Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

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LETTER OF INTEREST
LETTRE D'INTÉRÊT

Title - Sujet TIC3 Air Project	
Solicitation No. - N° de l'invitation W8475-175274/A	**Date** 2016-10-24
Client Reference No. - N° de référence du client W8475-175274	**GETS Ref. No. - N° de réf. de SEAG** PW-$$QD-017-26025
File No. - N° de dossier 017qd.W8475-175274	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2017-01-16**	**Time Zone** **Fuseau horaire** Eastern Standard Time EST
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☐ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Anand, Ricky	**Buyer Id - Id de l'acheteur** 017qd
Telephone No. - N° de téléphone (819) 420-1755 ( )	**FAX No. - N° de FAX** (819) 953-4510
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:** Specified Herein Précisé dans les présentes	

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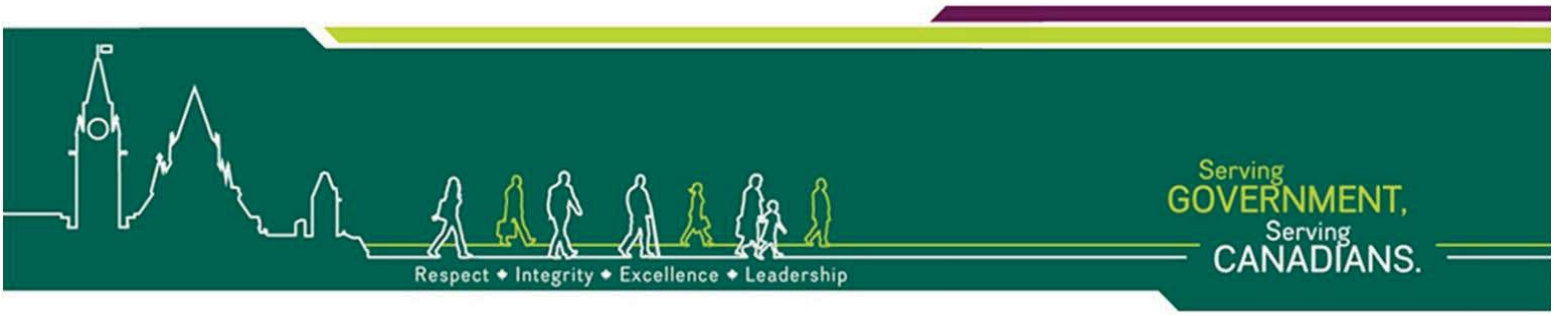


LETTER OF INTEREST (LOI)
FOR
TACTICAL INTEGRATED COMMAND, CONTROL AND COMMUNICATIONS (TIC3) AIR PROJECT

1. Purpose and Nature of the Letter of Interest (LOI)

Public Works and Government Services Canada (PWGSC) is requesting Industry feedback regarding the TIC3 project requirements as listed in the annexes and appendices provided herewith. The requirements as described in the attached annexes will be fulfilled for Government of Canada on behest of the Department of National Defence.

The objectives of this LOI are to:

a. Apprise potential bidders of the requirements of this project;
b. Collect information regarding the technical feasibility of the requirements as published in this LOI package.
c. Seek industry feedback to streamline DND technical requirements to help develop potential Request for Proposal/s that may be published sometime in the near future;
d. Seek industry feedback on economic leveraging opportunities;
e. Seek costing information from industry for budgetary purposes; and
f. Engage potential bidders and answer their questions, as necessary.

Canada would like to engage industry and seek feedback on technical documents that are published via this LOI package, as this will facilitate formalizing the Request for Proposal (RFP) process. An Industry Day/s is being organized for this project that will be held in the National Capital Region (NCR). Canada may consider the information gathered, during the Industry Day/s, for the improvement of the technical documents and the RFP process. There will be a plenary session to kick-off the Industry Day followed by one-on-one meetings with the interested suppliers.

The Defence Procurement Strategy (DPS) applies to the TIC3 project. As part of the DPS, Canada is seeking information on potential economic leveraging opportunities for the TIC3 project. Respondents should be aware that any contracts entered into as a result of any subsequent request for proposals that may follow this LOI may contain socio-economic benefit requirements, which may include the Industrial and Technological Benefits (ITB) Policy. Please refer to Appendix 1 – Industrial and Technological Benefits and value Proposition attached herewith.

Under the ITB Policy, companies awarded defence procurement contracts are required to undertake business activities in Canada, equal to the value of the contract. In addition, a core element of the ITB Policy is a rated and weighted Value Proposition. Further information regarding the ITB Policy can be found at www.ic.gc.ca/itb .

This LOI is neither a call for tender nor a Request for Proposal (RFP). No agreement or contract will be entered into based on this LOI. The issuance of this LOI is not to be considered in any way a

commitment by the Government of Canada, nor as authority to potential respondents to undertake any work that could be charged to Canada. This LOI is not to be considered as a commitment to issue a subsequent solicitation or award contract(s) for the work described herein.

Although the information collected may be provided as commercial-in-confidence (and, if identified as such, will be treated accordingly by Canada), Canada may use the information to assist in drafting performance specifications (which are subject to change) and for budgetary purposes.

Respondents are encouraged to identify, in the information they share with Canada, any information that they feel is proprietary, third party or personal information. Please note that Canada may be obligated by law (e.g. in response to a request under the Access of Information and Privacy Act) to disclose proprietary or commercially-sensitive information concerning a respondent (for more information: http://laws-lois.justice.gc.ca/eng/acts/a-1/).

Respondents are asked to identify if their response, or any part of their response, is subject to the Controlled Goods Regulations.

Participation in this LOI is encouraged, but is not mandatory. There will be no short-listing of potential suppliers for the purposes of undertaking any future work as a result of this LOI. Similarly, participation in this LOI is not a condition or prerequisite for the participation in any potential subsequent solicitation/s.

Respondents will not be reimbursed for any cost incurred by participating in this LOI.

The LOI closing date published herein is not the deadline for comments or input. Comments and input will be accepted any time up to the time when/if a follow-on solicitation is published.

2. Background Information:

The TIC3 Air project will provide critical command, control and communications infrastructure that will support the Canadian Armed Forces (CAF) and the Royal Canadian Air Force (RCAF) in carrying out the full spectrum of possible operations. Regardless of the assigned mission, TIC3 Air project delivery will enable the chain of command to gain relevant Situational Awareness (SA), to support the Commander in making effective decisions, and will support RCAF units in responding to the Commander's direction in a timely manner.

The TIC3 Air project will deliver both domestic and deployed capabilities. As such, the related equipment will be subject to a wide spectrum of environments. Please see attached annexes for further details.

3. Potential Work Scope and Constraints:

The TIC3 Air project will upgrade and provide needed critical communications infrastructure to include:

a. Replacement of the existing Air Traffic Management (ATM) Ground/Air/Ground (G/A/G) radios with a network of modern, reliable ATM G/A/G radios;

b. Replacement of the existing Canadian Air Defence Radio System (CADRS) G/A/G radios with a network of modern, reliable Air Defence (AD) G/A/G radios;

c. Establishment of a network of Link-16 enabled Tactical Data Link (TDL) Ground Entry Stations (GESs) within Canada to support domestic operations;

d. Delivery of a set of deployable Link-16 and Link-11 enabled TDL GESs to support expeditionary operations;

e. Delivery of a set of deployable Streaming Video (SV) GESs, as well as a domestic network of fixed SV GESs. The domestic network will include the capability to store and distribute SV; and

f. Providing a Link-16 relay capability for the fleet of CC150 Polaris Multi-Role Tanker Transport (MRTT) aircraft to extend Link-16 coverage during deployed operations.

4. Legislation, Trade Agreements, and Government Policies:

The following is indicative of some of the legislation, trade agreements and government policies that may impact any follow-on solicitation(s):

- Agreement on Internal Trade (AIT)
- Defence Production Act
- Industrial and Technological Benefits (ITB) Policy
- Defence Procurement Strategy (DPS)
- Controlled Goods Program (CGP)
- Federal Contractors Program for Employment Equity (FCP-EE)
- Comprehensive Land Claim Agreements (CLCAs)

5. Schedule:

In providing responses, the following schedule should be utilized as a baseline:

Letter of Interest (LOI) Closing Date	As specified on the main page of this document.
Industry Day	22nd to 24th November 2016
One on One sessions	22nd to 24th November 2016

Canada may modify the above timeline anytime as necessary.

