (degrees/min);
- r) Max draught;
- s) Nav status; and
- t) MMSI number.

**REQ 113.** - The MSIMS must display an identifying symbol for the following AIS contacts:

- a) Vessels;
- b) Offshore installations; and

c) AtoN.

**REQ 114.** - The MSIMS must display the following information associated with an AIS vessel contact symbol:

- a) Direction of travel;
- b) If the contact is active or inactive; and
- c) All positions received from the contact to provide the track history.

**REQ 115.** - The MSIMS must provide a means to visually differentiate active and inactive AIS targets through colours or different symbology.

**REQ 116.** - The MSIMS must have the capacity to process and display at least 3000 AIS contacts.

**REQ 117.** - The MSIMS must have a capacity to process and display, at a minimum, 100 AIS aid-to-navigation (AtoN) reference points.

**REQ 118.** - The MSIMS must provide the Operator with a means to search AIS Targets using, at a minimum, the following attributes:

- a) Vessel's name;
- b) IMO number; and
- c) MMSI number.

**REQ 119.** - The MSIMS must provide the Operator with a means to display the total number of AIS targets detected during a flight.

#### **6.2.5.6      *Direction Finder***

##### **Information**

The location of people in distress needs to be quickly and accurately determined in order to maximize the chances of a successful rescue, regardless of the prevailing conditions or the theatre of operation. A DF monitors specific radio frequencies, primarily emergency transponders or other radio transmitters, providing a bearing and strength to the signal. These are used by the NASP crews to locate the source by triangulating the transmission.

The Contractor will be required to provide the Direction Finder and associated software to integrate the Direction Finder with the other sensors and the MSIMS.

**REQ 120.** - A DF must be fully integrated into the MSIMS.

**REQ 121.** - The DF must be capable of homing on all maritime and aeronautical frequencies. Homing device to monitor emergency channels 121.5, 156.8, 243.0, and 406.025 MHz.

- REQ 122.** - The DF must display, both visually on the Moving Map and numerically, the relative bearing and signal strength.
- REQ 123.** - The MSIMS must provide the Operator with a means to:
- a) Display, in a separate window, a graphical representation of the bearing line as well as the numeric values of the bearing in degrees and the signal strength;
  - b) Automatically display the DF bearing line on the map from aircraft when a DF transmission is detected;
  - c) Automatically update all DF information on the MSIMS at the same rate as received by the DF receiver;
  - d) Status of DF indicated on the MSIMS status bar icon (active/inactive);
  - e) Turn the display of DF bearing line(s) on the Moving Map top off;
  - f) Save and display individual bearings lines as Objects in the MSIMS to triangulate the signal; and
  - g) Search for DF lines in the MSIMS database.

#### **6.2.5.7      *Maritime Surveillance Radar***

##### **Information**

The MSIMS Surveillance Radar will provide over-water search, detection and classification of targets throughout the mission envelope of the Dash 8 aircraft.

The Contractor will be required to provide the Maritime Surveillance Radar and associated software to integrate it with the other sensors and the MSIMS.

- REQ 124.** - The system must include a Surveillance Radar.
- REQ 125.** - The Surveillance Radar must provide the following modes of operation:
- a) Small target mode;
  - b) Long range surveillance mode with a range of 200NM;
  - c) Short Range Awareness mode;
  - d) Weather avoidance mode;
  - e) Turbulence detection;
  - f) Air to Air mode;
  - g) Synthetic Aperture Radar mode (SAR);
  - h) Spot SAR;
  - i) Strip SAR;
  - j) Track While Scan (TWS) mode;
  - k) Inverse Synthetic Aperture Radar (ISAR) mode;
  - l) Range Profile mode; and
  - m) Ground Moving Target Indicator (GMTI).

- REQ 126.** - The Surveillance Radar must be frequency separated from the SLAR to avoid mutual interference as both radars must operate simultaneously.

- REQ 127.** - The MSIMS must be capable of operating with and without the Surveillance Radar system being installed and/or serviceable.
- REQ 128.** - The Surveillance Radar must continue to be fully operational if the MSIMS is unserviceable.
- REQ 129.** - The Surveillance Radar must have the following mandatory requirements:
- a) Capable of over-water searching and detection of surface targets in various sea states and target density conditions;
  - b) Capable of sea and ground clutter elimination;
  - c) Capable of simultaneously tracking and displaying a minimum of 1000 targets of interest; and
  - d) Capable of classifying small, medium and large targets; and
  - e) Capable of detecting Search and Rescue transponders.
- REQ 130.** - The Surveillance Radar must provide the Operator with the following radar tilt controls:
- a) Automatic stabilized elevation coverage dependent on the Operators selected range scale and aircraft altitude;
  - b) Slaved antenna elevation based on the line of sight centered on a target or geographic position; and
  - c) Manual control by the Operators.
- REQ 131.** - The Surveillance Radar must operate through a 360 degree azimuth sector, in all search modes.
- REQ 132.** - The Surveillance Radar system must control the beam scan angle relative to the earth's horizon to compensate for aircraft roll maneuvers of up to 25 degrees.
- REQ 133.** - The Surveillance Radar antenna must be stabilized in the radar scanning plane throughout the mission envelope, compensating for aircraft movement in pitch and roll, to maintain a level horizon angle displayed to the Operator within the limits of the antenna.
- REQ 134.** - The Surveillance Radar must provide the Operator with a means to declutter individual Objects, information layers, symbology, or groups thereof, from the display.
- REQ 135.** - The Surveillance Radar must provide a means for the Operator to manually filter the contacts detected with the Surveillance Radar based on speed and course.
- REQ 136.** - The Surveillance Radar must be capable of interleaving weather radar system functions and Surveillance Radar functions.

- REQ 137.** - The Surveillance Radar must detect radar search and rescue transponder signals (SART) and provide a visual indication to the Operator to assist in locating the source of the signal.
- REQ 138.** - The Surveillance Radar must provide sector scanning centered on an Operator selected:
- a) Bearing relative to aircraft;
  - b) Bearing relative to North;
  - c) Contact; and
  - d) Geographical position.
- REQ 139.** - The Surveillance Radar system must detect targets through elevation angles from +/- 30 degrees, centered on the aircraft centreline bearing, optimizing the elevation position of the beam as a function of the selected mode and scenario.
- REQ 140.** - The MSIMS must provide a means to display to the pilot and co-pilot an indication that the Surveillance Radar is transmitting.
- REQ 141.** - The Surveillance Radar must be automatically inhibited from transmitting on the ground unless the override switch at REQ 142 is selected.
- Note: The intent of this requirement is to provide the Operator with a means to test the Surveillance Radar when taxiing before take-off. A positive on/off control switch will be provided to ensure ground crew safety.
- REQ 142.** - The Surveillance Radar must be capable of having a single override switch, or equivalent, mounted in the cockpit by TC-ASD during installation, to allow the Radar to transmit while on the ground.
- REQ 143.** - The Surveillance Radar's Antenna must be automatically inhibited from moving when the Radome is open unless the maintenance override at REQ 142 is selected.
- REQ 144.** - If the Surveillance Radar requires a Radome then the Surveillance Radar must have a maintenance override in the vicinity of the Surveillance Radar Antenna to allow the antenna to rotate but not transmit when the Radome is opened for maintenance activities.
- REQ 145.** - The Surveillance Radar must have a maximum unambiguous range for surface search of greater than 170 nautical miles at 20,000 feet altitude.
- REQ 146.** - The GMTI mode must simultaneously detect moving targets on sea and land.
- REQ 147.** - The GMTI mode must provide a means for the Operator to manually initiate the tracking of contacts on land.



#### 6.2.5.7.1 Inverse Synthetic Aperture Radar Mode (ISAR)

**REQ 148.** - The MSIMS Surveillance Radar ISAR function must:

- a) Produce and display continuous ISAR imaging in real time;
- b) Be operational up to at least a 42 NM Slant range;
- c) Have a one-dimensional Integrated Side Lobe Ratio/Peak Sidelobe Ratio no greater than -17/-18 dB in range and -15/-15 dB in cross-range;
- d) Provide a resolution of <30 cm or better, for a swath width of at least 300 m; and
- e) Provide a resolution of <1.2 m or better, for a swath width of at least 2.0 km.

**REQ 149.** - The ISAR mode must be able to image targets that are slow moving.

**REQ 150.** - In the MSIMS Surveillance Radar ISAR function, the MSIMS must:

- a) Provide the Operator with a means to designate a target using any point on the surface plot;
- b) Provide the Operator with a means to designate a target using a point on a SAR image;
- c) Provide the Operator with a means to select the length of a data collection frame between 0.5 secs and a maximum of at least 4 secs;
- d) Automatically control antenna tilt based on the contact location in relation to the aircraft position; and
- e) Produce ship imagery optimally focused for fine resolutions in cross-range.

**REQ 151.** - While displaying Inverse Synthetic Aperture Radar images, the MSIMS must provide the Operator with a means to:

- a) Automatically calculate target length based on aspect angle and selected contact beginning and end;
- b) Measure target vessel size based on aspect angle and the sides of the contact; and
- c) Measure distance between selected contact superstructure features to refine contact information for the purpose of classification.

**REQ 152.** - The Surveillance Radar must be integrated with the MSIMS and provide an ISAR library facility that provides the Operator with the ability to:

- a) Save and associate ISAR images with a particular track; and
- b) Store images on an attached USB drive to recall them for reference during a flight.

### 6.2.5.7.2 Synthetic Aperture Radar Mode (SAR)

#### Information

The image quality performance for all MSIMS Surveillance Radar Imaging functions is statistical in nature and therefore there will be cases where the flight conditions are met but part or all of the measured targets do not meet the stated requirements.

In the Surveillance Radar, the range and azimuth resolution and Integrated Side Lobe Ratio/Peak Sidelobe Ratio performance requirements stated below must be met for at least 90% of the specified targets for at least 90% of the specified acquisitions.

- REQ 153.** - In the MSIMS Surveillance Radar Imaging functions, the MSIMS must provide a means for the operator to select the swath width and control ground resolution at the centre of the Surveillance Radar sensor FOV.
- REQ 154.** - In the MSIMS Surveillance Radar Imaging functions, the MSIMS must be able to operate to a minimum range measured from the centre of the beam provided by a depression angle of at least 25 degrees, or 3.0 NM slant range, whichever is greater.
- REQ 155.** - In the MSIMS Surveillance Radar Imaging functions, the MSIMS must provide the operator with the following display controls:
- a) Automatic setting of contrast and brightness;
  - b) Manual setting of contrast and brightness;
  - c) Pan and Zoom of the image; and
  - d) The Zoom shall have a maximum setting of at least 4x.
- REQ 156.** - In the MSIMS Surveillance Radar Imaging functions, the MSIMS must be able to record the imagery data and provide a means to transfer the data from the MSIMS to a removable disk drive or by file transfer.
- REQ 157.** - In the MSIMS Surveillance Radar Imaging functions, the MSIMS must provide the Operator with the means to select from the following image formats for storage:
- a) Magnitude only;
  - b) Complex only; and
  - c) Both Magnitude and Complex.
- REQ 158.** - In the MSIMS Surveillance Radar Imaging functions, the MSIMS must automatically control the gain setting in the Stripmap, Land Spot and ISAR imaging modes.
- REQ 159.** - In the MSIMS Surveillance Radar Stripmap function, the MSIMS must:

- a) Provide the operator with a means to define the area to be stripmapped;
- b) Provide the operator with a means to stripmap an area at a fixed offset distance from the initial flight track of the radar; and
- c) Automatically control antenna tilt based on the selected area location in relation to the aircraft position.

**REQ 160.** - The MSIMS Surveillance Radar Stripmap function must:

- a) Process data in real time;
- b) Provide a resolution  $<1.1$  m (range and cross range resolution) with a swath width greater than 1.2 NM and a maximum instrumented slant range greater than 25 NM;
- c) Provide a resolution  $<12.0$  m (range and cross range resolution) with a swath width greater than 18 NM and a maximum instrumented slant range greater than 45 NM;
- d) Provide the Operator with a means to select the resolution and swath width combinations, with at least 3 different settings and with the largest resolution less than 12.0 m;
- e) Generate and display ground range corrected images with square pixel spacing on the ground, with a total geometric distortion no more than 2%; and
- f) Have a one-dimensional Integrated Side Lobe Ratio/Peak Sidelobe Ratio no greater than -21/-21 dB in range and -19/-19 dB in cross-range, during parallel track operation.

**REQ 161.** - The MSIMS Surveillance Radar Land Spot function must:

- a) Produce and display continuous Spotlight imaging in real time;
- b) Provide the operator with a means to designate the center of the swath area coverage;
- c) Be operational up to at least a 42 NM Slant range;
- d) Provide a resolution  $<20$  cm (range and cross range), with a swath width of at least 300 m;
- e) Provide a resolution  $<1.2$  m (range and cross range), with a swath width of at least 2000 m;
- f) Provide a means for the operator to select the resolution and swath width combinations, with at least 3 different settings and with the largest resolution less than 2.0 m;
- g) Be able to stack (non-coherently integrate) from 1 to a minimum of 12 consecutive full-resolution, ground stabilized image frames. The number of frames to integrate must be selectable by the operator;
- h) Generate and display ground range corrected images with square pixel spacing on the ground, with a total geometric distortion no more than 2%; and
- i) Have a one-dimensional Integrated Side Lobe Ratio/Peak Sidelobe Ratio no greater than -21/-21 dB in range and -19/-19 dB in cross-range.

**REQ 162.** - The Surveillance Radar system Track While Scanning (TWS) function must be able to track and display at least 1000 contacts simultaneously.

#### **6.2.5.7.3 Dead Reckon (DR)**

##### **Information**

When Contacts are no longer being detected by any sensors, the MSIMS will begin performing dead reckoning calculations to determine their extrapolated position. If the Contact is re-acquired by a sensor, the Contact will resume being updated by that sensor and will no longer be dead reckoned.

**REQ 163.** - The MSIMS must dead reckon (DR) Contacts that are no longer being detected by any sensors or subsystems by calculating their projected paths based on last known position, speed, heading and rate of change of these parameters.

**REQ 164.** - The MSIMS must provide an indication to the operator when it begins to DR a Contact.

**REQ 165.** - The MSIMS must automatically cease DR and resume normal tracking when a Contact is re-detected by any sensor or Subsystem.

**REQ 166.** - The Surveillance Radar system must DR all radar targets when they are not within the radar's horizon.

### **6.2.6 Communication Systems**

#### **6.2.6.1 General**

##### **Information**

The MSIMS must provide, through the SATCOM communications link, the capability for the Operator to email and live stream high-definition Intelligence, Surveillance and Reconnaissance (ISR) data, including video and images, to Headquarters, Command Centres, ships and other co-operating units in order to facilitate well-coordinated missions. It will also be used for voice communications and internet connection.

The Contractor will not be required to provide the hardware for the SATCOM, it will be provided as GFE. The Contractor will be required to work with TC-ASD Engineering to enable access to the MSIMS through onboard Ethernet.

**REQ 167.** - The MSIMS must be able to be integrated with the aircraft's satellite communications system (SATCOM) through the onboard Ethernet.

**REQ 168.** - Chat Function – The Contractor must provide “chat” functionality communication between on-board Operators at each MSIMS Mission Work Station and the

ground command based on commercially available software.

- REQ 169.** - The MSIMS must provide an interface to a web-based solution provided by the Contractor to allow an Operator off or on board the aircraft to monitor and control the digital communications when the MSIMS is unserviceable including:
- a) Enable and disable communications;
  - b) Switch between communication network profiles;
  - c) Monitor connection status for each of the following networks:
    - i) Satellite;
    - ii) WIFI; and
    - iii) Cellular.
  - d) Monitor data receive and transmission volumes; and
  - e) Monitor or data receive and transmission rates.
- REQ 170.** - The Contractor must provide the required number of wired and wireless Ethernet LAN ports during the PDR to allow TC to install the ports.

## **6.2.7 MSIMS Design and Layout**

### **Information**

Canada will manufacture the aircraft equipment avionics racks to house the MSIMS computers and Canada, or its designate(s), will be responsible for locating and installing the equipment racks in the aircraft. If there are any limitations to cable lengths, or if extenders are required, then the Contractor must advise of such requirements. The specifications for the MSIMS computers must be included in the interface control document which will be reviewed at the PDR and CDR meetings.

The Contractor will be required to provide the two Mission Work Stations.