6. Important Notes to Respondents:

Interested Respondents may submit their responses to the PWGSC Contracting Authority, identified below, preferably via email:

Ricky Anand
Contracting Authority
Public Works and Government Services Canada
Acquisitions Branch
Land and Aerospace Equipment Procurement and Support Sector
Place du Portage, Phase III, 8C2
Gatineau, Québec
K1A 0S5
Canada

Telephone: 819-420-1755
Facsimile: 819-953-4510
E-mail: Ricky.Anand@pwgsc..gc.ca

A point of contact for the Respondent should be included in the package.

Changes to this LOI may occur and will be advertised on the Government Electronic Tendering System. Canada asks Respondents to visit Buyandsell.gc.ca regularly to check for changes, if any.

7. Upcoming Engagement Sessions:

Interested respondents will have the opportunity to participate in the Industry Day and One-to-one Sessions with the government officials from 22nd to 24th November 2016. The purpose of these sessions is to provide interested participants with the opportunity to obtain further information about the TIC3 Air Project and its specific requirements.

To register for the Industry Day, please email Contracting Authority at the email address provided above before **16th November 2016 14.00 Hrs.** Alternatively, respondents can contact **Vidia Debidin** at 819-420-2699 or by email at Vidia.Debidin@pwgsc.gc.ca.

Non-attendance at the industry day will not preclude any supplier from bidding on this requirement should follow-on solicitation/s be issued.

8. Closing date for the LOI/RFI:

Responses to this LOI are to be submitted to the PWGSC Contracting Authority identified above, on or before 16th January 2017 - 14.00 Hrs.

Respondents should present their responses in MS Word and Excel format as they deem fit. Please ensure the requested costing information is contained in Annex F and G provided herewith.

APPENDIX 1

INDUSTRIAL AND TECHNOLOGICAL BENEFITS AND VALUE PROPOSITION

Canada is requesting that industry provide information regarding Canadian capabilities, export potential, R&D activities, and industrial opportunities to help Canada develop leveraging approaches for procurements that may occur as a result of this LOI.

For each LOI element your company responds to, please provide responses to the following questions:

1. To what extent would economic opportunities be affected (negatively or positively) should the Government consider bundling some of its requirements? Which requirements would you recommend be bundled or unbundled to obtain maximum economic benefits?

2. Where do you see economic opportunities for your company to undertake work directly in Canada related to the requirement?

3. Where do you see economic opportunities for your company in undertaking work with Canadian companies:

    a. Directly related to the requirement (please list)
    b. in other areas (please elaborate)

4. Are these opportunities already established in Canada or do these areas require investment?

5. What R&D activities related to the requirement do you anticipate undertaking?

    a. Directly related to the requirement?
    b. in other areas?

6. Are there any export opportunities related to the requirement that could be leveraged?
    a. Directly related to the requirement?
    b. in other areas?

7. Are there any other areas of priority that should be considered for leveraging?

Letter of Interest (LOI)

Draft General Project Requirements

Royal Canadian Air Force Tactical Integrated Command, Control and Communications Project (TIC3 Air Project)

Note:

This document is provided to be used as a supplement to the LOI questions. It provides background information on the requirements for the TIC3 Air Project. The information contained in this document will help when answering the questions. In particular, the two tables at the end of this document are providing three levels of measurement for the Technical Requirements (Mandatory, Highly Desirable, and Desirable) as well as a list of sites for the G/A/G radios, for the Ground Entry Stations for Link-16 and Streaming Video requirements. The Annexes are separated by capabilities and they provide information to complete the requirements that TIC3 Air aim to deliver.

TABLE OF CONTENTS

LIST OF FIGURES

Respondents should review the following documents in the order as they appear below. These documents are provided herewith as part of the Letter of Interest package. There are eight documents provided for this LOI including this document.

Annex A – Ground-Air-Ground Radio Requirements
Annex B – Tactical Data Link System Requirements
Annex C – Streaming Video System Requirements
Annex D – CC 150 Relay Requirements
Annex E – SATCOM Terminals Requirements
Annex F – Ground-Air-Ground Cost Breakdown Template
Annex G – SATCOM Terminals Cost Breakdown Template

Respondents should utilize Annex F and Annex G to provide costing information as requested in these documents.

1. INTRODUCTION

1.1 Project End Goals

The TIC3 Air project will upgrade and provide needed critical communications infrastructure to include:

a. Replacement of the existing Air Traffic Management (ATM) Ground/Air/Ground (G/A/G) radios with a network of modern, reliable ATM G/A/G radios;

b. Replacement of the existing Canadian Air Defence Radio System (CADRS) G/A/G radios with a network of modern, reliable Air Defence (AD) G/A/G radios;

c. Establishment of a network of Link-16 enabled Tactical Data Link (TDL) Ground Entry Stations (GESs) within Canada to support domestic operations;

d. Delivery of a set of deployable Link-16 and Link-11 enabled TDL GESs to support expeditionary operations;

e. Delivery of a set of deployable Streaming Video (SV) GESs, as well as a domestic network of fixed SV GESs. The domestic network will include the capability to store and distribute SV; and

f. Providing a Link-16 relay capability for the fleet of CC150 Polaris Multi-Role Tanker Transport (MRTT) aircraft to extend Link-16 coverage during deployed operations.

1.2 Project Constraints and Restraints

1.2.1 Project Constraints

The TIC3 Air project is limited by the following constraints:

a. The selected technology must support interaction with coalition forces without any additional modifications or enhancements; and

b. Training materials and all operating manuals must be available in both official languages.

2. SYSTEM OPERATION

2.1 Mission

The TIC3 Air project will provide critical command, control and communications infrastructure that will support the Canadian Armed Forces (CAF) and the Royal Canadian Air Force (RCAF) in carrying out the full spectrum of possible operations. Regardless of the assigned mission, TIC3 Air project delivery will enable the chain of command to gain relevant Situational Awareness (SA), to support the Commander in

making effective decisions, and will support RCAF units in responding to the Commander's direction in a timely manner.

2.2 Environment

The TIC3 Air project will deliver both domestic and deployed capabilities. As such, the related equipment will be subject to a wide spectrum of environments.

2.2.1 Physical Environment

The G/A/G radios and fixed domestic GESs will be installed in controlled environments where there is a full suite of support infrastructure available. Both operating and storage conditions are considered to be benign. The G/A/G radio and domestic Link-16 networks will provide coverage in Canada, and will be impacted by the geography of Canada, including the effects that diverse geographical features, northern latitudes, extreme distances, and climatic conditions have on radio communications.

Deployable GESs will be operated in both austere and benign conditions, depending on the deployment location and local infrastructure. Deployable GESs may be required to operate in facilities with limited environmental controls, including tents, vehicles, or deployable shelters. As such, the systems will need to operate throughout a wide range of temperature, humidity, and air quality conditions, as well as through a wide range of power conditions. In addition, deployable systems must survive the full range of possible transport and storage conditions during deployment.

The CC150 MRTT Link-16 capability will normally be operated in a benign environment aboard the CC150. However, since the aircrew will continue operations in the face of aircraft damage and/or aircraft system failures creating a degraded internal environment onboard a CC150, the MRTT Link-16 capability must be able to operate in the same conditions required for other non-flight critical equipment on the aircraft. In addition, since the MRTT Link-16 capability may remain on the aircraft throughout a deployment, the capability must be capable of surviving the temperature extremes required for systems when an aircraft is powered down on the ground.

2.2.2 Radio Frequency (RF) Environment

G/A/G radios and Link-16 GESs must comply with frequency spectrum allocations, as assigned by Innovation, Science and Economic Development Canada (ISED, previously Industry Canada).

2.2.3 Cyber Environment

Link-16 and SV GES systems will interface with other CAF Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)

capabilities, including battle-space management and C2 capabilities, through classified Department of National Defence (DND) networks.

2.3 Threats

2.3.1 RF Threats

A comprehensive discussion of threats to radio devices is beyond the scope of this document. However, some examples of RF attack vectors are:

a. Interception (data and voice);

b. Spoofing;

c. Internet Protocol identification (specific to IP-based communications or network interfaces);

d. Keymat compromise (typically requires attack against the Key Management Infrastructure or access the crypto module itself);

e. Electronic Warfare (Jamming); and

f. Tampering.

2.3.2 Cyber Threats

GES systems will be subject to the same threats as any other service or capability integrated into DND classified networks. Major threats include:

a. Unauthorized disclosure, manipulation, disruption, or destruction of information;

b. Network availability due to lost connectivity (disconnected mode);

c. Information loss due to hardware failure or destruction by physical attack; and

d. Information loss due to software or other service failures.

In countering the above threats, the responsibilities are divided between the system and the underlying network. The system security architecture must control access to the applications, resources, and data, ensuring that only authorized individuals have the capability to access and/or manipulate them. Existing classified network Operational and Technical Authorities will be responsible for network access and network security, including the detection and countering of threats.

2.4 Concept of Operations

Success in future operations will depend on being networked with many different organizations, systems and platforms through data links, secure and non-secure communications systems and systems used for combat identification, airspace control, and air traffic management.

Tactical data links are a key element in the future of the RCAF transformation. In order for commanders to make effective decisions, the commander must have timely SA. The effective employment of data links across the RCAF will help enable SA. Data links will be employed across the joint environment in domestic, NATO and NORAD operations. Data will be distributed within the CAF, and to NORAD, NATO, and the 5-Eyes community, as required.

2.5 Concept of Support

TIC3 Air project capabilities will be used in both static CF locations and on deployments, and in keeping with the Canadian Forces Aerospace Sustain Doctrine; the system must be maintainable in the field. Qualified Aerospace Telecommunication & Information Systems Technician (ATIS) and AC Op personnel will carry out Level 1 and Level 2 maintenance at both static and deployed locations. The use of interchangeable commercial hardware components will reduce the number of replacement components that must be stocked.

2.6 Key Roles

The key roles associated with the capabilities delivered by the TIC3 Air project are partitioned into the following groups:

a. System operation;

b. System maintenance; and

c. System development.

2.6.1 System Operation Roles

System operation roles include those roles associated with operating delivered systems, providing data to the systems, and consuming data from the systems. These roles are detailed below in Paragraphs 2.6.1.1 through 2.6.1.7.

2.6.1.1 G/A/G Radio Operators

Replacement G/A/G radio systems will not impact staffing levels for ATM and AD, in accordance with existing policy and direction. However, it is expected that the deployment of new systems may result in reductions in operator workload.

2.6.1.2 GES Operators

Deployable GES systems will replace existing capabilities at units which will continue to be manned at existing levels which is in line with the industry standard..

2.6.1.3 Link Data and SV Providers

Link data and SV will be primarily generated by RCAF air assets with Data Link and/or SV capabilities, such as CF188, CP140, and CH148 aircraft. Aircrew staffing levels and qualifications will be defined by the RCAF, and are outside the scope of the TIC3 Air project.

2.6.1.4 System Technical Support

Required system maintenance will be performed by ATIS technicians and AC Op personnel at both deployed and fixed locations.

2.6.1.5 LCMM

The existing G/A/G radio Life Cycle Maintenance Manager (LCMM) role will continue to be required. Fixed and deployable GES and TDL relay capabilities will require LCMM support.

2.6.1.6 Contracted Support

It is expected that third line equipment maintenance, repair, and overhaul will be performed through contracted services. It is also expected that software maintenance and enhancement will be performed through contracted services.

2.6.1.7 Network Maintenance and Support

Network support will continue to be manned in accordance with existing DND policies and procedures, and will be the responsibility of the appropriate operational and technical authorities. It is outside of the scope of this TIC3 Air project.

2.6.2 System Development Roles

The roles, responsibilities, and qualifications of DND staff (CAF, Public Service, and contracted support) required for the implementation of the TIC3 Air project will be defined during the Definition phase of the project, and documented in the project management plan (PMP).

2.7 Key Tasks

2.7.1 System Operation Tasks

2.7.1.1 G/A/G Radio Operators

The replacement G/A/G radios will continue to be operated by ATM and AD staff in accordance with existing policy and direction. No new tasks are anticipated.

2.7.1.2 GES Operators

Deployable GESs will replace existing capabilities, and will continue to be operated by current staff. No new tasks are currently anticipated for Link-16 related activities. However, modernized SV capabilities may introduce additional SV management and control tasks.

Although the domestic fixed GES systems represent additional capability, it is expected that the associated key tasks will be similar to those for the deployable GES systems.

2.7.2 System Maintenance Tasks

2.7.2.1 System Technical Support

Assigned ATIS technicians and AC Op personnel will be responsible for routine and preventative maintenance of the systems.

ATIS technicians will be responsible for first line support, which will include system level fault investigation, and removal and replacement of defective line replaceable units (LRUs). LRU repair will be performed at third line facilities through contracted support.

AC Ops and/or ATIS technicians may also be responsible for installation of software updates, where those updates are expected to be accomplished at the field or depot level. This will be dependent upon security restrictions imposed on the software, and the complexity of the support update process.

2.7.2.2 LCMM

System LCMMs will be responsible for the design, engineering, configuration management, maintenance, and disposal of system equipment (hardware and software). The LCMM will also be responsible for all maintenance and repair contracts for the hardware and software, which includes the management of any required Foreign Military Sales (FMS) cases. The LCMM position requirements for the new fixed and deployable GES and TDL relay capabilities will be rationalized during the Project's Definition phase.

2.7.2.3 Contracted Support

The key tasks required to be performed by contracted support will be defined by the contractor, in accordance with the requirements of each system. As per para 2.7.2.1, LRU repair will be performed through contracted support.

2.7.2.4 Network Maintenance and Support

Network maintenance and support task identification will be the responsibility of the network owner and is outside the scope of this project.

2.8 User Characteristics

Users of the systems will be trained military or civilian members of DND, or contracted staff with the requisite skills and security clearances. The system shall be useable by anyone who meets the skill and training specifications of a position that requires the use of the system/subsystem.

Users will have normal information technology skills for their rank and experience. Users shall be trained, as required, on the applications and networks to which these capabilities will connect.

2.8.1 G/A/G Radio System Users

Little to no change is foreseen for the operational users of the G/A/G radio systems (i.e., Air Traffic Management and Air Defence). The TIC3 Air project will provide increased reliability and added functionality (e.g., secure communications, frequency agility, etc.).

3. DESIGN AND CONCEPT GUIDANCE

3.1 Design Guidance

3.1.1 General Guidance

To minimize technical, cost and schedule risks, TIC3 Air project delivered capabilities must maximize the use of commercial off-the-shelf components (COTS), whenever possible. This approach will avoid the risks, costs, and schedule impacts associated with system development.

The application of interoperability standards (MIL-STDs and/or NATO STANAGs), and requirements for commonality with American and NATO data link systems will ensure interoperability with NORAD and NATO forces. The application of MIL-STDs and STANAGs will also be used to ensure SV and TDL distribution capabilities are interoperable with NORAD, NATO, and 5-Eyes Community. Systems and subsystems will also be designed to be compatible with commercial networks, as appropriate.

The use of common hardware components will be maximized in order to reduce the number of replacement components that must be stocked and carried on deployment.

3.1.2 Security

Although systems must be able to handle data up to the SECRET level, the use of hardware or software components that impose security requirements will be minimized. The exception to this will be specialized security devices, such as cryptographic systems, codes and access devices.

The systems should be designed such that the system will be unclassified once data and specialized security devices have been removed.

3.1.3 Network Architecture

Link-16 and SV GES systems will make use of existing DND networks, including Consolidated Secret Network Infrastructure (CSNI), to distribute data and video. Both the speed of data distribution and the volume of video and data that can be distributed are directly related to the capabilities of those networks, the operating constraints applied to those networks, and the security levels and caveats allocated to those networks.

3.1.4 Degraded Operation

The TIC3 Air capabilities must not have a single point of failure that would have an impact on the continuity of aerospace operations. All equipment failures that may affect the execution of any of these tasks must be quickly correctable by standard maintenance techniques (e.g. Removal and replacement at the LRU level).

Each capability must be capable of providing cues or notification to users when operating in a degraded state.

3.1.5 Maintenance

In order to reduce maintenance and support costs, remote maintenance capabilities must be maximized. In addition, fault isolation capabilities must be maximized to reduce system down time and repair time. As well, the need for specialized maintenance and handling tools must be minimized. For G/A/G Radio capabilities self-diagnostics and Built-In-Test-Equipment (BITE) must be included, as a minimum.

3.1.6 Portability

In order to maximize system portability, deployable systems must be designed in a modular manner that can be torn down, packed, shipped, and reassembled in a relatively rapid manner. As new equipment is likely to consume less power than equipment

currently in use it is expected that existing portable power generation equipment at affected units will be sufficient. Further, when packed in shipping containers, deployable systems must be transportable by all normal transport methods available to the CAF, including tactical and strategic military air transport, commercial air transport, military or commercial road transport, rail, or ship.

All classified components must be able to be shipped separately, to allow transport by commercial carriers.