### **6.2.7.1 Mission Workstation (MWS)**

- REQ 171.** - The Contractor must provide an Interface Control Document to enable Canada to manufacture the aircraft equipment racks to house the MSIMS equipment.
- REQ 172.** - Two separate MWSs must be provided that will allow TC-ASD to install them on the Dash-8-100 aircraft located on the left and right side of fuselage. The MWS must be designed so they can attached to the standard seat rails. The Contractor must provide the design and engineering reports for the MWS to TC-ASD. As a means of compliance they will require an analysis of the engineering report that confirms that the loading requirements and design meets the various requirements of CAR 521.
- REQ 173.** - The two MWS must be identically laid out for commonality and ease of training for the Operators.

- REQ 174.** - Each MWS must provide both Operators with full access and control of the MSIMS, the sensors and associated mission systems.
- REQ 175.** - The design of the MWS must be reviewed and approved at the PDR and CDR meetings, this will include, at a minimum:
- a) Keyboards, Layout and configuration;
  - b) Data Entry, Cursors - Keyboard cursor control;
  - c) Data entry using keyboard characteristics.
- REQ 176.** - The MSIMS human-computer interfaces must provide the crew with similar, logically related transactions for similar tasks.
- REQ 177.** - Input to the MSIMS human-computer interface must result in positive feedback to the user of the acceptance or rejection of a data entry.
- REQ 178.** - The MSIMS human-computer interfaces response times must not exceed the values defined in MIL-STD-1472G Table V.
- REQ 179.** - The MSIMS human-computer interfaces must provide the operator with an indication when any displayed information may be corrupt or invalid.
- REQ 180.** - The MSIMS must have an uninterruptible power source to ensure critical mission systems can be shut down properly to ensure no data are lost if there is power interruption to the system.
- REQ 181.** - Each MWS must provide the Operator, at a minimum, with the means to:
- a) Power up the entire MSIMS and all sensors;
  - b) Collectively power down all sensors and the MSIMS;
  - c) Shut the power off to all sensors, the MSIMS and the uninterrupted power source using one switch selection in the event of an emergency;
  - d) Port access for data transfer to external device from mission system; and
  - e) Port access to the mission management system.
- REQ 182.** - The design of the MWS must include a GFE control switch for the IR/UV door, which will be installed by Canada.
- REQ 183.** - The design of the MWS must include a GFE, stand-alone video recording device for the MX-15HDi Camera System separate from any recording conducted in the MSIMS, which will be installed by Canada.
- REQ 184.** - The design of the MWS must include a GFE supplied communications panel and headphone jack, which will be installed by Canada.
- REQ 185.** - Each MWS must provide a minimum total screen area equivalent to two 23-inch displays.
- REQ 186.** - Desirable Requirement - The MWS displays should be touch screen.

- REQ 187.** - The MWS displays must support and provide equal or higher resolution for all sensor inputs (i.e. MX-15HDI).
- REQ 188.** - Each MWS must provide a "QWERTY" type input interface for text and numeric key-entries including a number pad.
- REQ 189.** - Each MWS must provide the Operator with a cursor control device or display control interface allowing the selection of any displayed Object and any point on the display(s).
- REQ 190.** - Each MWS must be equipped with a Multi-Axis Joystick Controller that provides the Operator with, at a minimum, a means to:
- a) Zoom in and out in each sensor window;
  - b) Move left, right, up and down within each active sensor window;
  - c) Centre the moving map on aircraft position; and
  - d) Centre the active sensor display on the aircraft's latest position.
- REQ 191.** - The GFE MX15HDI Hand Controller Units must be:
- a) Integrated into each MWS;
  - b) The MX15HDI hand controller mount must be secured on the right side of each MWS providing one hand operation; and
  - c) The MX15HDI hand controller must be removable from the hard mount for two hand operation.
- REQ 192.** - One GFE MX15HDI laser firing control panel must be integrated into each MWS.
- REQ 193.** - The MSIMS must provide the Operators with the independent means to control all sensors from each MWS.
- REQ 194.** - All MWS displays, controls, panels, switches and readouts must be readable by the Operators in all lighting conditions.
- REQ 195.** - Each MWS must provide controls to adjust the intensity of the lighting for its controls, switches, readouts, displays, and panels from off to full-bright.
- REQ 196.** - The MWS must provide each Operator with a fully adjustable lamp to illuminate the MWS console during night operations.

### **6.2.7.2      *Mission Display Unit (MDU)***

#### **Information**

MDUs are used by the crews to enhance mission situational awareness by providing display of MSIMS imagery and video feeds. These will be used in the cockpit by the pilots and in the cabin by crews that do not have access to one of the consoles.

- REQ 197.** - Two portable MDUs must be provided.
- REQ 198.** - Desirable Requirement - The MDUs should be wireless.
- REQ 199.** - The MSIMS must visually display mission information on two portable MDUs concurrently with the two MWS.
- REQ 200.** - The MDUs must display each of the following mission sensor windows separately:
- a) Live MX15HDi EO/IR Camera System's video feed(s);
  - b) Live SLAR waterfall and associated numeric annotation data;
  - c) Live IR/UV waterfall and associated numeric annotation data;
  - d) Surveillance Radar; and
  - e) The Moving Map with:
    - i) The aircraft position, course and speed numerically written;
    - ii) The aircraft current position as an icon pointed in the direction of travel;
    - iii) The aircraft track;
    - iv) All Object icons and their ID numbers.
- REQ 201.** - The MDUs must provide the following functionality to the user:
- a) Select the sensor window to be displayed;
  - b) Zoom in and out of the window
  - c) Pan left, right, up and down.

## **6.2.8 MSIMS Functionality**

### **Information**

The MSIMS is intended to support the NASP through the effective integration and management of the following mission functions:

- a) Data and Mission Management;
- b) Identification and analysis of targets;
- c) Documentation of evidence and data collection;
- d) Reporting;
- e) Post-flight debriefing; and
- f) Post mission analysis and data archiving.

### **6.2.8.1 Data Management**

- REQ 202.** - The MSIMS must employ a data management strategy that allows all mission data to be geospatially related. This could be in the form of a geodatabase but the Contractor may provide a data management structure that best meets the functionality requirements outlined in this SOW.
- REQ 203.** - All geographic data must be Open Geospatial Consortium (OGC) compliant.



- REQ 204.** - The MSIMS must employ a standard file naming convention for all images from varying sensors, video and audio recordings.
- REQ 205.** - The MSIMS must provide the Operator with a means to search the database using at a minimum, text in the free-text comments field and full and partial entries of the following properties:
- a) Vessel's name;
  - b) MMSI number; and
  - c) IMO number.
- REQ 206.** - The database search function must provide the Operator with the following:
- a) A display of search results showing the number of Objects that met the criteria out of total Objects in the database;
  - b) A means to select an Object from the queried list that highlights the Object in the list window and on the Moving Map; and
  - c) An option to conduct a sub-search of the first query results.
- REQ 207.** - Desirable Requirement - The MSIMS should provide a means to search and visually display the location of street addresses from the Open Street Map database for all of Canada.

#### **6.2.8.2      *Data Storage***

- REQ 208.** - The MSIMS must include non-volatile data storage for all mission data. The MSIMS must be capable of storing all data captured from all the mission sensors for a duration of 16 hours.
- REQ 209.** - To reduce end of mission data back-up times, the MSIMS must record mission data directly to the MSIMSs internal storage device and simultaneously record data to removable media.
- REQ 210.** - The removable media chosen by the Contractor must be commercially available.
- REQ 211.** - The Contractor must provide 1 main and 5 spare removable media devices.
- REQ 212.** - The MSIMS recording device must provide a visual indication to the Operator when 75% of its maximum recording capacity has been reached.
- REQ 213.** - The MSIMS recording device must provide the Operators with a time-slider feature to replay the recording of all mission data in a synchronized fashion at any point during the mission.
- REQ 214.** - The MSIMS must keep recording current data while the Operator is using the time-slider feature.
- REQ 215.** - The Operator must be able to exit the time-slider feature at any point and go back

to live display.

**REQ 216.** - The MSIMS recording device must provide the Operator with a means to pause, rewind, and fast forward all recorded data.

**REQ 217.** - The MSIMS must capture, encode and compress all audio files using current industry standards and formats to provide a high quality audio product.

**REQ 218.** - The MSIMS must capture, encode and compress all video in accordance with the current industry standards and the Motion imagery Standards Board (MISB) specifications including H.264, a modern transport mechanism and the video metadata.

### **6.2.8.3      *MSIMS Handling***

**REQ 219.** - The MSIMS must have standardized functionality across the fleet to minimize time required to cross-train surveillance officers. The following requirement details standardize Operator input commands for the MSIMS:

- a) Right click of mouse on any active sensor or map initiates Target creation;
- b) Last created Object is by default the selected Object;
- c) All polygons drawn in any sensor are automatically shown geo-corrected on the map simultaneously.

**REQ 220.** - The MSIMS must employ, at the minimum, the following keyboard shortcuts:

- a) Arrows – left, right, up and down for each active window;
- b) + / - keys – zooming in and out;
- c) Enter key - select action button;
- d) Tab to scroll through selected fields and Objects in Object list;
- e) Shift key – removes all Objects and marks off of the active remote sensor display; and
- f) ESC – to back out of function.

**REQ 221.** - The MSIMS must provide a means for the Operator to create a Point Target at the current position of the aircraft with a button that is always available regardless of submenus active. This Point Target will have at a minimum the following properties set by the system:

- a) Date;
- b) Time (UTC);
- c) Aircraft information including:
  - i) Position (latitude/ longitude);
  - ii) Speed;
  - iii) Altitude; and
  - iv) Course.

**REQ 222.** - For the Point Target above, the MSIMS must automatically display a

georeferenced icon at the location of the aircraft position on the Moving Map, the SLAR and IR/UV sensor windows.

#### **6.2.8.3.1 MSIMS Display and Monitoring**

- REQ 223.** - The MSIMS must provide each Operator with the means to:
- a) Manage all aspects of the mission;
  - b) Continuously monitor status of whole system and each sensor;
  - c) Control all sensors; and
  - d) Access information from external sources.
- REQ 224.** - The MSIMS must have a default display window configuration when the mission starts up.
- REQ 225.** - The MSIMS must provide a single key stroke to remove and redisplay each component window from the display.
- REQ 226.** - The MSIMS must provide a single button that will allow the Operator to maximize any active window to full screen view and back to the previous window size and location.
- REQ 227.** - The MSIMS must allow any displayed windows to be:
- a) Resized independently on any display; and
  - b) Repositioned independently on each display.
- REQ 228.** - Desirable Requirement - The MSIMS should have user profiles allowing an Operator to save window configurations and Operator preferred settings.
- REQ 229.** - The MSIMS must indicate to the other MWS Operator when a requested function is currently in use if the other Operator already has full control of a specific shared functionality.
- REQ 230.** - The MSIMS must provide visible feedback to the Operator to indicate when a requested function is available, selected and unavailable.
- REQ 231.** - Within the MSIMS, selecting a sensor window will make that the active sensor displaying all related functionality for that particular sensor.
- REQ 232.** - When changing between primary sensors or Operators, the MSIMS must maintain the previous sensor's modes and selections.
- REQ 233.** - The MSIMS must provide a means to enter manual navigation data including, at minimum, Altitude and Speed in order for the SLAR and IR/UV sensors to create a waterfall display when the aircraft is on the ground.
- REQ 234.** - The MSIMS must display the following aircraft numeric information for each Operator:

- a) Current aircraft position (i.e. Latitude and Longitude);
- b) Date;
- c) Time (UTC);
- d) Altitude (ft);
- e) Course (in True and Magnetic); and
- f) Speed over ground (knots).

**REQ 235.** - The MSIMS must provide a separate window that displays all Properties about the Object selected in the List window.

**REQ 236.** - All Object Properties stored in the database for each Object type must be viewable in the Properties window when an Object is selected.

**REQ 237.** - The MSIMS must provide a means for the Operator to select and deselect the visibility of the List and Properties windows.

**REQ 238.** - The MSIMS must have a permanently displayed mission systems' status bar with coloured icons that change colour to indicate the status of the following:

- a) System Alerts;
- b) SLAR;
- c) IR/UV;
- d) Still camera;
- e) Video camera;
- f) EO/IR;
- g) AIS;
- h) Audio recording;
- i) Each digital external communications link;
- j) DF;
- k) Radar; and
- l) GPS.

**REQ 239.** - The colored status icons for the sensors listed in REQ 238 must have a means to indicate, at a minimum, the following;

- a) Operational, connected, or on-line;
- b) Connected but in Standby or in progress;
- c) Active error(s);
- d) Recording on (if Operator controlled); and
- e) Recording off (if Operator controlled).

**REQ 240.** - The MSIMS must provide a List window that allows elements of the system to be seen in list format including, at a minimum, all:

- a) objects in the mission database
- b) system alerts; and
- c) system overlays.

**REQ 241.** - If the Operator hovers the cursor over the status menu icon, more detailed information about the status of that sensor must be displayed.

- REQ 242.** - The MSIMS alerts and errors must be displayed to the Operator including:
- a) A list of all active system errors;
  - b) The error code;
  - c) The error code's properties; and
  - d) A visual indication when the Operator has reviewed the alert or error.

- REQ 243.** - The Contractor must provide a list of all error codes and their properties in the Operator's Manual.

#### **6.2.8.3.2 Mission Data Summary**

- REQ 244.** - The MSIMS must, at mission start-up, prompt the Operator to enter Mission Information in the Summary Mission Information screen from a user-defined list of values consisting of, at a minimum, the following:
- a) Aircraft ID;
  - b) Departure location;
  - c) Destination;
  - d) Area/Region of coverage;
  - e) Result of the mission;
  - f) PIC;
  - g) SIC;
  - h) System Operators;
  - i) Other crew; and
  - j) Free-text Comments field.
- REQ 245.** - The MSIMS must automatically assign a unique ID to each mission using the aircraft ID, the date to define the fiscal year and a sequential number.
- REQ 246.** - The MSIMS must provide the Operator with a means to enter mission timings in UTC to include, at a minimum, the following:
- f) Chocks out;
  - g) Wheels up;
  - h) Wheels down; and
  - i) Chocks in.
- REQ 247.** - The MSIMS must automatically calculate the following as part of the Summary Mission Information:
- a) Mission start and finish date and time;
  - b) Productive time of the sensors in hours and minutes;
  - c) Charter time in hours and minutes; and
  - d) Air time in hours and minutes.
- REQ 248.** - The MSIMS must provide the Operator with the means to display and edit mission summary information as detailed in REQ 244.

### 6.2.8.3.3 Moving Map

- REQ 249.** - The MSIMS must include a Moving Map display providing the Operator with a representation of the geographic area and the current position of the aircraft.
- REQ 250.** - The aircraft's position information must be displayed in the Moving Map:
- a) As an aircraft icon, at correct position, with heading of the aircraft shown by the icon pointing direction;
  - b) Automatically showing the entire flight track, which can be deselected by Operators; and
  - c) Displaying the flight times along the flight track, which are defaulted off but can be selected on by the Operator.
- REQ 251.** - The aircraft position icon on the Moving Map must refresh at the same frequency as the data is received by the GPS.
- REQ 252.** - Desirable Requirement - The MSIMS should provide a means to visually display the aircraft's projected course over ground on the Moving Map.
- REQ 253.** - Desirable Requirement - The length of the projected line should be Operator adjustable by increments of time.
- REQ 254.** - Desirable Requirement - The MSIMS should provide a means for the Operator to deselect the projected line.
- REQ 255.** - The Moving Map must provide the Operator with a means to select the orientation of the map to either True North up or Aircraft Heading up.
- REQ 256.** - Desirable Requirement - The MSIMS should provide an Operator selectable function to maintain the aircraft position in the centre of the moving map while in True North Up display.
- REQ 257.** - The Moving Map window must provide the Operator with a means to:
- a) Scroll the moving map up and down;
  - b) Pan left and right;
  - c) Change scale;
  - d) Centre the map on:
    - i) The aircraft's position;
    - ii) The aircraft's entire flight track;
    - iii) A geographical position;
    - iv) The line of sight of the EO/IR; and
    - v) Any selected Object.
- REQ 258.** - The Moving Map must provide an Operator-controlled Distance and Bearing tool to measure the distance and bearing between any two points on the map in

nautical miles and degrees true.

- REQ 259.** - For each Object created in a mission, the MSIMS must automatically create and display a georeferenced icon on the Moving Map with the Object ID number. The color and type of icon must follow a standardized icon strategy which must be carried throughout the integration of all sensors.