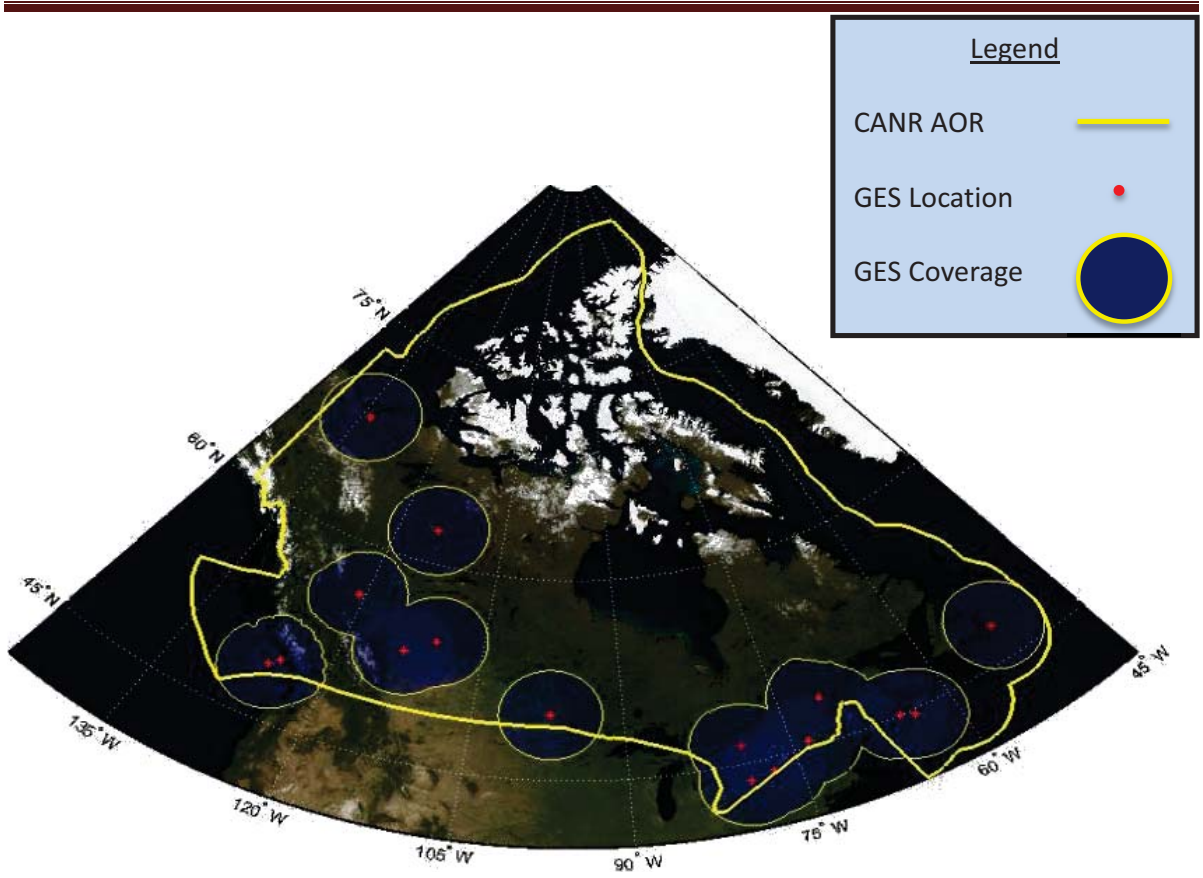
3.1.7 System Growth

It is desirable that systems have the capacity for growth to accommodate system upgrades, coverage expansions, and enhancements. While no specific growth in coverage area is currently forecast the G/A/G radio Fixed Link-16 GES and Fixed SV GES networks must be designed to accommodate coverage growth without significant re-engineering.

3.2 Design Concept

The G/A/G radio network must be a direct replacement for the current ATM and CADRS G/A/G radio networks. However, it is anticipated that all systems will be accessible via DND networks to support remote equipment maintenance.

Figure 1 illustrates the anticipated location of Link-16 and SV GES systems within the Canadian NORAD Region (CANR) area of responsibility (AOR). Any gaps in coverage are expected to be covered, on as and when required basis, through the use of deployable GESs.



3 Wing Bagotville *	19 Wing Comox *	12 Wing Shearwater/Halifax	Inuvik (FOL)
8 Wing Trenton	17 Wing Winnipeg	Toronto Edmonton	Ft St John
14 Wing Greenwood *	Montreal	Yellowknife (FOL)	St Johns
4 Wing Cold Lake *	22 Wing North Bay		Tofino

NOTES:

(1) All GES locations have Link-16 capabilities
*(2) Sites annotated with an * have both Link-16 and SV capabilities*
(3) Gaps in coverage will be filled using deployable GESs

Figure 1 – Anticipated Link-16 GES and SV sites within Canada

4. SYSTEM EFFECTIVENESS REQUIREMENTS

4.1 General Requirements

The TIC3 Air project must:

a. Achieve all operational requirements defined in Section 4, Section 5, and Section 6 of this document, the tables and all attached annexes.

b. Comply with the constraints identified in Paragraph 1.2 of this document;

c. Ensure no negative impact to any existing C2 or support capability, nor any adverse impact the CAF's ability to conduct operations;

d. Establish and resource an approved training program to satisfy steady-state force generation requirements for both operators and maintainers;

e. Deliver all required integrated support services (ISS) for a period of two years following the achievement of FOC. ISS shall be sufficient to ensure that reliability, availability and maintainability levels, as defined in Paragraphs 4.4 through 4.6, are achieved;

f. Ensure infrastructure requirements have been met in order to achieve (a), (d) and (e);

g. Ensure sparing levels are sufficient to support ISS, as defined in (e) and all spares have been received, codified and entered into the Supply System prior to FOC; and

h. Ensure required operational and technical support procedures/policies are approved and in place.

4.2 Operability

TIC3 Air delivered capabilities will be considered to be operable when:

a. All functional and performance requirements identified in this document, including the tables and the referenced annexes, are met;

b. The systems and subsystems can operate in the environments identified in Paragraph 2.2 in the face of the threats defined in Paragraph 2.3;

c. The G/A/G radios will meet or exceed the range and performance of the current G/A/G radios;

d. The GES and link relay capabilities will support data link operations in accordance with the 1 CAD DL CONOPS; and

e. The GES and Link-16 relay capabilities will support the timely and effective delivery of data to the chain of command in order to contribute to the Commander's Critical Information Requirements (CCIRs).

4.3 Survivability

The equipment and associated infrastructure delivered under the TIC3 Air project must be effective in all operating environments, as identified in Paragraph 2.2 of this document. The equipment and associated infrastructure must, to the greatest extent possible, be designed to survive the threats identified in Paragraph 2.3 of this document.

4.4 Maintainability

The mean time to repair (MTTR) must support the availability specified in Paragraph 4.5. In addition, the MTTR of individual G/A/G radio systems must be less than 15 minutes.

G/A/G radio systems and GESs must support comprehensive remote diagnostics. Both remote and on-site diagnostics must be able to exercise test capabilities to allow the fault isolation down to the Line Replaceable Unit (LRU) level.

System maintenance will not require any special tools or handling equipment, beyond that which is provided by the vendor. Where special tools or handling equipment is required, the vendor must supply sufficient quantities to support all fixed and deployable systems in a timely manner (in accordance with the availability requirements).

4.5 Availability

G/A/G radio networks (ATM and CADRS), the system of Fixed Link-16 and SV GESs, the deployable Link-16 and SV GESs, and the MRTT Link-16 capability must be capable of supporting continuous, high tempo operations. Availability requirements will be further defined during the Definition phase, based on operational and industry feedback.

4.6 Reliability

Both overall G/A/G radio network mean time between failures (MTBF) and the MTBF of individual G/A/G radio systems must support the availability specified in Paragraph 4.5. In addition, the MTBF of individual G/A/G radio systems must be no less than 50,000 hours.

The MTBF of individual deployable GES systems must be no worse than the reliability of current systems. The reliability of the system of TDL and SV GESs, and the reliability of the individual TDL and SV GESs must support the availability specified in Paragraph 4.5.

The MTBF for the MRTT Link-16 capability must support the availability specified in Paragraph 4.5.

4.7 Security

With the exception of ATM radios, TIC3 Air delivered capabilities must handle information up to the classification of SECRET. However, the project will only consider the security of this information from reception by a Radio or GES until the data is placed on a DND network. For SV capabilities the TIC3 Air project will deliver the capability to receive and decrypt and or forward encrypted video feeds from capable aircraft but will not equip aircraft with the equipment required to perform encryption.

As required, the Link-16 and SV GESs must connect to DND SECRET networks. TIC3 Air delivered capabilities must comply with all relevant GoC and DND network security policies and directives.

TIC3 Air delivered capabilities must meet the applicable Communications Security (COMSEC) requirements (including TEMPEST requirements) for the environment they are intended to operate in, per Paragraph 2.2, and in the face of the threats defined in Paragraph 2.3.

Physical security of the TIC3 Air delivered capabilities will be the responsibility of the units responsible for the operation and maintenance of the capabilities.

4.8 Environmental Sustainability

Systems and subsystems shall comply with all applicable environmental regulations.

4.9 Safety and Health

Systems and subsystems, when operated in accordance with approved procedures, shall not create any safety concerns or hazards to personnel or the general public. The systems and subsystems shall be developed and operated in accordance with applicable Health and Welfare Canada standards and safety codes. The design of the proposed solutions shall comply with applicable human factors standards, regulations and guidelines.

4.10 Delivery Requirements

Detailed system/subsystem quantities and quality requirements are defined in Table A (G/A/G Radio Requirements) and Table B (TDL Requirements).

5. TRAINING REQUIREMENTS

5.1 Training

5.1.1 General

Training requirements identified in this Section are limited to those personnel required to operate and maintain the systems and subsystems delivered under the TIC3 Air project. Personnel requirements for related and/or interfacing systems, including aircrew for link-enabled aircraft, battle-space management staff, and DND network management and support staff, are beyond the scope of this document.

The project will provide Initial Cadre Training, and will be responsible for providing the following to the LCMM in support of Regenerative/Steady-state Training:

a. Training packages suitable for in-service training of operators and technicians;

b. Any required training necessary for Train-the-Trainer operations and maintenance training;

c. Training packages will need to conform to CFITES and the Air Force Integrated Information & Learning Environment (AFIILE) standards. These standards will be made available in Definition Phase, as appropriate;

d. All training packages in alignment with applicable DND MOSIDs and Trade Structures DND MOSID and Trade Structure will be made available in Definition Phase; and

e. All training packages in bilingual format.

5.1.2 Operational Training

Operator training shall provide the necessary skills and knowledge for an operator to perform their role in the operation of TIC3 Air systems, subsystems and ground infrastructure. Training may take the form of individual training and/or team training, as applicable.

5.1.3 Maintenance Training

Maintainer training shall provide the necessary skills and knowledge for a maintainer to fulfil their role in maintaining TIC3 Air systems, subsystems and related ground equipment and infrastructure. Training may take the form of individual training and/or team training, as applicable.

5.1.4 Simulation

Simulation is not employed by the existing G/A/G radio network, or required for the G/A/G radio network delivered under this project.

Deployable Link-16 GESs will have simulation capabilities.

6. REQUIREMENTS TABLE

6.1 Detailed Requirements

The detailed requirements for the TIC3 Air project are found in the following tables:

a. Table A – Ground-Air-Ground Radio Requirements; and

b. Table B – Data Link System Requirements.

The criticality of the individual requirements has been categorized as follows:

a. **Mandatory (M)** - These are mandatory requirements. Fundamental changes to these requirements will result in the loss of capability. Each essential requirement must be met to pass system acceptance.

b. **Highly Desirable (HD)** - These requirements significantly improve system capability. Omission of an important requirement may not have an effect on the system acceptance. However, it may result in the loss of a capability that may affect the overall performance of the system.

c. **Desirable (D)** – These requirements improve system capability, but will not have an effect on overall system acceptance, nor will their omission adversely impact system capability.

7. GLOSSARY

Term	Glossary Definition
Availability	The ability of an item to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided.
Capability	A function of the ability of a force to plan and execute a mission. It is generally a function of force doctrine and structure (organization and equipment) plus training and support services.
Classified Network (C-Net)	The classified network (C-Net) is the physical network infrastructure (encrypted traffic bearer) implemented to accommodate a variety of enclaves in use by DND that operate at the security classification level of SECRET or above.
Common Operating Picture	An interactive and shared visual representation of operational information gathered from various sources.
Consolidated Secret Network Infrastructure	The Consolidated Secret Network Infrastructure (CSNI) is a single SECRET level and integrated Command and Control infrastructure developed to support the Canadian Forces operational requirements.
Contributions	Contributions are deliverables the project is required to provide to an external Project/Initiative.
Desirable (D) Requirement	These requirements enhance system capability. Omission of a Desirable requirement will not have an effect on system acceptance; however, it may result in the loss of a capability that may affect the overall performance of the systems. Use of the word “may” implies a

Term	Glossary Definition
	desirable requirement.
Enclave	Enclave is an isolated logical computer information system with a specific security classification and release caveat (e.g., DWAN, Comd-Net, LCSS TacNet, AFTAC, etc.). For classified enclave, this refers to cryptographic isolation.
Mandatory (M) Requirement	Fundamental changes to these requirements will result in the loss of functional capabilities. Each essential requirement must be met to pass system acceptance. These requirements can also be associated with the term "Mandatory". Use of the word "shall" implies an essential requirement.
Highly Desirable (HD) Requirement	These requirements significantly enhance system capability. Omission of a Highly Desirable requirement will not have an effect on system acceptance; however, it may result in the loss of a capability that may affect the overall performance of the systems. Use of the word "should" implies a highly desirable requirement.
Full Operational Capability	Full Operational Capability. The complete attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and which is manned or operated by an adequately trained, equipped, and supported military unit or force.
Graceful degradation	Fault-tolerance or graceful degradation is the property that enables a system (often computer-based) to continue operating in the event of the failure of or one or more faults within its components. If its operating quality decreases, the decrease is proportional to the severity of the failure as compared to a naively-designed system in which even a small failure can cause total breakdown.
Interoperability	The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate together effectively in the execution of assigned missions and tasks.
Initial Operational Capability	The first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and which is manned or operated by an adequately trained, equipped, and supported military unit or force.
Maintainability	The ability of item, under given conditions of use, to be retained in, or restored to, a state in which it can perform a required function, when maintenance is performed under given conditions and using stated

	procedures and resources.
Recognized Air Picture	A visual representation of detected aircraft activity within particular airspace based on data from various sources used to develop air domain situational awareness and to support decision-making.
Reliability	The ability of an item to perform a required function under given conditions for a given interval.
Situational Awareness	In its broadest sense, situational awareness (SA) provides the Commander with the ability to perceive the physical (maritime, land, air and space) and non-physical (cyber and human) domains. In the Defence context, SA capabilities are associated with the "Sense" function, which include surveillance, reconnaissance, and monitoring.
Streaming Video (SV)	Streaming Video is a multimedia that is constantly received by and presented to an end-user while being delivered by a streaming provider. With streaming, the client browser or plug-in can start displaying the data before the entire file has been transmitted. The name refers to the delivery method of the medium rather than to the medium itself.
Tactical Data Link (TDL)	A TDL is a standardized communications link suitable for transmission and receipt of tactical digital information. TDLs interface two or more command and control or weapons systems via single network architecture and multiple communication media. Current practice is to characterize a TDL by its standardized message formats and transmission characteristics (e.g. Link-16 – J Message).

8. ACRONYMS & ABBREVIATIONS

Acronym	Definition
5-Eyes	United States of America, United Kingdom, Canada, Australia, and New Zealand
ACP-T	Airlift Capability Project-Tactical
AD	Air Defence
ADatP	Allied Data Processing Publication
ADM(Mat)	Assistant Deputy Minister (Materiel)
AFIILE	Air Force Integrated Information & Learning Environment
AOR	Area of Responsibility
ATIS	Air Telecommunications and Information Systems

Acronym	Definition
ATM	Air Traffic Management
BCA	Business Case Analysis
BITE	Built-In-Test-Equipment
BLOS	Beyond Line of Sight
C2	Command and Control
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CADRS	Canadian Air Defence Radio System
CADS	Canadian Air Defence Sector
CANR	Canadian NORAD Region
CAOC	Canadian Air Operations Center
CAF	Canadian Armed Forces
CBT	Computer Based Training
CCIR	Commander's Critical Information Requirement
CJOC	Canadian Joint Operations Command
COMSEC	Communications Security
CONOPS	Concept of Operations
COP	Common Operating Picture
COTS	Commercial-Off-The-Shelf
CSNI	Consolidated Secret Network Infrastructure
DL	Data Link
DND	Department of National Defence
DAOD	Defence Administrative Orders and Directives
E-ITI	Enhanced Information Technology Infrastructure
ELE	End-of-Life Expectancy
FFCP	Future Fighter Capability Project
FMS	Flight Mission System
FOC	Full Operational Capability
FOL	Forward Operating Location
G/A/G	Ground-Air-Ground