Note: The icon strategy chosen by the Contractor will be discussed and approved at the Preliminary Design Review (PDR) and Critical Design Review (CDR) meetings.

- REQ 260.** - The Moving Map must store and recall digital map and chart databases including, at a minimum, the:
- a) Global coastline maps;
  - b) Terrestrial maps of North America;
  - c) Open street maps covering North America; and
  - d) Digital marine nautical charts with all Canadian EEZ coverage (i.e. CM-93/3 zone 8).

- REQ 261.** - The Moving Map must provide continuous zoom from 1:60,000,000 to 1:500.

- REQ 262.** - The Moving map must display the Global coastline starting at 1:60,000,000 until other maps are displayed. If no greater resolution maps are available for a region, the Global Coastline will always remain displayed.

- REQ 263.** - The Moving Map must display the Terrestrial maps of North America starting at 1:1,000,000 with increasing detail as the Operator increases the zoom.

- REQ 264.** - The Moving Map must display the Open Street Maps at 1:40,000 with increasing detail as the Operator increases the zoom.

- REQ 265.** - The Moving map must display the Digital Marine Charts at 1:100,000 with increasing detail as the Operator increases the zoom.

- REQ 266.** - Desirable Requirement - The Moving map should provide line of sight mask for each displayed sensor footprint and must incorporate height of terrain, where applicable, in the footprint positioning.

Note: The intent is for the Operator to be informed by the Moving Map tool as to what can and cannot be seen with each sensor system.

- REQ 267.** - Desirable Requirement - The Moving Map should provide the Operator with a means to turn the sensor footprint off and on collectively or individually for each sensor.

- REQ 268.** - The MSIMS must provide the Operator with a means to continuously display the position, range and bearing from the aircraft to:

- a) The cursor in any sensor window; and
- b) Any selected Object.

- REQ 269.** - The MSIMS must provide a means for the Operator to build SAR search patterns including, at a minimum, the following patterns: Parallel Line/Creeping Line, Expanding Square, Sector and Race Track. This requirement will be discussed at the PDR and CDR to ascertain proper track spacing and length.
- REQ 270.** - The MSIMS must provide a means to transfer the search pattern to the aircraft Flight Management System (FMS) so that it can be flown. This requirement will be discussed at the PDR and CDR to ascertain dependencies on the aircraft's FMS.
- REQ 271.** - The Moving Map must provide the Operator with the means to selectively display predefined overlays and maps including, :
- a) Air Defense Identification Zones, individually and collectively;
  - b) Custom layers;
  - c) Detailed marine charts;
  - d) Detailed terrestrial maps individually and collectively;
  - e) Maritime limits and boundaries
  - f) Tanker exclusion zones;
  - g) Marine protected areas; and
  - h) Location of:
    - i. oil rigs;
    - ii. Ship wrecks; and
    - iii. Natural seeps.



#### 6.2.8.3.4 Geospatial Imagery Overlay

##### Information

The NASP uses SLAR and IR/UV data to document and analyze phenomenon on the surface. There are times when the imagery needs to be provided in context to other data, like the coastline and Contacts or if the phenomenon extends over more than one sensor pass. The MSIMS must provide functionality to overlay remote sensed imagery on the Moving Map with proper geo-referencing and orientation. Sensor data overlay may need to be done live, as the data is acquired, or conducted after the sensor run is complete.

**REQ 272.** - The MSIMS must provide the Operator with the means to overlay remote sensor imagery onto the Moving Map with correct geo-referencing and orientation including, at a minimum, the SLAR, IR and UV data.

**REQ 273.** - The remote sensor overlay functionality must include, but not be limited to:

- a) Overlaying of live line-by-line sensor data including:
  - i) SLAR;
  - ii) IR; and
  - iii) UV;
- b) Overlay of previously recorded sensor data from:
  - i) SLAR;
  - ii) IR;
  - iii) UV; and
- c) Separate overlay controls for the following sensors:
  - i) SLAR;
  - ii) IR; and
  - iii) UV;
- d) A single button selection for removal of overlaid data from each sensor;
- e) A single button to deselect viewing the data in the Moving Map without completely removing the overlaid data; and
- f) Overlaid data will retain the same contrast and brightness settings as on the sensor display window.

**REQ 274.** - The MSIMS must provide a means for multiple strips of remote sensed imagery to be overlaid on the Moving Map at one time. Each sensor must be in a separate layer.

**REQ 275.** - The MSIMS must provide the Operator with a means to export overlaid remote sensed data to geospatial imagery file formats (i.e. geo-tiff and jpeg2000) with the precision parameters as detailed in section 6.2.8.5.1.1.

**REQ 276.** - The exported geospatial data must include all associated metadata and attribute data.

#### **6.2.8.4      *Object Handling***

##### **Information**

For the purposes of data management in the MSIMS, Canada's preferred nomenclature for the highest level of data hierarchy in the MSIMS is "Objects". Object types include, but are not limited to:

- a) Targets – both Point and Polygon (i.e. AIS Contacts, vessels, Radar Contacts, Oil Polygons and user created Targets: EOIR, SLAR, IR, and Map);
- b) Events (i.e. still camera images, screen captures from any sensor window, map images, whole system images, video recordings, EO/IR images, audio recordings)
- c) Graphical Aids (i.e. waypoints, routes, DF lines and user drawn Graphical Aids including: points, lines, polygons, text, arrows, sectors, and circles)
- d) Incident folder: an Incident Folder is a means for the Operator to group other Objects related to a specific incident.

**REQ 277.** - The MSIMS must employ a strategy to differentiate all Objects by, at a minimum, their type and by the sensor or window in which they were created. These must be represented by:

- a) An alpha or alphanumeric code; and
- b) Standardized icon colours and symbols.

**REQ 278.** - When each Object is created, the MSIMS must automatically display the icon with the Object ID number in georeferenced position on the Moving Map.

**REQ 279.** - For each Object in the MSIMS database, the MSIMS must automatically record:

- a) A unique, sequential Object ID number;
- b) An alpha or alphanumeric code that identifies the sensor/window it was created in and the type of Object it is;
- c) The date and time (UTC) the Object was:
  - i) created (i.e. user created target in map);
  - ii) automatically acquired with one of the sensors (i.e. AIS);
  - iii) if created from remote sensor data, the time that data was acquired; and
- d) The position (latitude and longitude).

**REQ 280.** - The MSIMS must list all mission Objects in a List window providing the Operator with a means to:

- a) Review Objects;
- b) Select Objects;
- c) Open Objects, and
- d) Access other functionality related to each type of Object.

- REQ 281.** - The MSIMS must list all Objects in the List window with, at a minimum, the following columns of information:
- a) The unique Object ID number;
  - b) The alphanumeric code identifying the sensor used to create the Object;
  - c) Time (UTC) the:
    - i) Object was created;
    - ii) data was acquired from which the Object made in a remote sensor window; or
    - iii) object was last updated if created from an automatic sensor (i.e. AIS);
  - d) The Objects position (latitude and longitude):
    - i) If the Object is moving with updating position (i.e. AIS) then it will display the current position; and
    - ii) If the Object is stationary or from remote sensed imagery, then it the position it was created at.
- REQ 282.** - The following are the minimum Properties that must be displayed for every Object in the mission:
- a) Unique, sequential number automatically assigned by the MSIMS to each Object;
  - b) Alpha or alphanumeric code for sensor/window the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Date;
  - e) Time;
  - f) Latitude;
  - g) Longitude; and
  - h) Free-text comments field.
- REQ 283.** - All Objects must have an editable, free-text comments field accessible in the Object dialogue box and its contents displayed in the properties window when the Object is selected.
- REQ 284.** - When new Target, Graphical Aid and Incident Folder creation is initiated, the MSIMS must prompt the Operator to confirm creation is desired.

### Information

Decluttering options must be available for all MSIMS Operator displays windows, both on an individual basis and on a "category" basis. "Categories" could be, for example, "all Targets from AIS", "all Targets", or "all Graphical Aids"; the Contractor should decide the decluttering options that best suits their system design. Decluttering is only intended to remove an Object from the Operator's display. Objects must be retained in memory as this is only a visual filter and the Objects must be able to be re-displayed.

- REQ 285.** - The MSIMS must allow the Operator to selectively declutter individual Objects, information layers, symbology, or groups thereof, from any display.
- REQ 286.** - The MSIMS must allow the Operator to selectively redisplay decluttered individual Objects, information layers, symbology, or groups of contacts, to any display.

#### **6.2.8.4.1 Targets**

##### **Information**

The architecture for the MSIMS must include three different types of targets: Contacts, Point Targets and Polygon Targets as defined below.

##### **6.2.8.4.1.1 Contacts**

##### **Information**

Contacts may be auto-detected and generated by the MSIMS sensors (i.e. Surveillance Radar and AIS) or manually created by the Operator. When possible, the MSIMS will correlate Contacts from separate sensors so that they appear as one Contact to the Operator; this will reduce Operator workload associated with managing Contacts.

- REQ 287.** - The MSIMS must automatically generate Contacts from the AIS and Surveillance Radar systems.
- REQ 288.** - The MSIMS must automatically correlate Contacts from all sources when they represent the same physical object based on their position, speed and/or heading.
- REQ 289.** - The MSIMS must provide the Operator with a means to manually correlate and de-correlate contacts.
- REQ 290.** - The MSIMS must provide the Operator with a means to selectively de-correlate individual contacts for display without affecting the actual correlation of the contact in memory.
- REQ 291.** - The MSIMS must automatically create an icon on the Moving Map for each Contact created.
- REQ 292.** - Each Contact automatically created by the MSIMS must have at least the following attributes:
- a) Unique number automatically assigned by the MSIMS to each Object;
  - b) Alpha or alphanumeric code for source of detection the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Standard identity in accordance with MIL-STD-2525C to include, at a minimum:
    - i) Friendly;

- ii) Hostile;
- iii) Pending; and
- iv) Unknown.
- e) Position in Latitude and longitude;
- f) Course;
- g) Speed; and
- h) An editable free-text comments field.

**REQ 293.** - When a new Contact is detected and icon is displayed on the Moving Map, the MSIMS must provide a visual indication to the Operator that it is a new Contact by flashing three times.

**REQ 294.** - The MSIMS must provide the Operator with a means to manually create Contacts with the following properties:

- a) Unique number automatically assigned by the MSIMS to each Object;
- b) Alpha or alphanumeric code for source of detection the Object was created in;
- c) Alpha or alphanumeric code for type of Object;
- d) Standard identity in accordance with MIL-STD-2525C must include, at a minimum:
  - i) Friendly;
  - ii) Neutral;
  - iii) Hostile;
  - iv) Pending; and
  - v) Unknown;
- e) Position in Latitude and longitude;
- f) Course;
- g) Speed; and
- h) An editable free-text comments field.

**REQ 295.** - The MSIMS must provide a means for the operator to modify, at a minimum, the following Contact properties:

- a) Editable free-text comments field; and
- b) Standard identity in accordance with MIL-STD-2525C must include, at a minimum:
  - i) Friendly;
  - ii) Neutral;
  - iii) Hostile;
  - iv) Pending; and
  - v) Unknown.

**REQ 296.** - Desirable Requirement - The MSIMS should provide the Operator with a means to quickly view Contact information by positioning the cursor over the icon. This information must include the following properties:

- a) Vessel name;
- b) Course; and
- c) Speed.

**REQ 297.** - The MSIMS must have different visual icons to differentiate Surveillance Radar Contacts including, at a minimum:

- a) Friendly;
- b) Neutral;
- c) Hostile;
- d) Pending; and
- e) Unknown.

**REQ 298.** - When the radar's TWS is the selected mode of operation for the radar, all TWS contacts, even when the radar is not currently selected for display, must be maintained.

#### **6.2.8.4.1.2 Point Targets**

**REQ 299.** - The MSIMS must provide the Operator with a means to create, at a minimum, the following Point Targets and their associated properties:

a) Weather Point Target to include:

- i. Atmospheric Conditions;
- ii. Visibility;
- iii. Wind Direction;
- iv. Sea State;
- v. Cloud Coverage; and
- vi. Ice coverage.

b) Vessel Point Target to include:

- i. Vessel Type;
- ii. Name;
- iii. Call sign;
- iv. IMO number;
- v. Port of call;
- vi. Destination;
- vii. Home Port;
- viii. Flag State; and
- ix. Vessel colour (e.g. hull, funnel, and structure).

c) Generic Point Target that is automatically populated by the MSIMS to include:

- i. Date and time created;
- ii. Category of Object – sensor/window used to create target;
- iii. Position (latitude/longitude);
- iv. Speed (kts), if applicable;
- v. Course (degrees), if applicable; and

**REQ 300.** - The MSIMS must provide the Operator with a means to update any Point Target's

position using the following sensors:

- a) Radar;
- b) SLAR;
- c) IR/UV; and
- d) EO/IR.

**REQ 301.** - When a Point Targets position has been updated, the MSIMS must calculate and display in the properties its direction and speed. The direction of travel between points of a contact must be displayed on the Moving Map as a line between them.

#### **6.2.8.4.1.3 Polygon Targets**

##### **Information**

The detection and assessment of Marine pollution incidents is a key mandate for the NASP which requires essential MSIMS functionality to calculate the estimated volume of oil within Operator generated polygons, called polygon targets. This requires the means for an Operator to input properties and visual observations of the oil that provide the thickness of the oil. These are entered as percent coverage of oil within a polygon and percent estimates of categories of oil. These oil categories have defined thickness values as outlined below.

**REQ 302.** - The MSIMS must provide the Operator with a means to create Polygon Targets in the Moving Map, SLAR, Surveillance Radar, IR and UV windows.

**REQ 303.** - The MSIMS must provide a means for the Operator to designate and edit Polygon Targets as Oil or Generic.

**REQ 304.** - When a Polygon Target is created, the MSIMS must automatically record, at a minimum, the following properties:

- a) Unique number automatically assigned by the MSIMS to each Object;
- b) Alpha or alphanumeric code for source of detection the Object was created in;
- c) Alpha or alphanumeric code for type of Object;
- d) Latitude and longitude of the first point selected;
- e) Area of the polygon;
- f) Calculated center of the polygon;
- g) Position of each vertex in the polygon;
- h) Date and time polygon was created, if in map, or date and time of data acquired if created in remote sensor window; and
- i) An editable free-text comments field.

**REQ 305.** - The MSIMS must provide the Operator with a means to enter or select the following data in the Oil Polygon Target dialogue box:

- a) Oil as the type of polygon;
- b) A properties window that provides the following parameter selections:
  - i) The observed oil coverage of the drawn polygon selectable from 0 – 100% in increments of 1%; and

- ii) The percentage of one or more categories of oil observed from 0 – 100% in increments of 1% to a total of 100 percent.
  - iii) The coverage and categories displayed as a pie chart;
- c) The following two methods of Oil Volume Calculations available for the Operator's selection:
  - i) Oil Categories thicknesses ( $\mu\text{m}$ ):
    - i. A – 0.04;
    - ii. B – 0.075;
    - iii. C – 0.15;
    - iv. D – 0.3;
    - v. E – 1.0; and
    - vi. F – 3.0.
  - ii) BONN oil thickness values ( $\mu\text{m}$ ):
    - i. Code 1 - 0.04 to 0.3;
    - ii. Code 2 – 0.3 to 5.0;
    - iii. Code 3 – 5.0 – 50.0;
    - iv. Code 4 – 50.0 – 200.0; and
    - v. Code 5 - > 200.0
- d) The ability to select:
  - i) Mystery spill;
  - ii) Suspected source;
  - iii) Follow-up required; and
  - iv) Whether the spill was visually observed.

**REQ 306.** - For Oil Polygons, the MSIMS must calculate the volume of oil, in liters, based on the Oil Volume Calculation method selected by the Operator.

**REQ 307.** - The MSIMS must provide the Operator with a means to edit the Oil Polygon parameters (i.e. percent coverage and percent of each category of oil). When changes are made in these parameters, the MSIMS must automatically recalculate and display the new parameters.