Acronym	Definition
GES	Ground Entry Station
GoC	Government of Canada
HF	High Frequency
IOC	Initial Operational Capability
IM	Information Management
ISR	Intelligence, Surveillance and Reconnaissance
JIIFC	Joint Information and Intelligence Fusion Capability
JREAP	Joint Range Extension Application Protocol
JUSTAS	Joint Unmanned Aerial Vehicle Surveillance Target Acquisition System
LCMM	Life Cycle Materiel Manager
LOS	Line of Sight
LRU	Line Replaceable Unit
MHP	Maritime Helicopter Project
MOB	Main Operating Base
MRTT	Multi-Role Tanker Transport
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
NATO	North Atlantic Treaty Organization
NORAD	North American Aerospace Defence Command
O&M	Operations and Maintenance
OPP	Operational Planning Process
PMP	Project Management Plan
PSTN	Public Switched Telephone Network
RAP	Recognized Air Picture
RCAF	Royal Canadian Air Force
RCMP	Royal Canadian Mounted Police
SA	Situational Awareness
SA&A	Security Assessment and Authorization
SAR	Search and Rescue
Sqn	Squadron

Acronym	Definition
SV	Streaming Video
TDL	Tactical Data Link
TIC3 Air	Tactical Integrated Command, Control and Communications Project
UHF	Ultra High Frequency
US	United States
USAF	United States Air Force
VHF	Very High Frequency

Table A - TIC3 Ground Air Ground Radio Requirements

Performance Requirements (Rqmt. #) – In specifying the different performance requirements, three levels of measurement will be used: **M**andatory (**M**), **H**ighly **D**esirable (**HD**) and Desirable (**D**).
The **Stage** column aligns requirements with the appropriate project stage (D = Definition, I = Implementation).
Verification Method – This column indicates the verification method (I = Inspection, D = Demonstration, A = Analysis, or T = Test) for capabilities to be provided.

Table A.1 - ATM Radio Requirements

Table A.1 ATM Radio Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.1.1 Background			
	Info		Air Traffic Management Radios include all those radios used to Coordinate and/or control RCAF Aircraft flight activities including ATC, flight following, flight advisory, Wing Operations and Sqn Operations radios.
	Info		The primary goal of the Air Traffic Management transmitters (TXs) and receivers (RXs) is to enable voice communications with aircraft by radio over the Aeronautical VHF and UHF Bands as defined in the ICAO regulations.
	Info		A **"Radio set**" is a TX and RX, and only operates on standard, international frequencies known as channels/frequencies, hereafter referred to as the "Radio" where each frequency equals one channel.
	Info		The TX and RX may be ultimately located anywhere from a few meters to many kilometres from the operating position(s), and may be co-located, or at two different sites.
	Info		For the purpose of this document, the expression "**Radio System**" includes all the ground components and connections configured for optimal performance and safe operational use by designated users. This includes the Radio, RF Link, Line Suppressor, Antenna and any ancillary components such as the Rack, High Power Amplifier (HPA), Filter, internal cabinet harness and power surge protection.
	E		All new ATM communication equipment must integrate with current ATM equipment that is not replaced by the TIC3 Air Project.
A.1.2 Location			
A.1.2.1	**M**	I	3 Wing Bagotville

Table A.1 ATM Radio Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.1.2.2	**M**	I	4 Wing Cold Lake
A.1.2.3	**M**	I	5 Wing Goose Bay
A.1.2.4	**M**	D	8 Wing Trenton
A.1.2.5	**M**	I	8 Wing Trenton / 8 ACCS - ATC Deployable Control Tower (Sky 2 Capability)
A.1.2.6	**M**	I	8 Wing Trenton / ATESS - Training Mock Up
A.1.2.7	**M**	I	9 Wing Gander
A.1.2.8	**M**	I	12 Wing Shearwater
A.1.2.9	**M**	I	14 Wing Greenwood
A.1.2.10	**M**	I	19 Wing Comox
A.1.2.11	**M**	I	17 Wing Winnipeg
A.1.2.12	**M**	D	CFB Petawawa
A.1.2.13	**M**	I	CFB Gagetown
A.1.2.14	**M**	I	CFB Borden
A.1.2.15	**M**	I	CFB Valcartier
A.1.2.16	**M**	I	CFB Shilo
A.1.2.17	**M**	I	Canadian Forces Ammunition Depot Dundurn
A.1.2.18	**M**	I	CFB Suffield
A.1.2.19	**M**	I	CFB Wainwright
A.1.2.20	**M**	I	CFB Edmonton
A.1.2.21	**M**	I	Canadian Forces Station Alert

Table A.1 ATM Radio Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.1.2.22	**M**	I	CFB Esquimalt
A.1.2.23	**M**	I	Patricia's Bay, BC
A.1.2.24	**M**	I	Eureka, NU
A.1.2.25	**M**	I	St. Hubert, QC
A.1.2.26	**M**	I	Forward Operating Location (FOL) Rankin Inlet, NU
A.1.2.27	**M**	I	Iqaluit, NU
A.1.2.28	**M**	I	Inuvik, NT
A.1.2.29	**M**	I	Ottawa, ON
A.1.2.30	**M**	I	Mountain View, ON
A.1.2.31	**M**	I	Yellowknife, NT
A.1.2.32	**M**	I	Barrington, NS
A.1.2.33	**M**	I	Holberg, BC
A.1.3 Requirements			
A.1.3.1	**M**	D	ATM Radios must be capable of operating, as defined in the ICAO regulations, in the Ground/Air/Ground VHF/UHF frequency bands.
A.1.3.2	**M**	D	ATM Radios must be capable of both 25KHz channel spacing and 8.333 KHz channel spacing over the VHF band.
A.1.3.3	**M**	D	ATM Radios must be capable of receiving and processing voice transmissions on the same frequency simultaneously without automatically blocking or selecting any voice transmissions.

Table A.1 ATM Radio Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.1.3.4	**M**	D	ATM Radio systems must have a range of no less than the radio systems they replace.
A.1.3.5	**M**	D	ATM Radio frequencies must be tuneable via the ATM Radio front panel. A remote radio management capability must be capable of remotely controlling the ATC Radios, which must include remotely tuning the radio frequencies.
A.1.3.6	**M**	D	Upon initialization (Cold Start), the ATM Radios' operating frequency must default to the last set value and all control and monitoring parameters must assume their last value.
A.1.3.7	**M**	D	Following a power outage, the ATM Radios must automatically recover within 30 seconds of the application of power, and restore their last configuration without operator or technician intervention.
A.1.3.8	**M**	D	ATM Radios must comply with all Industry Canada requirements for legal operation within Canada.
A.1.3.9	**M**	D	ATM Radios must be capable of being remotely operated via the present inventory of ATM voice communication systems (VCS) and remote radio access panels.
A.1.3.10	**M**	D	ATM Radio frequencies must be remotely selectable.
A.1.3.11	**M**	D	ATM Radios must be capable of continuous broadcast and **100%** duty cycle.
A.1.3.12	**M**	D	ATM Radios must be capable of operation in their intended electronic environment without causing interference.
A.1.3.13	**M**	D	Radio Emergency frequencies (referred to as **GUARD** frequencies: **VHF/121.5 and UHF/243.0**) must always be available for continuous and concurrent monitoring on ATM Radios.
A.1.3.14	**M**	D	The Air Traffic Management Radio network must provide a level of voice quality no less than that of

Table A.1 ATM Radio Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
			the existing Air Traffic Management Radio network.
A.1.3.15	**M**	D	Deployable ATM Radios must be required to operate in both austere and benign operational conditions including a wide range of temperature, humidity, air quality, and power conditions. In addition, they must survive the full range of possible transport and storage conditions during deployment.
A.1.3.16	**M**	D	ATM Radios must be protected against unauthorised access in accordance with DND security policies.
A.1.3.17	**M E**	D	IFRCC/Control Tower Emergency (i.e. Bug-Out) radio equipment must be portable and must have an independent power supply.
A.1.3.18	**HD**	D	ATM Radios should provide visual warning of errors, malfunctions, and/or degradations to operators.
A.1.3.19	**M**	D	ATM Radios must be replaceable as “hot-swappable” items.
A.1.3.20	**M**	D	The Air Traffic Management Radio network must have system availability sufficient to enable a sustainable 24 hour a day 365 day a year Air Traffic Management capability.
A.1.3.21	**M**	D	ATM Radios must be capable of operating at their required duty cycle for a period of one-year without the need for preventive maintenance.
A.1.3.22	**M**	D	The ATM Radio network must be capable of managing and modifying stored frequency lists on a per site basis, from designated remote locations, for example from a maintenance centre.
A.1.3.23	**M**	D	Planned and preventative radio maintenance must not adversely impact the required ATM radio network availability.
A.1.3.24	**M**	D	ATM Radio sites must be capable of recording and playback of transmissions.
A.1.3.25	**M**	D/I	RCAF Operators must receive training as required to enable operational use of the ATM Radio network.