**REQ 308.** - The MSIMS must display, at a minimum, the following information for all Polygon Targets in the Properties Window:

- a) Unique number automatically assigned by the MSIMS to each Object;
- b) Alpha or alphanumeric code for source of detection the Object was created in;
- c) Alpha or alphanumeric code for type of Object;
- d) Latitude and longitude of the first point selected;
- e) Area of the polygon;
- f) Calculated center of the polygon;
- g) Position of each vertex in the polygon;
- h) Date and time polygon was created, if in map, or date and time of data acquired if created in remote sensor window; and
- i) An editable free-text comments field;
- j) Percent Coverage (if oil polygon);
- k) Percent of each category of oil (if oil polygon);
- l) Total oil volume calculated in liters (if oil polygon);



- m) Whether mystery or suspected source spill (if oil polygon);
- n) Follow up required; and
- o) Visually observed (if oil polygon).

#### **6.2.8.4.2 Events**

##### **6.2.8.4.2.1 Image Handling**

###### **Information**

Images are used extensively by the NASP to support their operations and relay observations to clients. These need to be available to be sent in real time from the aircraft over restrictive bandwidths as well as saved and analyzed in fine detail for prosecutions. Images need to be captured and stored at high resolution and color quality yet the MSIMS must provide a means to selectively compress images to allow for transfer inflight.

Images can be acquired from the following sources in the MSIMS: Still camera, system images captured from a whole display and images captured from each sensor window including: SLAR, IR/UV, Surveillance Radar, video feeds from the MX-15HDi EO/IR Camera System and playback from video recordings. The following details required functionality for image handling in the MSIMS.

- REQ 309.** - The MSIMS must automatically assign a unique Object ID number to each image taken or captured in the mission. The Object ID number is a sequential number, starting at 1 for every object in the mission.
- REQ 310.** - The MSIMS must automatically assign an alphanumeric code to each image defining what type of Object it is and what sensor it was captured from. For example, SCI would mean that the object is a still camera image.
- REQ 311.** - The MSIMS must automatically create and display an icon on the Moving Map at the aircraft location where the image was taken along with the Object ID number.
- REQ 312.** - The MSIMS must store and manage all images in a manner that allows:
  - a) All images to be listed in an Objects list; and
  - b) Images to be opened by selecting them in the Object list or by the Moving Map Icon.
- REQ 313.** - When an image is opened in the MSIMS, an image dialogue box must open providing the following Operator functionality:
  - a) A preview of the image;
  - b) A means to rapidly scroll through all images in the current mission;
  - c) Button functions to allow image:
    - i) Viewing in large window;
    - ii) Editing;
    - iii) Copying;

- iv) Emailing; and
- v) Deleting.

- REQ 314.** - All images captured in the MSIMS must be saved in current industry standard formats.
- REQ 315.** - The MSIMS must provide the Operator with a means to convert full resolution images and make a compressed copy for transfer over SATCOM.
- REQ 316.** - When an image is captured, the MSIMS must automatically save, at a minimum, the following properties:
- a) Unique Object ID number;
  - b) Alpha or alphanumeric code for source of detection the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Date image was captured;
  - e) Time images was captured;
  - f) Latitude and longitude of the aircraft at the time the image was captured;
  - g) Image number in the mission;
  - h) File name of the actual image in the mission data folder; and
  - i) An editable free-text comments field.
- REQ 317.** - When an image is selected, the MSIMS must display all the properties associated to it in the properties window including, at a minimum, the:
- a) Unique Object ID number;
  - b) Alpha or alphanumeric code for source of detection the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Date image was captured;
  - e) Time images was captured;
  - f) Latitude and longitude of the aircraft at the time the image was captured;
  - g) Image number in the mission;
  - h) File name of the actual image in the mission data folder; and
  - i) An editable free-text comments field.
- REQ 318.** - The MSIMS must provide the Operator with a means to edit copies of images within the mission.
- REQ 319.** - The MSIMS must provide an email function button from the image dialogue box that will automatically open a new email message with the selected image(s) attached.
- REQ 320.** - Desirable Requirement - The MSIMS should provide the Operator with a means to link images to a Contact within the MSIMS database.
- REQ 321.** - Desirable Requirement - The MSIMS should provide a means for the Operator, while the mission is running, to review images that have been linked to Contacts.
- REQ 322.** - The MSIMS must provide a single button selection that allows the Operator to

take a screenshot of the following windows:

- a) A full mission system display;
- b) SLAR;
- c) IR/UV;
- d) Radar;
- e) Moving Map; and
- f) Each of the MX15HDi EO/IR Camera Systems' camera feeds.

**REQ 323.** - The MSIMS must store all screenshot images in an Image database with, at a minimum, the following information at the time the image was captured:

- a) Date;
- b) Time (UTC);
- c) Aircraft position;
- d) Aircraft course;
- e) Aircraft speed; and
- f) Aircraft altitude.

**REQ 324.** - The MSIMS must provide a means for the Operator to adjust the sensor window size to control the resolution of the screenshot images taken within the system. Enabling the operator to enlarge the sensor window will equate to an image with better resolution.

**REQ 325.** - When images are captured from the MX15HDi EO/IR Camera Systems' video, the still images must automatically be annotated by the MSIMS with, at a minimum, the following information:

- a) Mission Number;
- b) EO/IR as the source of the image;
- c) EO/IR target position;
- d) Date and time of when the image was captured;
- e) Aircraft position, course, speed and altitude;
- f) Aircraft position, course, speed and altitude when image taken, if from recorded video while still airborne, or Post-processed if taken after a flight.

#### **6.2.8.4.2.2 Video handling**

##### **Information**

The MX-15HDi Camera System is one of the primary sensors used to conduct ISR activities and it is essential the Operators have functionality to view, record, review and edit video in the MSIMS.

**REQ 326.** - The MSIMS must provide live video viewing and recording from multiple video feeds from the MX15HDi EO/IR Camera System including EOW, EON and IR. The selection of which video feed(s) to record from must be selectable by the Operators.

- REQ 327.** - The MX15HDi EO/IR Camera Systems' video must be able to be simultaneously recorded to the MSIMS database and to the GFE video recorder but must be controlled separately.
- REQ 328.** - The MSIMS must provide the Operator with a means to start and stop a video recording at each console.
- REQ 329.** - The status of the video recording must be shown on the system status bar including at a minimum, the following:
- a) Recording on/off
  - b) Operational;
  - c) Standby; and
  - d) Active Error.
- REQ 330.** - For each video recording the MSIMS must automatically:
- a) Assign a unique Object number;
  - b) Assign an alpha or alphanumeric code for source of video;
  - c) Assign an alpha or alphanumeric code for type of Object;
  - d) Record date;
  - e) Record time;
  - f) Record the latitude and longitude of the aircraft at the time video recording was initiated;
  - g) Record the console the recording was initiated at;
  - h) Calculate the duration of the recording in hours, minutes, seconds;
  - i) Assign the name of the video file within the mission data folder;
  - j) Create an editable free-text comments field;
  - k) Create a video recording icon;
  - l) Display the icon and Object number on the Moving Map.
- REQ 331.** - The recorded video must automatically be annotated by the MSIMS with the following information along the top of each frame of the recorded image:
- a) Mission Number;
  - b) Object unique ID number;
  - c) Date and time of video was captured;
  - d) Aircraft position, course, speed and altitude at time of recording;
  - e) Source of video: EON, EOW, IR; and
  - f) Target position of MX15HDi EO/IR Camera System reticle.
- REQ 332.** - When a video Object is selected the MSIMS must display, at a minimum, the following properties in the properties window:
- a) Unique Object number automatically assigned by the MSIMS;
  - b) Alpha or alphanumeric code for source of detection the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Date;
  - e) Time;

- f) Latitude and longitude of the aircraft at the time video recording was initiated;
- g) The console the recording was initiated at;
- h) Duration of the recording in hours, minutes, seconds;
- i) Name of the video file within the mission data folder; and
- j) An editable free-text comments field.

**REQ 333.** - The MSIMS must digitally index all video recordings with aircraft position and line-of-sight of MX15HDi EO/IR Camera System allowing for video playback in Moving Map display.

**REQ 334.** - When video from the MX-15HDi is played back, the position of the aircraft and line of sight of the MX-15HDi for each frame of the video must be displayed simultaneously on the Moving Map.

**REQ 335.** - The MSIMS must provide a means to select which video recording to playback that must include, at a minimum, the following options:

- a) Select the icon on the Moving Map;
- b) Select from the Object List; and
- c) A Video Recordings Playback list.

**REQ 336.** - The Video Recordings Playback list in the MSIMS must display at a minimum the following information:

- a) Date and time of recording;
- b) Length of recording;
- c) File size; and
- d) Video name with standard naming convention.

**REQ 337.** - The MSIMS must define a maximum video recording file size. When the recording meets that file size an alert must be displayed warning the Operator and a new video file must automatically begin recording with a new Object ID number.

**REQ 338.** - The MSIMS must playback recorded video using the following functionality:

- a) Video playback functions must include:
  - i) Play video normal speed;
  - ii) Pause;
  - iii) Stop playback;
  - iv) Fast forward; and
  - v) Reverse.
- b) Playback keyboard short cuts to facilitate review and editing of video must include:
  - i) Playback video at half speed in forward direction;
  - ii) Playback video at double speed in forward direction;
  - iii) Freeze video and initiate frame-by-frame playback in the forward direction;

- iv) Freeze video and initiate frame-by-frame playback in the backward direction;
- v) Return to normal playback; and
- vi) Still image capture.

**REQ 339.** - Still images captured during video playback must to be annotated with at least the following:

- a) Mission Number;
- b) Object unique ID number;
- c) Date and time of video was captured;
- d) Aircraft position, course, speed and altitude at time of recording;
- e) Source of video: EON, EOW, IR; and
- f) Target position of MX15HDi EO/IR Camera System reticle.

**REQ 340.** - The MSIMS must provide functionality for video editing to allow the Operator to clip short video segments in flight to enable video sharing over the SATCOM or cellular either streaming or email of video file.

**REQ 341.** - The MSIMS must provide the Operator with a means to make a video clip from any video recorded on the mission system during:

- a) A live mission;
- b) Post-flight processing.

**REQ 342.** - The MSIMS must provide the Operator with a means to set the start and end frame of a video clip both visually and by time.

**REQ 343.** - The MSIMS must provide the Operator with the estimated size of the video clip before the final video clipping function is executed.

**REQ 344.** - The MSIMS must not alter the original video recording both during and after the video editing process.

**REQ 345.** - The MSIMS must create a video clip as new file with a unique Object ID number.

**REQ 346.** - When a video clip is being made during a live mission, the MSIMS must annotate the video with, at a minimum, the following:

- a) Mission Number;
- b) Object unique ID number;
- c) Date and time of video was captured;
- d) Aircraft position, course, speed and altitude at time of recording;
- e) Source of video: EON, EOW, IR; and
- f) Target position of MX15HDi EO/IR Camera System reticle.

**REQ 347.** - When a video clip is being created during post-processing the annotation strip must display POSTPROCESS in the aircraft parameters field.

**REQ 348.** - The MSIMS must provide the Operator with a means to send a video clip(s) using

the email system with the selection of a single button or function.

- REQ 349.** - The MSIMS must provide the Operator with a means to start and stop live-streaming of video with the following required functionality:
- a) Source of video streaming is selected by the Operator and may be from either live feed or pre-recorded video;
  - b) Live streaming must be available on SATCOM and cellular;
  - c) Video compression must be in accordance with H.264 industry standard for video compression.
  - d) Live KLV metadata must be embedded in the live video stream.
- REQ 350.** - The Streaming Video must be able to be viewed by a commercially available laptop or tablet using a user friendly app or software. The software must be accessible with a user name and password which will be controlled by the NASP system administrator.
- REQ 351.** - To increase and decrease the amount of data in the video feed, Canada must be able to make adjustments to the following video parameters:
- a) Frames per second (FPS);
  - b) Video Size (full; half; quarter; sixteenth); and
  - c) Bandwidth.
- REQ 352.** - Desirable Requirement - The MSIMS should provide the Operator with a means to adjust the video compression and display the change in video file size as the compression is applied.

#### **6.2.8.4.2.3 Audio Recordings**

- REQ 353.** - The MSIMS must provide the Operator with the means to make digital audio recordings of the following:
- a) Intercom system;
  - b) SATCOM;
  - c) Voice calls;
  - d) Marine radios; and
  - e) Aviation radios.
- REQ 354.** - The MSIMS must provide the Operator with the means to playback a recorded audio file during the live mission and during Post-Processing.
- REQ 355.** - The MSIMS must provide the Operator with the following playback controls:
- a) Play audio at normal speed;
  - b) Pause;
  - c) Stop playback;
  - d) Fast forward; and
  - e) Rewind.

- REQ 356.** - When the Operator records audio, the MSIMS must automatically:
- a) Create a new audio file for each recording;
  - b) Assign a unique Object ID number to each recording; and
  - c) Create an icon on the Moving Map displayed with the Object ID where the audio recording was made.
- REQ 357.** - The MSIMS must provide a means to select which audio recording to playback that must include, at a minimum, the following options:
- a) Select the icon on the Moving Map; and
  - b) Select from the Object List.
- REQ 358.** - The MSIMS must annotate and store audio recordings with, at a minimum, the following information:
- a) Date;
  - b) Time (UTC);
  - c) Aircraft (latitude and longitude);
  - d) Aircraft course;
  - e) Aircraft speed;
  - f) Aircraft altitude; and
  - g) Duration of recording.
- REQ 359.** - When audio recording is selected, the MSIMS must display, at a minimum, the following properties in the properties list:
- a) Unique Object ID number;
  - b) Alpha or alphanumeric code for type of Object;
  - c) Date;
  - d) Time;
  - e) Latitude and longitude of the aircraft at the time audio recording was initiated;
  - f) The console the recording was initiated at;
  - g) Duration of the recording in hours, minutes, seconds;
  - h) Name of the audio file within the mission data folder; and
  - i) An editable free-text comments field.
- REQ 360.** - The MSIMS must provide a means to adjust the audio record volume by GUI and dial.
- REQ 361.** - When audio recordings are being made the MSIMS must show the record volume as a histogram. When audio volume is adjusted these adjustments must be shown in the histogram.
- REQ 362.** - The status of the audio recording must be shown on the system status bar including at a minimum, the following:
- a) Recording on/off
  - b) Operational;
  - c) Standby; and
  - d) Active Error.



#### 6.2.8.4.3 Graphical Aids

- REQ 363.** - The MSIMS must provide the Operator with the means to manually create, at a minimum, the following Graphical Aids in the mission system:
- a) Waypoints;
  - b) Routes;
  - c) Point;
  - d) Lines
  - e) Areas;
  - f) Arrows; and
  - g) Text.
- REQ 364.** - When a Graphical Aid is created, the MSIMS must automatically record with it, at a minimum, the following properties:
- a) Unique number Object assigned by the MSIMS;
  - b) Alpha or alphanumeric code for sensor/window the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Date;
  - e) Time created;
  - f) Latitude;
  - g) Longitude;
  - h) Free-text comments field;
  - i) Line length (if applicable);
  - j) Area of Object (if applicable);
  - k) Each of the vertices that are part of the Object (if applicable); and
  - l) Calculated centre position (if applicable).
- REQ 365.** - When a Graphical Aid is selected, the MSIMS must display, at a minimum, all of its properties including, at a minimum, the:
- a) Unique number Object assigned by the MSIMS;
  - b) Alpha or alphanumeric code for sensor/window the Object was created in;
  - c) Alpha or alphanumeric code for type of Object;
  - d) Date;
  - e) Time created;
  - f) Latitude;
  - g) Longitude;
  - h) Free-text comments field;
  - i) Line length (if applicable);
  - j) Area of Object (if applicable);
  - k) Each of the vertices that are part of the Object (if applicable); and
  - l) Calculated centre position (if applicable).
- REQ 366.** - All Graphical Aids created by the Operator in any sensor or window must be automatically displayed on the Moving Map with the Object ID number.

**REQ 367.** - Desirable Requirement - The MSIMS should provide the Operator with the means to change the colour of any Graphical Aid.

#### **6.2.8.4.4 Incident Folders**

##### **Information**

An "Incident Folder" is an Object type within the mission system that allows the Operator to group other Objects together that relate to an incident; it serves as a virtual file folder. This function allows the Operator to search the geodatabase and select which mission Objects are to be included in the folder. Whole Incident Folders should then be able to be emailed to clients with all associated files attached preventing the Operator from having to select each Object to attach to an email. The Incident Folders also provides a detailed list in the Flight mission report of all the Objects contained within it.

**REQ 368.** - The MSIMS must provide the Operator with a means to create Incident Folders with the following functional requirements:

- a) The initiation or creation of Incident Folders in any sensor or Moving Map window;
- b) The MSIMS must automatically assign an Object ID number;
- c) The automatic assignment of an alpha or alphanumeric code defining the Object type and the sensor or window it was created in;
- d) The automatic recording of the date, time and position the Incident Folder was created;
- e) The grouping of all data related to an incident including:
  - i) Images;
  - ii) Targets;
  - iii) Polygons;
  - iv) Points;
  - v) Audio recordings; and
  - vi) Video recordings.

**REQ 369.** - The MSIMS must provide the Operator with a means to select the Objects to be added to an Incident Folder from a list of all Objects in the mission.

**REQ 370.** - Within the Incident Folder dialogue box, the MSIMS must provide a list of Objects to select that is filterable by Object type.

**REQ 371.** - When an Incident folder is selected, the MSIMS must display, at a minimum, the following properties in the properties window:

- a) Unique Object ID number;
- b) Alpha or alphanumeric code for source of detection the Object was created in;
- c) Alpha or alphanumeric code for type of Object;
- d) Date;
- e) Time;
- f) Latitude and longitude of the aircraft at the time the Incident Folder was

- created; and
- g) An editable free-text comments field.

- REQ 372.** - Incident Folders within the MSIMS must be emailable by using a single button selection that will automatically open a new email message with all the Objects and their associated data attached.
- REQ 373.** - When an Incident Folder is selected to be emailed, the MSIMS must provide the Operator with a means to manually add and remove attachments from the email.
- REQ 374.** - The MSIMS must report the contents of each Incident Folder as a detailed list in the Mission Report. The Mission Report will be defined as part of the Critical Design Review.

#### **6.2.8.5 Data Handling**

##### **Information**

The MSIMS must be designed to facilitate easy transmission of surveillance data, including images and video to Headquarters, Command Centres, ships and other co-operating units in order to facilitate well-coordinated missions. Correspondingly, orders and surveillance data transmitted from these other units must be able to be received and entered into the surveillance system on the aircraft during a live mission.

##### **6.2.8.5.1 Data Reporting**

##### **Information**

Reporting is a very broad term that applies to many aspects within the MSIMS. This section specifically addresses the varying levels of precision for reporting of numeric data. Reporting in this context refers to three particular aspects for numeric data: Visual display, Reporting and Exporting Data and are detailed below:

- a) Visual display of numeric data refers to Object lists and properties as well as data annotation strips;
- b) Numeric data reporting refers to any means the MSIMS creates Reports or emails with lists of numeric data; and
- c) Exported refers to data that are compiled and extracted into various formats for sharing with other clients including KML and SHP.

##### **6.2.8.5.1.1 Precision of Reported Data**

- REQ 375.** - For numeric data displayed in the Object List, the time must be displayed as hour and minute and the position (latitude and longitude) must be displayed as degrees and minutes.
- REQ 376.** - For numeric data reported on all annotation strips, date and time must be

displayed as year, month, day, hour, minute, second including, at a minimum, annotation of data from the following sensors:

- a) SLAR;
- b) IR/UV;
- c) Surveillance Radar;
- d) All images;
- e) Video recording; and
- f) Audio recording.

**REQ 377.** - For numeric data displayed on all annotation strips, position (latitude and longitude) must be reported to a minimum precision of the 2<sup>nd</sup> decimal place of decimal minutes (i.e. 54 00.01) including, at a minimum, annotation of the following sensor data:

- a) SLAR;
- b) IR/UV;
- c) Surveillance Radar;
- d) All images;
- e) Video recording; and
- f) Audio recording.

**REQ 378.** - For all reported and exported data, the date and time must include the year, month, day, hour, minute, second.

**REQ 379.** - For all reported and exported data, position (i.e. latitude/longitude) must be reported to a minimum precision of the 2<sup>nd</sup> decimal place of decimal minutes (i.e. 54 00.01).

#### **6.2.8.5.1.2 Reports**

##### **Information**

The specific report requirements will be discussed at the PDR and CDR.

**REQ 380.** - The MSIMS must support Operator defined report templates as defined by the Sample NASP Report in Appendix C.

**REQ 381.** - The MSIMS must provide the Operator with a means of customizing report templates.

**REQ 382.** - The MSIMS must provide the Operators with a means of compiling reports in near real time during the mission including any data collected by the MSIMS.

**REQ 383.** - The MSIMS must provide the Operator with, at a minimum, the following Report functionality:

- a) Create;
- b) Save;
- c) Preview;

- d) Edit;
- e) Export; and
- f) Email.

**REQ 384.** - The MSIMS must provide the Operator with a means of exporting reports in, at a minimum, the following formats:

- a) PDF; and
- b) DOCX.

**REQ 385.** - All Report functionality must also be available to the Operator on the Ground Station using any data collected during a mission.

#### **6.2.8.5.1.3 Data Import and Export**

##### **Information**

The NASP works closely with many clients receiving tasking and providing analyzed data and results in near-real time. As such, Operators require a means to import and export data using varying formats and compression methods to transmit from the aircraft and store for client use after the mission has concluded. The following details minimum import and export functionality of the MSIMS.

**REQ 386.** - The MSIMS must provide the Operator with a means to import groups of Objects including points, lines, polygons, waypoints and routes to the mission during both live missions and during Pre- and Post-processing mission data in the following formats: csv and txt.

**REQ 387.** - The MSIMS must provide the Operator with a means to import Objects from a text file into the Moving Map. When used, the MSIMS will automatically create new Objects in the mission system each with its own unique ID. At a minimum, the following Windows keyboard shortcuts will be used to import these text based Objects:

- a) CTRL A for selecting all;
- b) CTRL C for copying; and
- c) CTRL V for pasting.

**REQ 388.** - The MSIMS must provide a means to import and create Objects including points, lines, polygons, waypoints and routes into the mission from KML, SHP and geoJSON formats.

**REQ 389.** - When Objects are imported from KML, SHP and geoJSON, the MSIMS must automatically create each as a new Object in the mission system with all the associated properties.

**REQ 390.** - The MSIMS must provide a means for the Operators to import Custom Layers for display on the Moving Map during a live mission in, at least, the following file formats:

- a) KML; and
- b) SHP.

- REQ 391.** - The MSIMS must provide the Operator with a means to import external geospatial imagery as a Custom layer during an active mission including at a minimum the following formats: JPEG2000 and GeoTIFF.
- REQ 392.** - The MSIMS must provide the Operator with a means to import Custom Layers and Objects using, at a minimum, the following:
- a) External storage;
  - b) An email attachment; and
  - c) The aircraft's LAN.
- REQ 393.** - The MSIMS must provide the Operator with a means to selectively control the display and removal of Custom Layers.
- REQ 394.** - Desirable Requirement - The MSIMS should provide the Operator with a means to control the level of transparency for Custom Layers.
- REQ 395.** - The MSIMS must broadcast line scan sensor (i.e. SLAR and IR/UV) imagery and metadata over the aircraft LAN via one distinct UDP port for each sensor. The broadcast must adhere to the standard defined in (APPENDIX B Annotation Datagram).
- REQ 396.** - The MSIMS must provide the Operators with a means to export selected Objects to geospatial formats KML and SHP including the following Objects:
- a) Polygons:
    - i) Oil polygons;
    - ii) Generic Polygons; and
  - b) Points:
    - i) AIS targets;
    - ii) Weather Targets;
    - iii) Waypoints;
    - iv) Radar targets;
    - v) Generic Targets; and
  - c) Lines:
    - i) Routes;
    - ii) DF lines;
  - d) All Graphical Aids including:
    - i) Points;
    - ii) Lines;
    - iii) Sectors;
    - iv) Circles;
    - v) Rectangles;
    - vi) Arrow; and
    - vii) Text.

- REQ 397.** - A dialogue box for exporting geospatial Objects must provide a means to search the geodatabase by type of Object.
- REQ 398.** - All attributes and properties for each Object must be included in the geospatial data export.
- REQ 399.** - The MSIMS must provide the Operator with a means to email exported KML and SHP files from the export dialogue box.
- REQ 400.** - The MSIMS function to email exported KML and SHP must automatically open a new email message with the selected file(s) attached.
- REQ 401.** - The MSIMS must provide the Operator with a means to export the aircraft's flight track to KML and SHP file formats. The flight track must be exported as points at 0.16 Hz (every 6 seconds) with, at a minimum, the following parameters for each point:
- a) Date;
  - b) Time (UTC); and
  - c) Aircraft:
    - i. Position (latitude/longitude);
    - ii. Course;
    - iii. Speed; and
    - iv. Altitude.
- REQ 402.** - The MSIMS must provide the Operator with a means to export the flight track at any point during the mission to include all points up to that moment in time.
- REQ 403.** - Desirable Requirement - The MSIMS should automatically export the flight track to KML and SHP at the end of the mission with, at a minimum, the properties listed in REQ 299.
- REQ 404.** - Desirable Requirement - The MSIMS should automatically export all oil polygons to KML and SHP file formats at the end of the mission including all associated attributes and properties.

#### **6.2.8.5.2 Data Transmission**

##### **Information**

The NASP provides essential data to clients and needs to do so in near-real time. As such the MSIMS needs to have a means of transmitting data in flight. Some data need to be compressed and transferred directly (i.e. live-streaming video) while other data may be transmitted using Operator initiated and mission system automated emails. The functionality requirements are detailed below.

- REQ 405.** - The MSIMS must provide a means for the Operator to transmit data in flight using the SATCOM, 3G, 4G, or LTE networks to include, at a minimum, the following:

- a) Sensor images;
- b) Screen captures;
- c) Video; and
- d) Reports.

**REQ 406.** - The MSIMS must automatically compress large imagery for transmission over the SATCOM, 3G, 4G, or LTE networks.

**REQ 407.** - Desirable Requirement - The MSIMS should provide a means for the Operator to choose the level of compression of geospatial imagery for transmission over SATCOM, 3G, 4G or LTE networks.

**REQ 408.** - The MSIMS must automatically compress MX15HDi video maintaining good quality imagery while allowing for live streaming with, at a minimum, the following transfer rates:

- a) 432 KBps in streaming video mode; and
- b) 256 KBps in background IP mode.

#### **6.2.8.5.2.1 MSIMS Email functionality**

**REQ 409.** - The MSIMS must provide an email system for the Operator to compose, send, receive, retrieve, view and automatically send emails.

**REQ 410.** - The MSIMS system must have an email program with, at a minimum, the following functionality:

- a) Email organization boxes including:
  - i) Inbox;
  - ii) Drafts saved;
  - iii) Outbox; and
  - iv) Sent box.
- b) Email message functions including:
  - i) Reply;
  - ii) Reply all;
  - iii) Forward; and
  - iv) Delete.
- c) Emails to include the following fields:
  - i) From,
  - ii) To;
  - iii) CC;
  - iv) BCC;
  - v) Subject; and
  - vi) Attachments with default path to image folder.
- d) A means to set the email addresses and email servers to be used;
- e) A means to add attachments to emails;
- f) Operator defined and controlled contact and distribution lists;



- g) Access to contact and distribution lists from within an active email message and from the main email program;
- h) A visual display indicating the progress of emails being sent and received; and
- i) Automatically generate new emails with selected Object(s) attached when prompted by Operators.

**REQ 411.** - The MSIMS must provide an automatic email system that generates and sends specified emails at set intervals (i.e every 5 minutes) set by the operator to a predefined distribution list(s), also set by the Operator, that includes, at a minimum, the following:

- a) Aircraft Tracking emails to include:
  - i) Latitude and longitude;
  - ii) Course;
  - iii) Speed;
  - iv) Date;
  - v) Time (UTC); and
- b) All AIS targets are compiled into the body of an email including the following AIS properties:
  - i) Category of target (AIS);
  - ii) Type (i.e vessel or other);
  - iii) Time (UTC);
  - iv) Position – latitude/longitude;
  - v) Course (degrees – true);
  - vi) Speed (knots);
  - vii) Vessel type – AIS A or B;
  - viii) Name;
  - ix) Call Sign;
  - x) IMO number;
  - xi) Port of Call;
  - xii) Destination;
  - xiii) ETA;
  - xiv) Ship/cargo type;
  - xv) Length/Width;
  - xvi) True heading;
  - xvii) ROT (degrees/min);
  - xviii) Max draught;
  - xix) Nav status; and
  - xx) MMSI number.

The final format of the automatic emails will be provided at the CDR meeting.

**REQ 412.** - Desirable Requirement - The MSIMS should provide a function that automatically extracts all AIS data, including complete vessel tracks and all properties, into KML format every 15 minutes and sends this file via email to a predefined distribution list.

### **6.2.8.6      *MSIMS Ground Station***

#### **Information**

To allow for detailed analysis of mission data and evidence preparation, Operators require mission system software that replicates the software on the aircraft but supplied on a laptop computer. This computer, termed a Ground Station, will also be used for training new Surveillance Officers working on previously recorded missions to learn the functionality and operation of the MSIMS. Ground station will be used to conduct Pre and Post-Processing of mission data.

**REQ 413.** - One Ground Station must be supplied.

**REQ 414.** - The Ground Station must be the latest generation laptop computer to include, at minimum, the following:

- a) 17" monitor;
- b) USB mouse;
- c) Backlight keyboard;
- d) Four USB 2.0 ports;
- e) Two USB 2.0 ports;
- f) HDMI capability;
- g) Larger hard drive space - 2TB;
- h) Number pad;
- i) I7 processor with a GPU;
- j) Long battery life;
- k) Optical reader;
- l) Gigabit Ethernet;
- m) High performance General Purpose Graphics Processing Unit (GPGPU);
- n) Internal Compact flash cards;
- o) Internal SD card reader; and
- p) 16 GB RAM.

**REQ 415.** - The Ground Station must be capable of importing, replaying, analyzing, printing and exporting selected segments of the entire mission data post flight.

**REQ 416.** - The Ground Station must replicate all functionality and display parameters as the MSIMS on the aircraft.

**REQ 417.** - As Ground Station lacks aircraft peripherals to navigate the MSIMS, all mission navigation must be done using mouse and keyboard shortcuts that replicate those available on the aircraft.

**REQ 418.** - The Ground Station must be able to write data to external storage device which includes DVD, USB, External Hard drive, compact flash drive.

**REQ 419.** - All Report functionality available on the aircraft must be available to the Operator on the Ground Station using any data collected during a mission including, at a

- minimum,
- a) Create;
- b) Save;
- c) Preview;
- d) Edit; and
- e) Export.

**REQ 420.** - The Ground Station must provide the Operator with a means of exporting reports in, at a minimum, the following formats:

- a) PDF; and
- b) DOCX.

#### **6.2.8.7      *Pre-Processing of Mission Data***

##### **Information**

Pre-processing of mission data is when a new mission is created but no new sensor data will be added until the mission is uploaded or run live on the aircraft.

**REQ 421.** - The Ground Station must provide the Operator with, at a minimum, the following pre-processing functions:

- a) Creation of points, lines, waypoint, routes and polygons as well as oil polygons;
- b) Target creation in map; and
- c) Image capture.

#### **6.2.8.8      *Post-Processing of Mission Data***

##### **Information**

Post-Processing is when no new sensor data is added to a mission file but all pre-recorded mission data can be reviewed and editing functions are available.

**REQ 422.** - The Ground Station must provide the Operator with, at a minimum, the following Post-Processing functions:

- a) Video and audio playback;
- b) Video editing;
- c) Image captures;
- d) Target creation;
- e) Creation of points, lines, waypoint, routes and polygons as well as oil polygons;
- f) Geo-referencing sensor data including SLAR, IR/UV and ISAR;
- g) Export all geospatial data products available on the aircraft;
- h) Mission parameters in mission summary are editable;

- i) Distance and Bearing tool;
- j) Cursor location on remote sensors is shown on the map;
- k) Position of cursor and selectable Object viewable in cursor; and display window.

**REQ 423.** - Post-Processing must be available on the aircraft and on the ground station.

## **7 MODIFICATION OF EXISTING SYSTEMS FOR MX15HDI INTEGRATION**

### **Information**

Canada has procured new MX15Hdi Camera Systems that require three existing, operational MSS6000 mission systems be updated to accommodate the new high definition camera systems.

**REQ 424.** - The Contractor must upgrade three of Transport Canada's MSS6000 Mission Systems, TC001 in Moncton, NB, TC009 in Richmond, BC and TC014 in Ottawa, Ontario to integrate the MX15Hdi in accordance with REQ 93 to REQ 107 of this SOW.