Table A.1 ATM Radio Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.1.3.26	**M**	D/I	RCAF Maintenance personnel must receive training as required to enable continuous, high tempo operational availability of the ATM Radio network.
A.1.3.27	**M**	D/I	Final versions of all operations, maintenance, training, test, and inspection procedures and manuals for the ATM Radio network and its sub-components must be provided in both official languages (English and French).

Table A.2 - Air Defence

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.1 Background			
	Info		The primary goal of the Air Defence AD TXs and RXs is to enable voice communications with aircraft by radio over the Aeronautical VHF and UHF Bands used for AD, Wing Operations (W Ops)/Squadron Operations (Sqn Ops) and ATC radio backups for authorized operational users.
	Info		A "***Transceiver"*** is a device comprising both a transmitter and a receiver which are combined and share common circuitry and in a single housing. When no circuitry is common between transmit and receive functions, the device is a transmitter-receiver.
	Info		For the purpose of this document, the expression "**Radio System**" includes all the ground components and connections configured for optimal performance and safe operational use by designated users. This includes the Radio, RF Link, Line Suppressor, Antenna and any ancillary components such as the Rack, HPA, Filter, internal cabinet harness and power surge protection.
A.2.2 Location			
A.2.2.1	**M**	I	St. Anthony (L'Anse aux Meadows), NL
A.2.2.2	**M**	I	St. John's (Robin Hood Bay), NL
A.2.2.3	**M**	I	Fortune Head (Mount Pleasant), NL
A.2.2.4	**M**	I	Port Aux Basques, NL
A.2.2.5	**M**	I	Shearwater, NS
A.2.2.6	**M**	I	Saint John (Red Head), NB

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.2.7	**M**	I	Newport, QC
A.2.2.8	**M**	I	Havre St. Pierre, QC
A.2.2.9	**M**	I	Mont-Joli (Ste Flavie), QC
A.2.2.10	**M**	I	Trois Rivieres (Ste Marthe du Cap), QC
A.2.2.11	**M**	I	CFB Kingston, ON
A.2.2.12	**M**	I	North Bay, ON
A.2.2.13	**M**	I	Ottawa, ON
A.2.2.14	**M**	I	Toronto, ON
A.2.2.15	**M**	I	Montreal, QC
A.2.2.16	**M**	I	Moncton, NB
A.2.2.17	**M**	I	Quebec City (Valcartier), QC
A.2.2.18	**M**	I	Greenwood, NS
A.2.2.19	**M**	I	Trenton, ON
A.2.2.20	**M**	I	Bagotville, QC
A.2.2.21	**M**	I	Charlottetown, PE
A.2.2.22	**M**	I	Meaford, ON
A.2.2.23	**M**	I	London, ON
A.2.2.24	**M**	I	CFB Suffield, AB
A.2.2.25	**M**	I	Hinton, AB

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.2.26	**M**	I	Cranbrook, BC
A.2.2.27	**M**	I	Penticton (Campbell Mountain), BC
A.2.2.28	**M**	I	Quesnel, BC
A.2.2.29	**M**	I	CFB Aldergrove, BC
A.2.2.30	**M**	I	Esquimalt (Victoria), BC
A.2.2.31	**M**	D	Ucluelet, BC
A.2.2.32	**M**	I	Sandspit, BC
A.2.2.33	**M**	I	Winnipeg, MB
A.2.2.34	**M**	I	Calgary, AB
A.2.2.35	**M**	I	Edmonton, AB
A.2.2.36	**M**	I	Vancouver, BC
A.2.2.37	**M**	I	Comox, BC
A.2.2.38	**M**	I	Cold Lake, AB
A.2.2.39	**M**	I	Moose Jaw, SK
A.2.2.40	**M**	I	Norman Wells, NT
A.2.2.41	**M**	I	Fort Simpson, NT
A.2.2.42	**M**	I	Yellowknife, NT
A.2.2.43	**M**	I	High Level, AB
A.2.2.44	**M**	I	Wollaston Lake (Collins Bay), SK

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.2.45	**M**	I	Rankin Inlet, NU
A.2.2.46	**M**	I	Iqaluit, NU
A.2.2.47	**M**	I	Kuujjuaq, QC
A.2.2.48	**M**	I	Schefferville, QC
A.2.2.49	**M**	I	Wabush, NL
A.2.2.50	**M**	I	Goose Bay, NL
A.2.3 Requirements			
A.2.3.1	**M**	D	AD Radios must be capable of operating within the standard G/A/G VHF/UHF frequency bands.
A.2.3.2	**M**	D	AD Radios must be capable of receiving and processing voice transmissions on the same frequency simultaneously without automatically blocking or selecting any voice transmissions.
A.2.3.3	**M**	D	AD Radio systems must have a range no less than the radio systems they replace.
A.2.3.4	**M**	D	AD Radio frequencies must be tuneable via the radio front panel. A remote radio management capability shall be capable of remotely controlling the radios, which shall include remotely tuning the radio frequencies.
A.2.3.5	**M**	D	Upon initialization (Cold Start), the Radios operating frequency must default to the last set value and all control and monitoring parameters must assume their last value.
A.2.3.6	**M**	D	The Air Defence Radio network must be capable of normal and secure communications with RCAF, NORAD, and NATO airborne platforms.
A.2.3.7	**M**	D	The following AD Radio sites must be capable of anti-jam operation compatible with RCAF and NORAD airborne platforms:
A.2.3.7.1	**M**	I	a) Cold Lake, AB

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.3.7.2	**M**	I	b) Bagotville, QC
A.2.3.7.3	**M**	I	c) Greenwood, NS
A.2.3.7.4	**M**	I	d) Goose Bay, NL
A.2.3.7.5	**M**	I	e) Iqaluit, NU
A.2.3.7.6	**M**	I	f) Comox, BC
A.2.3.7.7	**HD**	I	g) Trenton, ON
A.2.3.7.8	**HD**	I	h) Winnipeg, MB
A.2.3.7.9	**HD**	I	i) Yellowknife, NT
A.2.3.7.10	**D**	I	j) Ottawa, ON
A.2.3.7.11	**D**	I	k) Toronto, ON
A.2.3.7.12	**D**	I	l) Montreal, QC
A.2.3.7.13	**D**	I	m) Quebec City (Valcartier), QC
A.2.3.7.14	**D**	I	n) Calgary, AB
A.2.3.7.15	**D**	I	o) Edmonton, AB
A.2.3.7.16	**D**	I	p) Vancouver, BC
A.2.3.7.17	**D**	I	q) Esquimalt (Victoria), BC
A.2.3.7.18	**D**	I	r) Shearwater, NS
A.2.3.8	**M**	D	Following a power outage, the AD Radios must automatically recover within 30 seconds of the application of power, and restore their last configuration without operator or technician intervention.
A.2.3.9	**M**	D	AD Radios must comply with all Industry Canada requirements for legal operation within Canada.

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.3.10	**M**	D	AD Radios must be capable of being remotely operated via the present inventory of Air Defence Voice Communication Systems (VCS) / remote radio access panels.
A.2.3.11	**M**	D	AD Radios must be capable of operation in their intended electronic environment without causing interference.
A.2.3.12	**M**	D	The AD Radios must be capable of monitoring Radio Emergency frequencies (known as **GUARD** frequencies: **VHF/121.5 and UHF/243.0**) and the UHF Military Air Intercept Common Channel (**AICC**), **UHF/364.2 concurrently with any other AD Radio operations.**
A.2.3.13	**M**	D	The Air Defence Radio network must provide a level of voice quality no less than that of the existing Air Defence Radio network.
A.2.3.14	**M**	D	AD Radios must be protected against unauthorised access in accordance with DND security policies.
A.2.3.15	**HD**	D	AD Radios should provide visual warning of errors, malfunctions, and/or degradations to operators.
A.2.3.16	**HD**	D	AD Radios should be replaceable as “hot-swappable” items.
A.2.3.17	**M**	D	The Air Defence Radio network must have system availability sufficient to enable a sustainable 24 hour a day 365 day a year Air Defence / Wing Operations capability.
A.2.3.18	**M**	D	AD Radios must be capable of operating at their required duty cycle for a period of one-year without the need for preventive maintenance.
A.2.3.19	**M**	D	The AD Radio network must be capable of managing and modifying stored frequency lists on a per site basis, from designated remote locations, for example from a maintenance centre.
A.2.3.20	**M**	D	Planned and preventative radio maintenance must not adversely impact the required radio network availability.