**REQ 425.** - Alternatively, relating to REQ 424, if it is more cost effective, the Contractor may propose to replace the three existing MSS6000 mission systems with the solution being provided within this contract which integrates and utilizes all existing sensors, meeting the requirements within this SOW and integrates the MX15Hdi in accordance with REQ 94 to REQ 107 of this SOW.

**REQ 426.** - Desirable Requirement - The update to the existing mission systems should be delivered 4 months after Contract Award.

**REQ 427.** - The existing mission systems must be able to live stream HD video via the SATCOM or cellular to recipients on the ground using the same streaming video solution across all four TC NASP aircraft.

**REQ 428.** - The existing mission systems must be able to view previously recorded video both on the aircraft and on the MSIMS Ground Stations.

**REQ 429.** - Canada currently has four ground stations in use. The software on these four Ground Stations must be upgraded / modified to incorporate HD video while retaining all current functionality of the system.

**REQ 430.** - Alternatively, relating to REQ 429, if it is more cost effective, the Contractor may propose to replace the four existing MSS6000 Ground Stations with the solution being provided within this contract, without sacrificing any functions of the ground stations by meeting the requirements within this SOW and integrates the MX15Hdi in accordance with REQ 414 to REQ 420.

Note: TC has one ground station with each aircraft and one at HQ, for a total of

four.

## 8 DOCUMENTATION

- REQ 431.** - All deliverables must come with certificates of conformity to allow Canada to certify the provided equipment as part of the installation at a later date.
- REQ 432.** - The Mission Work Station must come with airworthiness certification. (i.e. green tagged)
- REQ 433.** - All system operator manuals, maintenance manuals and other documentation as per requirements of this SOW must be provided digitally as well as hard copy for training purposes. 10 Operator manuals and maintenance manuals must be provided in hardcopy as part of the contract.
- REQ 434.** - All training materials must be provided digitally in MS PowerPoint and .PDF to Canada to allow for in house training.

## 9 TEST PLANS AND PROCEDURES

### Information

Canada will review all test plans within 30 days of receipt from the Contractor. Canada reserves the right to require the Contractor to rewrite and/or modify any document(s) if the content is inadequate.

Any Flight Test Plans or Procedures, developed by the Contractor, that have an impact on aircraft safety or airworthiness must be approved or be acceptable to Transport Canada Civil Aviation (TCCA) or delegate.

- REQ 435.** - The Contractor must include an outline of the test plan objectives for evaluation by the TC personnel and the technical authority.
- REQ 436.** - The Contractor must adhere to all applicable Canadian Aviation Regulations for any system maintenance and repairs.

### 9.1 Factory Acceptance Test (FAT) Plan

In order to evaluate the software and end-to-end functionality of the factory integration of features (sensors, data management, etc), Canada must be invited to witness all system functionality through an acceptance test before final delivery.

The following methodology will be used by Canada at the FAT.

REQ ID	Contractor's Proposed	Inspection	Demonstration	Analytical Methods	Test	Amplification Information
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#	Solution as per Proposal					– Qualification
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- REQ 437.** - The Contractor must provide access to the acceptance test facilities for all systems to allow Canada or its designate(s) to witness and participate in the system end-to-end functionality during factory acceptance testing.
- REQ 438.** - End-to-end tests must demonstrate real or simulated targets detected, processed, displayed and recorded.
- REQ 439.** - End-to-end tests completed in the factory must demonstrate all the mandatory and rated requirements of this SOW.
- REQ 440.** - The details of the Factory Acceptance Test must be specified in the Project Management Plan.
- REQ 441.** - If the Surveillance Radar is not delivered with the MSIMS, all test plans must include a provision for follow-on Factory Acceptance Testing of the Surveillance Radar.

## 9.2 Pre-flight Ground Acceptance Test (Pre-FLT GAT) Plan

- REQ 442.** - The Contractor must submit a Pre-flight Ground Acceptance Test Plan that will be conducted on board the TC Dash 8 aircraft prior to the Flight Acceptance test. The timeline associated with this test is unknown at this time. It will only occur once TC-ASD has finalized the installation/integration of the MSIMS and associated mission sensors on the Dash 8.
- REQ 443.** - The Pre-flight Ground Acceptance Test Plan must indicate that the test, when conducted, will demonstrate the end-to-end system is fully serviceable in a powered-up mode.
- REQ 444.** - If the Surveillance Radar is not delivered with the MSIMS, all test plans must include a provision for follow-on Pre-Flight Ground Acceptance testing of the Surveillance Radar to be conducted at facilities within Canada.

## 9.3 Flight Acceptance Test Plan (FLT-AT)

Canada will cover the costs associated with aircraft operations during the FLT-AT.

- REQ 445.** - The FLT-AT will follow successful completion of the Pre-FLT-GAT and when any required airworthiness certification has been acquired. The timeline associated with this test is unknown at this time. It will only occur once TC-ASD has finalized the installation of the MSIMS and associated mission sensors on the Dash 8.
- REQ 446.** - The FLT-AT must indicate that the test, when conducted, would demonstrate the

end-to-end system is fully serviceable. Three successful operational style missions must be completed as part of the FLT-AT.

**REQ 447.** - If glitches are observed in the system during the FLT-AT, then they must be fixed and the test starts over with three more successful operational style missions.

**REQ 448.** - If the Surveillance Radar is not delivered at the same time with the MSIMS, all test plans must include a provision for follow-on Flight Acceptance testing of the Surveillance Radar during three successful operational style missions.

## **10 INSTALLATION SUPPORT**

The installation and certification of the system in the aircraft are the responsibility of Canada or it's designate(s) and will take place at a facility selected by Canada; however, support may be required by the Contractor.

**REQ 449.** - The Contractor must provide installation and testing support during the commissioning of the system in the aircraft. The Contractor must ensure that a responsible delegate is present at the designated facility for the post-installation Pre-flight Ground Acceptance Test, and Flight Acceptance Test in order to support functionality verification and any system troubleshooting.

**REQ 450.** - If the Surveillance Radar is not delivered with the MSIMS then the Contractor must ensure that a responsible delegate is present at the designated facility for the post-installation Pre-flight Ground Acceptance Test, and Flight Acceptance Test in order to support functionality verification and any system troubleshooting.

## **11 OPTIONS**

The Contractor must provide Canada with the option to acquire:

### **11.1 Training**

MSIMS Operator training - at a minimum of 10 days, including, at a minimum, 5-days for the Surveillance Radar. The training must teach the operator how to use the new MSIMS and all its associated interfaces. As the surveillance radar is new to Transport Canada, an initial operator's course is required to teach the surveillance officers how to use the surveillance radar and its interface. The final curriculum must be provided for review and approval at the CDR. All training materials must be provided to Canada digitally in PowerPoint and PDF to allow for in house training. 10 copies of the Operators manual must also be provided for the training course.

MSIMS Maintenance training - including maintenance of MSIMS and the front line maintenance of the Surveillance radar. The curriculum must be provided for review and approval at the CDR. All training materials must be provided to Canada digitally in PowerPoint and PDF to allow for in house training. 10 copies of the maintenance manual must also be provided for the training course.

Note: Training will take place in Ottawa, Ontario. Scheduling of the training will be determined by mutual agreement and based on classroom and aircraft availability which will be provided by Canada.

### **11.2 Engineering Support**

The Contractor must provide Canada with the option to obtain engineering support during the installation and commissioning of the system in 2021 by TC ASD.

The option quoted must be for an hourly rate per engineer that can assist with the integration work of the associated sensors when being integrated on the aircraft. Timelines will be discussed at the PDR and CDR. Estimate 100 hours for costing purposes.

The engineering support required for the Pre-Flight Ground Acceptance Test, and the Flight Acceptance Tests of the MSIMS are included in this contract and will not be billed as an additional service.

### **11.3 Spare Side Looking Airborne Radar (SLAR) Antennae**

The Contractor must provide Canada with the option to acquire up to four Ericsson



SLAR Antennae, part number - 103 01/5.

#### **11.4 Spare Ericsson SLAR Transmit Receive Units.**

The Contractor must provide Canada with the option to acquire up to two Ericsson SLAR Transmit Receive Units, Part Number UFA 10241.

#### **11.5 Additional Surveillance Radars**

The Contractor must provide Canada with the option to acquire two additional Surveillance Radars which will be fully integrated with the existing MSS6000 mission systems or the Contractors proposed MSIMS.

Alternatively, if it is more cost effective, the Contractor may propose to replace the existing MSS6000 mission systems with the solution being provided within this contract which integrates and utilizes all existing sensors, meet the requirements within this SOW and integrates additional surveillance radars in accordance with REQ 125 to REQ 166.

#### **11.6 Initial Provisions to Support MSIMS**

The Contractor must provide Canada with the option to acquire initial provisioning in the form of recommended spare parts list that can be used to support this new MSIMS for the next 5 years based on 1200 hours of surveillance per year.

## 12 DELIVERABLE AND ACCEPTANCE CRITERIA

### 12.1 Project Management

**REQ 451.** - Upon contract award, the Contractor must deliver a detailed project management plan (PMP) and a detailed system functionality description and architecture document for review and approval by Canada. The Project Plan must:

- a) Indicate available start dates in 2020 and 2021 to complete the work;
- b) Include a list of all the resources that will be assigned to this project as well as provide a brief description of their role/responsibilities;
- c) Indicate which components within the SOW require Non-recurring engineering;
- d) (i) Provide actual additional weights, supported by a reference to TCCA approved design/data, if available, that will be added to the basic weight of the aircraft as a result of the installation of the MSIMS and all its components specified in the SOW:

OR

(ii) Provide the following information if the details of additional weights if unavailable at time of bid:

- description of how the Contractor plans to minimize additional weight as part of the design process;
  - a plan for the dedicated engineering resources (and other resources as applicable) that will be applied to the design process to minimize adding weight to the aircraft; and
  - an estimate of the design implications that add weight to the aircraft.
- e) The Contractor must provide evidence of their recent\* previous experience with design, engineering, manufacture and testing for sections 5 to 15 of this SOW;
  - f) The Contractor must provide a summary of their organizational capacity to carry out the work within the SOW, as well as identify the key resources required (and available) to implement these Tasks.
  - g) The Contractor must identify any data dependencies on ASD; and
  - h) The Contractor must identify how much time they have allocated, as part of their plan, for TC to respond to queries.

(\*For clarity "recent" is considered within the last ten years of this RFP)

**REQ 452.** - Desirable Requirement - The Contractor should provide documentation illustrating that it has successfully delivered projects of the same scope up to a maximum of 5 in the last ten (10) years from bid closing on mission systems and with similar system complexity.

**REQ 453.** - Desirable Requirement - The Contractor should provide a Project/Work Plan with the bid submission. The detailed Project/Work Plan, as per the Guideline in section 12.3, must include all tasks and deliverables specified in this SOW, projected on a timeline that spans from contract award to delivery.

As a minimum, this Project Work Plan must include the number of days to complete the following activities, and must substantiate how the Contractor will adhere to the provided timelines:

- a) Number of calendar days required from contract award to Preliminary Design Review (PDR);
- b) Number of calendar days required from PDR to Critical Design Review (CDR);
- c) Number of Months after Contract Award to complete the work detailed in the SOW;
- d) Number of calendar days to complete the Factory Acceptance Test (assuming there are no deficiencies to rectify); and
- e) Number of calendar days to complete the Ground Acceptance Test (assuming there are no deficiencies to rectify).

## 12.2 Project Management Plan – Supporting Evidence Required

**REQ 454.** - As part of the PMP, the Contractor must propose a schedule of meetings and reviews, which will include at a minimum the following milestones. The milestones dates will be completed upon contract award and will assist in completing the basis of payment:

<b><u>Milestone Meeting</u></b>	<b><u>Location</u></b>	<b><u>Date</u> <u>(Months after Contract</u> <u>Award (MACA))</u></b>
Project kick-off, review of draft Interface Control Document, and review of detailed system architecture and functionality description	Teleconference	TBD
Approval of Project Management Plan	Document Receipt and Approval	TBD
Preliminary Design Review Meeting	TBD	TBD
Deliver preliminary Interface control document (ICD) for MSIMS.	Document Receipt and Approval	TBD
Critical Design Review Meeting	Teleconference	TBD
Deliver of final Interface control document (ICD).	Document Receipt and Approval	TBD
Delivery of Surveillance Radar Interface Control Document (ICD)	Document Receipt and Approval	TBD
Equipment / Avionics Rack Interface	Document Receipt and	TBD

Control Document (ICD)	Approval	
Delivery of all Test Plans	Document Receipt and Approval	TBD
Factory Acceptance Test of all hardware components as specified in the SOW (MSIMS)	TBD	TBD
Factory Acceptance Test of the MSIMS which includes all the deliverables identified in the SOW.		
Commissioning (without radar), Ground Acceptance Test - Successful completion of Ground Acceptance Test of the MSIMS (minus the surveillance radar) which includes all the deliverables identified in the SOW.	Canada	TBD
Commissioning (without radar) Flight Acceptance Test - Successful completion of Flight Acceptance Test of the MSIMS (minus the surveillance radar) which includes all the deliverables identified in the SOW.	Canada	Dependent on when TC completes the Integration
Factory Acceptance Test Surveillance Radar	At Radar Factory	TBD
Commissioning (with radar), Ground Acceptance Test - Successful completion of Ground Acceptance Test of the MSIMS with the surveillance radar as per deliverables identified in the SOW.	TBD	Dependent on when TC completes the Integration
Commissioning (with radar), Flight Acceptance Test - Successful completion of Flight Acceptance Test of the MSIMS with the surveillance radar as per deliverables identified in the SOW.	TBD	Dependent on when TC completes the Integration
Preliminary Design Review Meeting – modification of existing mission systems and ground stations for MX15 HDi integration	TBD	TBD
Deliver preliminary Interface control document (ICD) for upgrade	Document Receipt and Approval	TBD
Critical Design Review Meeting - modification of existing mission systems and ground stations for MX15 HDi integration	Teleconference	TBD

Deliver of final Interface control document (ICD) for upgrade.	Document Receipt and Approval	TBD
Commissioning, Ground Acceptance Test - Successful completion of Ground Acceptance Test of the existing mission systems with new software as per deliverables identified in the SOW.	TBD	Dependent on when TC completes the Integration
Commissioning, Flight Acceptance Test - Successful completion of Flight Acceptance Test of the existing mission systems with new software as per deliverables identified in the SOW.	TBD	Dependent on when TC completes the Integration

## 12.3 Project Management Plan Guideline

In addition, the PMP must include as a minimum the following information for approval by Transport Canada as detailed at:

<https://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/ti-it/ervcpgpm-dsfvpmpt-eng.html>:

1. Executive Summary
2. Integration Management
  - 2.1 Project Governance and Project Team Structure
  - 2.2 Roles and Responsibilities
  - 2.3 Change Management
    - 2.3.1 Change Control
    - 2.3.2 Issue Management
  - 2.4 Project Close Out
3. Scope Management
  - 3.1 Scope Statement
  - 3.2 Requirements Management
  - 3.3 Project Deliverables
    - 3.3.1 Work Activities
    - 3.3.2 Requirements Control
    - 3.3.3 Constraints
    - 3.3.4 Assumptions
    - 3.3.5 Stakeholders
4. Schedule Management
  - 4.1 Milestone
  - 4.2 Schedule Control
5. Cost Management
  - 5.1.1 Estimation
  - 5.1.2 Budget Allocation
  - 5.1.3 Budget Control
6. Quality Management
  - 6.1 Quality Assurance
  - 6.2 Quality Control
7. Human Resource Management
8. Communications Management
  - 8.1 Stakeholder Analysis
  - 8.2 Project Reporting and Communication
  - 8.3 Metrics Collection
9. Risk Management
10. Procurement Management
11. Information Management
12. References

## 12.4 Meetings

**REQ 455. - Progress Report Meetings** - On a bi-weekly basis, or as requested by TC ASD, the Contractor must prepare and chair progress report meetings via video or teleconference. The intent of the progress meetings is to provide TC ASD and the Contracting Authority with a status update on the work performed to date and to facilitate a verbal information exchange. The Contractor is responsible for ensuring that all necessary representatives are available to respond to any questions from TC ASD AMO or AEO.

**REQ 456. - Monthly Progress Report** - On a monthly basis, the Contractor must submit a progress report of the aircraft's upgrade, showing the percentage of work completed and the expected completion date. The report must be submitted electronically and in the following format:

Task Number	Upgrade Start Date	% Work Completed	Description of Work Completed	Description of Remaining Work	Estimated Delivery Date

**REQ 457. - Systems Requirement Review (SRR)** – Following contract award, the purpose of the SRR is to outline the expectations and to clarify details relevant to the tasks to be completed, the PDR and the CDR meetings. The SRR will be carried out in the form of telephone/video conference calls.

**REQ 458. - Preliminary Design Review (PDR)** - The purpose of the PDR is to review the conceptual design and to discuss constraints and scope of adjustments to ensure that the planned technical approach will meet the TC ASD requirements. The PDR will be carried out in person at an agreed upon location.

**REQ 459. - Critical Design Review (CDR)** - The purpose of the CDR is to review the detailed design. The detailed design must include, specifications, descriptions of interoperability with existing systems, etc. The detailed design must also include specific details of how the design will be executed (schedules, sub-Contractors, etc). The detailed design should include as much information as possible as it will serve as the basis for the implementation phase. The detailed design must be approved by TC ASD prior to the commencement of the work. The CDR will be carried out in person at an agreed upon location. The Contractor will present their detailed design at the CDR meeting in Contractor format. TC ASD will accept the CDR as complete only when it has been demonstrated that each of the following exit criteria are satisfied:

- a) The detailed design addresses all elements of the SOW; meets all TC ASD AEO requirements to complete and approve the provisional installations as detailed in this SOW and all NASP mission requirements are satisfied

- b) The Contractor has demonstrated their readiness to manufacture and have each component install ready by TC ASD or its delegate
- c) The Contractor has described in sufficient detail their methodology for a phased system delivery with the surveillance radar coming later than the MSIMS
- d) The Contractor has described in sufficient detail their methodology for a testing the design / system
- e) The Contractor must provide the design and engineering reports for the Mission Work Stations as the means of compliance will require an analysis of the engineering report that confirms that the loading requirements and design meets the various requirements of CAR 521.
- f) The Contractor has described in sufficient detail their methodology to certify the design and the provision of a Certification Plan; and
- g) The Contractor has demonstrated that the proposed equipment are compatible with other affected aircraft systems.

### **13 LANGUAGE OF WORK**

All documentation must be in English and be provided digitally in softcopy.

### **14 SECURITY REQUIREMENTS**

A Security Requirements Check List (SRCL) will be completed prior to the RFP being issued.

### **15 GOVERNMENT-FURNISHED EQUIPMENT/INFORMATION**

Targeted Aircraft - The targeted aircraft will be TC's Dash 8 100 serial number 17. TC will provide the Contractor access to all available documentation that is relevant to the detailed design and integration of the system.

In addition to other requirements specified in this document, the MSIMS must integrate the Government Furnished Equipment (GFE) specified within this SOW.

If TC requires training, as per section 11, TC will provide classroom facilities, access to the aircraft and will cover the costs of flight operations associated with the training.



## Appendix A to Annex A - Annotation Datagram

This Data Annotation Block format is provided for guidance only. The Contractor will develop a Data Annotation block appropriate to the applied system along the principals illustrated in this example. The annotation will consist of 64 bytes of data followed by N bytes of image data on each line. Each line from each line-scanning sensor will be one data record. The data records consist of 64 bytes of annotation followed by n bytes of sensor image (pixel) bytes ordered left to right and for the case of the IR/UV Sensor, IR imagery data is first followed by the UV imagery data.

Item	Description	Bytes
Line count	(0 ~ 65535), wraps around positive integer,	2
Byte count - record	number of bytes in record	2
Byte count - annotation	number of bytes of annotation data in record	2
Byte count - image data	number of bytes of image data in record	2
Byte count - /pixel	number of bytes per pixel of image data (1 or 4?)	1
Sensor type	Sensor ID: 1 for SLAR, 2 for IR/UV	1
Date	Year (4 digit) 2 bytes, Month (01~12) 1 byte, Day (01~31) 1 byte	4
Time (UTC)	Hour (0~23) byte, Minute (0~59) byte, Second (0~59) byte	3
Aircraft position -Latitude	decimal degrees, north positive, 32-bit float	4
Aircraft position -Longitude	decimal degrees, east positive, 32-bit float	4
Heading	decimal degrees, 32-bit float	4
Aircraft Altitude	metres, 32-bit float	4
Antenna Look Direction	Left=1/Right=2/Both=0	1
Pixel size	Metres/Pixel - variable in scanner case, 32-bit float	4
1 <sup>st</sup> pixel - latitude	decimal degrees, north positive, 32-bit float	4
1 <sup>st</sup> pixel - longitude	decimal degrees, east positive, 32-bit float	4
Last pixel - latitude	decimal degrees, north positive, 32-bit float	4
Last pixel - longitude	decimal degrees, east positive, 32-bit float	4
Ground speed	decimal knots, 32-bit float	4
Validity		4
Checksum		2
<b>Total</b>		<b>64</b>

## Appendix B to Annex A – Sample Report

C-GXXX Transport XXX

NASP - MISSION REPORT /  
RAPPORT DE MISSION - PNSA

<b>FLIGHT INFORMATION / INFORMATION SUR LE VOL</b>
<b>MISSION INFORMATION / INFORMATION SUR LA MISSION</b>

Date: \_\_\_\_\_ Flight Number / Numéro de vol: \_\_\_\_\_

Objective / But : Primary / Primaire: \_\_\_\_\_ Secondary / Secondaire: \_\_\_\_\_

Area of Operation / Zone d'opération: \_\_\_\_\_

Comments / Commentaires : \_\_\_\_\_

<b>CREW INFORMATION / INFORMATION SUR L'ÉQUIPAGE</b>
--

Pilot / Pilote		Mission Lead / Chef d'équipe		Other / Autre	
Co-pilot / Co-pilote		Officer / Agent(e)		Other / Autre	
		Officer / Agent(e)		Other / Autre	

<b>FLIGHT DATA / DONNÉES DU VOL</b>
-------------------------------------

FLIGHT TIMES/TEMPS DU VOL			REGIONAL TIME / TEMPS PAR RÉGION					
From / De			PAC	P & N	ONT	QC	MAR	NL / TN
To / À								
Departure / Départ								
Take off / Décollage								
Landing / Atterrissage								
Arrival / Arrivée								
Charter / Nolisé	HR/MIN	HR/DEC	0.0	0.0	0.0	0.0	0.0	0.0
Airborne / En vol	0:00	0.0						
	0:00	0.0						
			TOTAL 0.0					

Pollution	Other / Autre	TOTAL
0.0		0.0

Charter Time Division / Répartition du temps nolisé

Number of pollution incidents observed/Nombre d'incident de pollution observés

Suspected Source / Source Probable: \_\_\_\_\_

Unknown Source / Source Inconnu: \_\_\_\_\_



all the mandatory requirements of the Statement of Work including those that are not part of this mandatory technical criteria bid evaluation.

reports, flight test reports/data, engineering attestations, Interface control documents, other Operational/Technical substantiating documentation,

r certifies the uirement is stood and will be met (YES / NO)	Supporting Evidence Required	Reference to Bidder's Proposal	Pass (P)	Fail (F)	Verification of Supporting Evidence by Canada (Page/Para #)
	<p>The Bidder's documentation must prove that the proposed solution is at TRL 9.0 and clearly identifies it as an operational system at the time of the bid by providing references to other customers using the system.</p> <p>The Bidder must provide proof of successful completion of three similar projects in the last 10 years from RFP closing date.</p> <p>The substantiating evidence must include name of customer, start and end date of project, description of project, dollar value, type of aircraft, type(s) of specialized operational mission equipment designed and installed and reference letter from client. Please complete the template in Annex A.</p>				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				

	RFP closing date showing their system being integrated on maritime patrol aircraft which had no effect on the continued airworthiness and operation of the subject aircraft.					
	The substantiating evidence must be provided in the template in Appendix B. Data must include the name of customer, the start and end date of project, a description of the project, contract dollar value, type of aircraft, type(s) of specialized operational mission equipment designed and installed and reference letter from client.					
	The Bidder must demonstrate in their proposal, with clear references, how this requirement is understood and their solution to address it, as detailed in the SOW.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.  This must be verified at Factory Acceptance by the bidder providing proof of documented environmental conditions of system components.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.  Note: This must be verified at Factory Acceptance by the bidder providing proof of documented results from tests relating to shock and vibration in accordance with RTCA-DO160G standards.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.  Note: This must be verified at Factory Acceptance by the bidder providing proof of documented results from tests relating to humidity in accordance with RTCA-DO160G					

	bidder providing proof of documented environmental conditions of system components.					
	The Bidder must demonstrate in their proposal, with clear references to the Operator's manual, how this requirement is understood and their solution to address it, as detailed in the SOW.					
	The Bidder must demonstrate in their proposal, with clear references to the Operator's manual, how this requirement is understood and their solution to address it, as detailed in the SOW.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
	The Bidder must demonstrate in their proposal, with clear references to the Operator's manual how this requirement					

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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					
	<p>The Bidder must demonstrate in their proposal, with clear references to substantiating documentation, proof of the experience they have integrating IR/UV Sensors into the mission system. The response must clearly demonstrate that this requirement is understood and their solution to address it, as detailed in the SOW.</p> <p>Must include name of customer, start and end date of project, description of project, dollar value, type of aircraft, type(s) of specialized operational mission equipment designed and installed.</p> <p>Provide examples of three previous similar work completed within the last ten years from RFP Closing date. If more than three examples and/or references are provided, the evaluation team will only evaluate the most recent three examples.</p>					
	Not evaluated as part of the bid, will be verified for					



	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
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	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
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	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as				





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	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	<p>The Bidder must demonstrate in their proposal, with clear references to substantiating documentation, proof of the experience they have integrating an AIS into the mission system. The response must clearly demonstrate that this requirement is understood and their solution to address it, as detailed in the SOW.</p> <p>Must include name of customer, start and end date of project, description of project, dollar value, type of aircraft, type(s) of specialized operational mission equipment designed and installed.</p> <p>Provide examples of three previous similar work completed within the last ten years from RFP closing date. If more than three examples and/or references are provided, the evaluation team will only evaluate the most recent three examples.</p>				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				

						The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.			
						Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.			
						<p>The Bidder must demonstrate in their proposal, with clear references to substantiating documentation, proof of the experience they have integrating a Direction Finder into the mission system. The response must clearly demonstrate that this requirement is understood and their solution to address it, as detailed in the SOW.</p> <p>Must include name of customer, start and end date of project, description of project, dollar value, type of aircraft, type(s) of specialized operational mission equipment designed and installed.</p> <p>Provide examples of three previous similar work completed within the last ten years from RFP closing date.</p> <p>If more than three examples and/or references are provided, the evaluation team will only evaluate the most recent three examples.</p>			
						Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.			
						Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.			
						Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.			

	<p>radar into a mission system. The response must clearly list the make and model of the surveillance radar that has previously been integrated into the mission system. The bidder must demonstrate that this requirement is understood and their solution to address it, as detailed in the SOW.</p> <p>Must include name of customer, start and end date of project, description of project, dollar value, type of aircraft, type(s) of specialized operational mission equipment designed and installed.</p> <p>Provide examples of three previous similar work completed within the last ten years from RFP closing date.</p> <p>If more than three examples and/or references are provided, the evaluation team will only evaluate the most recent three examples.</p>				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	The Bidder must clearly list the frequency of the Surveillance Radar in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				
	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.				

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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.					





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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.						
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	The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals, how this requirement is understood and their solution to address it, as detailed in the SOW.						
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.						
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.						
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.						

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	<p>The Bidder must demonstrate in their proposal, with clear references to substantiating documentation such as operator's manuals and Interface Control Documents, how this requirement will be met considering the existing IP rights rest with the present service provider of the system (ST Airborne systems). The bidder must clearly indicate that they understand the magnitude of these upgrades and their solution to address it, as detailed in the SOW.</p> <p>The bidder <b>must</b> provide evidence that they have secured an agreement in principle with the IP holder (ST Airborne Systems) on IP Holder Letterhead that they can secure the appropriate IP rights to upgrade the existing systems. At the end of the day, there must be no doubt that the prime bidder has secured the IP data rights, and licences and they can contract this portion of the work to ST Airborne Systems.</p>				
	<p>If the Bidder is proposing a new solution versus upgrading of existing systems, then the bid must demonstrate, with clear references to substantiating documentation such as operator's manuals, how this requirement will be met. The bidder's strategy must clearly lay out the plan to provide a new solution is being offered. The bidder must clearly indicate that they understand the magnitude of these upgrades and their solution to address it, as detailed in the SOW. If a new mission is being proposed, the bidder must provide examples of three previous similar work completed within the last ten years from the closing date of the RFP.</p>				
	<p>Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.</p>				
	<p>Response requires a brief description from the bidder demonstrating that the requirement is understood and bidder's commitment to address it, as detailed in the SOW.</p>				

	<p>this requirement will be met considering the existing IP rights rest with the present service provider of the system (ST Airborne systems). The bidder must clearly indicate that they understand the magnitude of these upgrades and their solution to address it, as detailed in the SOW.</p> <p>The bidder must provide evidence that they have secured an agreement in principle with the IP holder (ST Airborne Systems) on IP Holder Letterhead that they can secure the appropriate IP rights to upgrade the existing systems. At the end of the day, there must be no doubt that the prime bidder has secured the IP data rights, and licences and they can contract this portion of the work to ST Airborne Systems.</p>				
	<p>If the Bidder is proposing a new solution versus upgrading of existing systems, then the bid must demonstrate, with clear references to substantiating documentation such as operator's manuals, how this requirement will be met. The bidder's strategy must clearly lay out the plan to provide a new solution is being offered. The bidder must clearly indicate that they understand the magnitude of these upgrades and their solution to address it, as detailed in the SOW. If a new mission is being proposed, the bidder must provide examples of three previous similar work completed within the last ten years from the closing date of the RFP.</p>				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				
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	Not evaluated as part of the bid, will be verified for contractual acceptance as per the SOW.				

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2 brochures, proposal, data sheets or Other Substantiating Documentation by completing the “Reference to Offeror’s so will result in a non-complaint bid.

offers to enable a full assessment as the evaluation will be based exclusively on the information contained in the offer.

there is no minimum points required. The cost to include the applicable point rated deliverables must be included in the

ing reports, flight test reports/data, engineering attestations, other Operational/Technical substantiating documentation,

Rated Scoring Grid (where days are specified, this is measured in calendar days)	Bidder's Supporting Evidence (Specify page)	Maximum Points Available	Bidder Points Scored	Verification of Supporting Evidence by Canada (Page / Para#)
months and 1 day after Contract Award = 10  months after Contract Award = 20 Points  dder must provide a clear timeline with ntiating documentation (detailed project plan oof of previous contracts delivered under rable timeframe) that shows the proposed i can be delivered in the desired timeframe.		20 Points		
months and 1 day after Contract Award = 10  months after Contract Award – 20 Points  dder must provide a clear timeline with ntiating documentation (detailed project plan oof of previous contracts delivered under rable timeframe) that shows the proposed i can be delivered in the desired timeframe.		20 Points		

emonstrate in their proposal, that this ement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		2 Points		
ts for RCS interface  ts if different application is chosen  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		5 Points		
ts for Operator-selectable tool for object size  ts if not available  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		2 Points		

if not available the bidder must demonstrate in their proposal, that this requirement is understood and provide substantiating information with clear references to the Operator's manual or interface control document to show the proposed system has this capability, as detailed in the SOW.	2 Points		
for touch screen capable displays  if not available  bidder must demonstrate in their proposal, that this requirement is understood and provide substantiating information with clear references to the Operator's manual or interface control document with the proposed system has this capability, as detailed in the SOW.	2 Points		
for wireless Mission Display Units  if not available  bidder must demonstrate in their proposal, that this requirement is understood and provide substantiating information with clear references to the Operator's manual or interface control document with the proposed system has this capability, as detailed in the SOW.	5 Points		
for search and visual display functionality  if not available  bidder must demonstrate in their proposal, that	5 Points		



ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		3 Points		
ts for projected course over ground as ped in this requirement  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		3 Points		
ts if the length of the projected line should be tor adjustable by increments of time.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		2 Points		
ts if the MSIMS can provide a means for the tor to deselect the projected line.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		2 Points		

ts if the Moving Map can provide an Operator means to maintain the aircraft position in the centre of the moving map while in True North Up mode. 2.0 Points if not able to implement as specified. The Bidder must demonstrate in their proposal, that this requirement is understood and substantiating information with clear references to the Operator's manual or interface control document to show the proposed system has this capability, as detailed in the SOW.		2 Points		
ts if the Moving map can provide line of sight for each displayed sensor footprint and it operates height of terrain, where applicable, in georeferenced positioning. 4 Points if not able to implement as specified. The Bidder must demonstrate in their proposal, that this requirement is understood and provide substantiating information with clear references to the Operator's manual or interface control document to show the proposed system has this capability, as detailed in the SOW.		4 Points		
ts if the Moving Map can provide the Operator means to turn the sensor footprint off and on individually or individually for each sensor. 4 Points if not able to implement as specified. The Bidder must demonstrate in their proposal, that this requirement is understood and provide substantiating information with clear references to the Operator's manual or interface control document to show the proposed system has this capability, as detailed in the SOW.		4 Points		

ts if the MSIMS can provide the Operator with ns to quickly view Contact information by ining the cursor over the icon. This information nclude the properties listed in the SOW.0 if not able to implement as specified.The must demonstrate in their proposal, that this ement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		3 Points		
ts if the MSIMS can provide the Operator with ns to link images to a Contact within the MSIMS ise.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		5 Points		
ts if the MSIMS can provide a means for the tor, while the mission is running, to review s that have been linked to Contacts.  ts is not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as :d in the SOW.		2 Points		

ts if the MSIMS can provide the Operator with ns to adjust the video compression and display ange in video file size as the compression is d. 0 Points if not able to implement as ed.The Bidder must demonstrate in their sal, that this requirement is understood and e substantiating information with clear nces to the Operator's manual or interface l document to show the proposed system has pability, as detailed in the SOW.	5 Points		
ts if the MSIMS can provide the Operator with ans to change the colour of any Graphical Aid.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as d in the SOW.	2 Points		
ts if the MSIMS can provide the Operator with ns to control the level of transparency for n Layers.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as d in the SOW.	2 Points		

ts if the MSIMS can automatically export the rack to KML and SHP at the end of the mission it a minimum, the properties listed in REQ Points if not able to implement as specified.The must demonstrate in their proposal, that this ement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as d in the SOW.	4 Points		
ts if the MSIMS can automatically export all oil ns to KML and SHP file formats at the end of ssion including all associated attributes and ties.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as d in the SOW.	4 Points		
ts if the MSIMS can provide a means for the tor to choose the level of compression of atial imagery for transmission over SATCOM, i or LTE networks.  ts if not able to implement as specified.  dder must demonstrate in their proposal, that quirement is understood and provide ntiating information with clear references to erator's manual or interface control document w the proposed system has this capability, as d in the SOW.	4 Points		

every 15 minutes and sends this file via email redefined distribution list. 0 Points if not able to implement as specified. The Bidder must demonstrate in their proposal, that this requirement is understood and provide substantiating information in the form of references to the Operator's manual or other control document to show the proposed method has this capability, as detailed in the SOW.	5 Points			
Within 10 days and 1 day after Contract Award = 10 Points Within 10 days after Contract Award = 20 Points The Bidder must provide a clear timeline with supporting documentation (detailed project plan and proof of previous contracts delivered under the same timeframe) that shows the proposed method can be delivered in the desired timeframe.	20 Points			
1 point per project up to a maximum of 5 projects The Bidder must provide proof of successful completion of similar projects in the last 10 years. Include name of customer, start and end date of project, name of project, customer reference description of project, dollar value, and contact letter from client.	50 Points			
Within 10 days – 20 Points Within 7 months and 1 day to 14 days – 10 points Greater than 14 months and 1 day calendar year – 2 Points	20 Points			
	<b>209 Points</b>	<b>Total Available Points</b>		

[illegible]

[illegible]



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## **ANNEX “C”**

### **DRAFT FINANCIAL EVALUATION**

Bidders must complete the Pricing Tables below and include them in their financial bid once completed. Bidders must include a price for all items. The information in this Annex will form part of the resulting contract.

**Table 1.**

<b>A) FIRM PRICES</b>				
<b>1. MSIMS</b>				
In consideration of the Contractor satisfactorily delivering all of its obligations under the Contract, the Contractor will be paid the following all-inclusive firm prices, Customs duties included and Applicable Taxes are extra, in CAD.				
<b>Schedule of Deliverables</b>				
<b>Milestone Number</b>	<b>Milestone Description</b>	<b>Percentage % of Contract Value</b>	<b>Amount (\$)</b>	<b>Estimated Delivery Date</b>
1.1	Approval of Project Management Plan and associated timelines	1.5	\$	As per bid
1.2	Provision of record of decision and draft Interface control document from Preliminary Design Review Meeting	1.5	\$	As per bid
1.3	Provision of record of decision and final Interface control document from Critical Design Review Meeting	2	\$	As per bid
1.4	Delivery of Surveillance Radar Interface Control Document (ICD)	1.5	\$	As per bid
1.5	Delivery of Equipment / Avionics Rack Interface Control Document (ICD)	1.5	\$	As per bid
1.6	Delivery of all test plans	2	\$	As per bid
2	Factory acceptance of all hardware components as specified in the SOW.	10	\$	As per bid
3	Factory Acceptance Test of the MSIMS which includes all the deliverables identified in the SOW.	10	\$	As per bid
3.1	Successful completion of Ground Acceptance Test of the MSIMS (minus the surveillance radar) which includes all the deliverables identified in the SOW.	5	\$	As per bid
3.2	Successful completion of Flight Acceptance Test of the MSIMS (minus the surveillance radar) which includes all the deliverables	10	\$	As per bid

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	identified in the SOW.			
3.3	Provision of all system documentation as defined in the SOW (minus the surveillance radar)	3	\$	As per bid
4.1	Successful completion of Ground Acceptance Test of the MSIMS with the surveillance radar as per deliverables identified in the SOW.	15	\$	As per bid
4.2	Successful completion of Flight Acceptance Test of the MSIMS with the surveillance radar as per deliverables identified in the SOW.	10	\$	As per bid
5	Provision of all system documentation as defined in the SOW.	4	\$	As per bid
6	PDR - modification of existing mission systems and ground stations for MX15 HDi integration	2	\$	As per bid
6.1	CDR - modification of existing mission systems and ground stations for MX15 HDi integration	3	\$	As per bid
6.2	Successful completion of Ground Acceptance Test of the existing mission systems and ground stations for MX15 HDi integration	9	\$	As per bid
6.3	Successful completion of Ground Acceptance Test of the existing mission systems and ground stations for MX15 HDi integration	9	\$	As per bid
<b>Total:</b>		<b>100%</b>	\$	As per bid

## 2. OPTIONAL DELIVERABLES

If any of the optional deliverables are exercised, they will only come into effect a contract amendment by the Contract Authority. All options can be exercised on multiple amendments in increments of one (1) unit or greater, but not to exceed the option quantity.

In consideration of the Contractor satisfactorily completing all of its obligations under the Optional Deliverables of the Contract, the Contractor will be paid the following all-inclusive firm prices, Customs duties included and Applicable Taxes are extra, in CAD.

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work, unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work. . If applicable, the rates used to establish any design changes will be the same rates as used for AWR.

### \*\*\*Note to Bidders\*\*\*

The Estimated Volumes provided below will be used for the Bid Evaluation purposes only and should not be construed as a commitment or expectation on the part of Canada.

		Quantity	Each	Extended
2.1	Ericsson SLAR Antennae	4	\$	\$
2.2	Ericsson SLAR Transmit Receive Units	2	\$	\$
2.3	Additional Surveillance Radars	3	\$	\$
2.4	Initial Spares Package to Support MSIMS	1	\$	\$
<b>TOTAL PRICE FOR OPTIONAL DELIVERABLES:</b>				\$

**Table 2.**

**B) COST REIMBURSABLE**

**3. ADDITIONAL WORK REQUIREMENTS**

Additional Work Requirements (AWR) will be subject to Fixed Time Rates or a Laid Down Cost plus markup, which must include relative overheads, Custom Duties, and excluded taxes, as applicable.

The scope and cost of AWRs will be based upon the bid rates and will be authorized and issued in accordance with the requirements specified in Article TBD - Task Authorization Process of the contract. Payment will be made in accordance with the Basis and Method of Payment specified in each Task Authorization (TA) issued for AWRs.

For the performance of the work in the Task Authorization by authorized Subcontractors, other than corporate affiliates of the Contractor, the Contractor will be reimbursed its actual costs plus a markup of \_\_\_\_%. Payment for corporate affiliate will be at direct cost with no markup by the Contractor.

Payment may be either Fixed Time Rate or Laid-Down Cost plus a markup of \_\_\_\_%.

Canada's total liability to the Contractor under the Contract for all authorized Task Authorizations (TAs), inclusive of any revisions, must not exceed the sum of \$ \_\_\_\_\_. Customs duties are included and Applicable Taxes are extra, in CAD.

Item	Description	Proposed Rate (i)	Multiplication Factors (ii)	Extended Price (i) x (ii) (A)
3.1	Operator Training – minimum 10 days including a minimum of 5 days for the Surveillance Radar	\$ /Day	10 days	\$ (A)
3.2	Maintenance training	\$ /Day	10 days	\$ (B)
3.3	Engineering Support	\$ /Hour	300 hours	\$ (C)
<b>TOTAL PRICE FOR ADDITIONAL WORK REQUIREMENTS: ((A)+(B)+(C))</b>				<b>\$</b>

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Table 3.		
SUMMARY TOTAL BID PROPOSAL		
1.	TOTAL PRICE FOR DELIVERABLES	\$
2.	TOTAL PRICE FOR OPTIONAL DELIVERABLES	\$
3.	TOTAL PRICE FOR ADDITIONAL WORK	\$
TOTAL BID PROPOSAL:		\$

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## **ANNEX "D"**

### **DRAFT BASIS OF PAYMENT**

**Table 1.**

**A) FIRM PRICES**

**1. DELIVERABLES**

In consideration of the Contractor satisfactorily completing all of its obligations under the Deliverables of the Contract, the Contractor will be paid the all-inclusive firm prices as specified in this Annex, Customs duties included and Applicable Taxes are extra.

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work, unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

Canada will make Firm Price Payments, in accordance with below Schedule of Milestones subject to the Method of Payment and Invoicing provisions of the Contract in CAD.

**Schedule of Milestones**

Milestone Number	Milestone Description	Percentage % of Contract Value	Amount (\$)	Estimated Delivery Date
1.1	Approval of Project Management Plan and associated timelines	1.5	<i>\$TBD</i>	<i>As per bid</i>
1.2	Provision of record of decision and draft Interface control document from Preliminary Design Review Meeting	1.5	<i>\$TBD</i>	<i>As per bid</i>
1.3	Provision of record of decision and final Interface control document from Critical Design Review Meeting	2	<i>\$TBD</i>	<i>As per bid</i>
1.4	Delivery of Surveillance Radar Interface Control Document (ICD)	1.5	<i>\$TBD</i>	<i>As per bid</i>
1.5	Delivery of Equipment / Avionics Rack Interface Control Document (ICD)	1.5	<i>\$TBD</i>	<i>As per bid</i>
1.6	Delivery of all test plans	2	<i>\$TBD</i>	<i>As per bid</i>
2	Factory acceptance of all hardware components as specified in the SOW.	10	<i>\$TBD</i>	<i>As per bid</i>



3	Factory Acceptance Test of the MSIMS which includes all the deliverables identified in the SOW.	10	<i>\$TBD</i>	<i>As per bid</i>
3.1	Successful completion of Ground Acceptance Test of the MSIMS (minus the surveillance radar) which includes all the deliverables identified in the SOW.	5	<i>\$TBD</i>	<i>As per bid</i>
3.2	Successful completion of Flight Acceptance Test of the MSIMS (minus the surveillance radar) which includes all the deliverables identified in the SOW.	10	<i>\$TBD</i>	<i>As per bid</i>
3.3	Provision of all system documentation as defined in the SOW (minus the surveillance radar)	3	<i>\$TBD</i>	<i>As per bid</i>
4.1	Successful completion of Ground Acceptance Test of the MSIMS with the surveillance radar as per deliverables identified in the SOW.	15	<i>\$TBD</i>	<i>As per bid</i>
4.2	Successful completion of Flight Acceptance Test of the MSIMS with the surveillance radar as per deliverables identified in the SOW.	10	<i>\$TBD</i>	<i>As per bid</i>
5	Provision of all system documentation as defined in the SOW.	4	<i>\$TBD</i>	<i>As per bid</i>
6	PDR - modification of existing mission systems and ground stations for MX15 HDi integration	2	<i>\$TBD</i>	<i>As per bid</i>
6.1	CDR - modification of existing mission systems and ground stations for MX15 HDi integration	3	<i>\$TBD</i>	<i>As per bid</i>
6.2	Successful completion of Ground Acceptance Test of the existing mission systems and ground stations for MX15 HDi integration	9	<i>\$TBD</i>	<i>As per bid</i>
6.3	Successful completion of Ground Acceptance Test of the existing mission systems and ground stations for MX15 HDi integration	9	<i>\$TBD</i>	<i>As per bid</i>
<b>Total:</b>		<b>100%</b>	<i>\$TBD</i>	<b><i>As per bid</i></b>

## 2. OPTIONAL DELIVERABLES

Optional Deliverables must be exercised by the Contracting Authority through a contract amendment. All options can be exercised on multiple amendments in increments of one (1) unit or greater, but not to exceed the option quantity.

In consideration of the Contractor satisfactorily completing all of its obligations under the Optional Deliverables of the Contract, the Contractor will be paid the following all-inclusive firm prices subject to the Method of Payment and Invoicing provisions of the Contract. Customs duties included and Applicable Taxes are extra.

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work, unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work. If applicable, the rates used to establish any design changes will be the same rates as used for AWR.

Deliverable Number	Deliverable Description	Quantity	Estimated Delivery Date
2.1	Ericsson SLAR Antennae	4	<i>TBD</i>
2.2	Ericsson SLAR Transmit Receive Units, option to obtain up to 2	2	<i>TBD</i>
2.3	Additional Surveillance Radars	3	<i>TBD</i>
2.4	Initial Provisions to Support MSIMS	<i>As per bid</i>	<i>TBD</i>

**Table 2.**

**B) COST REIMBURSABLE**

**3. ADDITIONAL WORK REQUIREMENTS**

Additional Work Requirements (AWR) over and above the Milestones will be costed based on Table below.

The scope and cost of AWRs will be based upon the bid rates and will be authorized and issued in accordance with the requirements specified in Article TBD - Task Authorization Process of the contract. Payment will be made in accordance with the Basis and Method of Payment specified in each Task Authorization (TA) issued for AWRs.

The Contractor must furnish all material goods necessary to complete the Work in order to be accepted by Canada. The Contractor will be reimbursed for its reasonable costs incurred of such goods, plus the applicable markup.

For the performance of the work in the Task Authorization by authorized Subcontractors, other than corporate affiliates of the Contractor, the Contractor will be reimbursed its actual costs plus a markup of \_\_\_\_%. Payment for corporate affiliate will be at direct cost with no markup by the Contractor.

Payment may be either Fixed Time Rate or Laid-Down Cost plus a markup of \_\_\_\_%.

Canada's total liability to the Contractor under the Contract for all authorized Task Authorizations (TAs), inclusive of any revisions, must not exceed the sum of \$ \_\_\_\_\_. Customs duties are included and Applicable Taxes are extra.

3.1	Operator Training – minimum 10 days including a minimum of 5 days for the Surveillance Radar	<i>Fixed Time Rate per day</i>	<i>As per the bid</i>
3.2	Maintenance training	<i>Fixed Time Rate per day</i>	<i>As per the bid</i>
3.3	Engineering Support	<i>Fixed Time Rate per Hour</i>	<i>As per the bid</i>
3.4	Travel and Living Expenses – The Contractor will be reimbursed for the authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for additional overhead or profit, in accordance with the meal, private vehicle and incidental expense allowances specified in Appendices B, C and D of the Treasury Board Travel	<i>\$TBD</i>	<i>\$TBD</i>

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	Directive ( <a href="https://www.njc-cnm.gc.ca/directive/d10/en">https://www.njc-cnm.gc.ca/directive/d10/en</a> ), and with the other provisions of the directive referring to "travelers", rather than those referring to "employees".		
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**Table 3.**

<b>C) OTHER</b>	
4. Transportation:	Transportation costs to and from the Contractor's facility are the responsibility of TC ASD.
5. Customs Duties:	Customs duties are included in the contract value.
6. Applicable Taxes:	TBD