Table A.2 Air Defence			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
A.2.3.21	**M**	D	The AD Radio network must be capable of recording and playback of transmissions.
A.2.3.22	**M**	D/I	RCAF Operators must receive training as required to enable operational use of the Air Defence Radio network.
A.2.3.23	**M**	D/I	Final versions of all operations, maintenance, training, test, and inspections procedures and manuals for the Air Defence Radio network must be provided in both official languages (English and French).
A.2.3.24	**M**	I	Training AD Radios must be installed and set to work at 3 Wing Bagotville, 4 Wing Cold Lake and 8 Wing Trenton for aircrew training purposes.
A.2.3.25	**M**	I	The Training AD Radios must be identical to anti-jam radios provided as part of the upgrade to the CADRS network.
A.2.3.26	**M**	I	The training AD Radios must only be used for local training activities and must not be integrated into the CADRS network.

Table B – Data Link Systems Requirements

Performance Requirements (Rqmt #) – In specifying the different performance requirements, three levels of measurement will be used: **M**andatory (**M**), **H**ighly **D**esirable (**HD**) and Desirable (**D**).
The **Stage** column aligns requirements with the appropriate project stage (D = Definition, I = Implementation).
Verification Method – This column indicates the verification method (I = Inspection, D = Demonstration, A = Analysis, or T = Test) for capabilities to be provided.

Table B.1 Fixed Link-16 GES Requirements

Table B.1 Fixed Link-16 GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.1.1 Background			
B.1.1.1	**Info**		Domestic Link-16 communication infrastructure composed of fixed Ground Entry Stations (GESs) will be controlled from and provide data to the Canadian Air Defence Sector (CADS). These GESs will receive and transmit Link-16 data to and from capable airborne platforms, and potentially similarly equipped Navy and Army platforms. Data can then be forwarded from CADS to other C2 centres for enhanced Situational Awareness (SA) and C2 functionality in support of domestic exercises and operations.
B.1.1.2	**Info**		Coverage refers to the ability of airborne units to communicate with a ground based Link-16 terminal. In this respect a single Link-16 GES provides "coverage" to airborne units. The size of a coverage area is determined by the inherent range performance of a Link-16 terminal as modified by individual site conditions such as antenna location and terrain interference. Overlapping coverage refers to a situation in which some AORs are covered by more than one Link-16 terminal. Coverage for locations listed in section B.1.2 may be provided by a GES that is not necessarily located in that location.
B.1.2 Location			
B.1.2.1	**M**	**D**	3 Wing Bagotville, QC
B.1.2.2	**M**	**D**	8 Wing Trenton, ON
B.1.2.3	**M**	**I**	14 Wing Greenwood, NS
B.1.2.4	**M**	**I**	4 Wing Cold Lake, AB

Table B.1 Fixed Link-16 GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.1.2.5	**M**	**I**	19 Wing Comox, BC
B.1.2.6	**M**	**I**	17 Wing Winnipeg, MB
B.1.2.7	**M**	**I**	Montreal (St-Hubert and/or Mirabel), QC
B.1.2.8	**M**	**I**	22 Wing North Bay, ON
B.1.2.9	**M**	**I**	12 Wing Shearwater / Halifax, NS
B.1.2.10	**M**	**I**	London, ON
B.1.2.11	**M**	**I**	Calgary, AB
B.1.2.12	**M**	**I**	FOL Yellowknife, NT
B.1.2.13	**M**	**D**	Inuvik, NU
B.1.2.14	**M**	**I**	Ft St John, BC
B.1.2.15	**M**	**I**	St Johns, NL
B.1.2.16	**M**	**I**	Vancouver (e.g. Tofino), BC
B.1.2.17	**HD**	**I**	NCR, ON
B.1.2.18	**HD**	**I**	Wabush, NL
B.1.2.19	**HD**	**I**	Mould Bay, NU
B.1.2.20	**HD**	**I**	Tofino, BC
B.1.2.21	**HD**	**I**	Shingle Point, YT (NWS LRR – BAR 2)
B.1.2.22	**HD**	**I**	Whitehorse, YT
B.1.2.23	**HD**	**I**	Cartwright, NL (NWS LRR – LAB-6)
B.1.2.24	**HD**	**I**	Sydney, NS (CCR)
B.1.2.25	**HD**	**I**	Port Hardy, BC

Table B.1 Fixed Link-16 GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.1.2.26	**HD**	**I**	Cape Dyer, NU (NWS LRR DYE-M)
B.1.2.27	**HD**	**I**	Normal Wells, NT
B.1.2.28	**D**	**I**	9 Wing Gander, NL
B.1.2.29	**D**	**I**	5 Wing Goose Bay, NL
B.1.2.30	**D**	**I**	Alert, NU (CFS)
B.1.2.31	**D**	**I**	Cape Perry, NT (NWS LRR – PIN-M)
B.1.2.32	**D**	**I**	Saglek, NL (NWS LRR – LAB-2)
B.1.2.33	**D**	**I**	Esquimalt (Victoria), BC
B.1.2.34	**D**	**I**	Brevoort, NU (NWS LRR – BAF-3)
B.1.2.35	**D**	**I**	Ft Simpson, NT
B.1.2.36	**D**	**I**	Dewar Lakes, NU
B.1.2.37	**D**	**I**	Kamloops, BC
B.1.2.38	**D**	**I**	Pond Inlet, NU
B.1.2.39	**D**	**I**	Cambridge Bay, NU (NWS LRR – CAM-M)
B.1.2.40	**D**	**I**	Puvirnituq, QC
B.1.2.41	**D**	**I**	Lynn Lake, MB
B.1.2.42	**D**	**I**	Hall Beach, NU (NWS LRR – FOX-M)
B.1.2.43	**D**	**I**	Shepherd Bay, NU (NWS LRR – CAM-3)
B.1.2.44	**D**	**I**	Marathon, ON
B.1.2.45	**D**	**I**	Resolute Bay, NU
B.1.2.46	**D**	**I**	Eureka, NU

Table B.1 Fixed Link-16 GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.1.2.47	**D**	**I**	Rankin Inlet, NU (FOL)
B.1.2.48	**D**	**I**	Churchill, MB
B.1.3 Requirements			
B.1.3.1	**M**	**D**	Fixed Link-16 GESs must be capable of remote operation by CADS.
B.1.3.2	**M**	**D**	Remote operation capabilities must be available on a continuous basis, 24 hours a day, 7 days a week.
B.1.3.3	**M**	**D**	Fixed Link-16 GESs must provide a coverage range of no less than 200NM for Aircraft flying at 30 000 feet in an environment without significant interference.
B.1.3.4	**M**	**D**	Fixed Link-16 GESs must be capable of remote operation, configuration, and monitoring.
B.1.3.5	**M**	**D**	Fixed Link-16 GESs must not interfere with ATC equipment or Navigational Aids.
B.1.3.6	**M**	**D**	Fixed Link-16 GESs must be interoperable with RCAF, NORAD and NATO Link-16 enabled airborne platforms, and shall be compliant with one or both of MIL-STD-6016E and STANAG 5516(E4). Where a system is only compliant with one of these standards a list of differences must be provided.
B.1.3.7	**M**	**D**	Fixed Link-16 GES network equipment located at CADS must be capable of transmitting information to other C2 centres using Joint Range Extension Applications Protocol (JREAP) B and C in compliance with one or both of MIL-STD-3011 and STANAG 5518. Where a system is only compliant with one of these standards a list of differences must be provided.
B.1.3.8	**M**	**D**	Fixed Link-16 GESs must allow local and remote personnel to participate in J-voice conversations over the Link-16 network.
B.1.3.9	**M**	**D**	Fixed Link-16 GESs must be capable of receiving and synchronizing to a GPS-based External Time Reference (ETR).
B.1.3.10	**M**	**I**	Fixed Link-16 GES network equipment located at CADS must be capable of distributing received

Table B.1 Fixed Link-16 GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
			data over designated DND Classified networks, on an as required basis.
B.1.3.11	**M**	**D**	Fixed Link-16 GESs must be capable of transmitting received data to CADS.
B.1.3.12	**Info**		Link-16 Crypto keymat will be provided by CFCSU.
B.1.3.13	**M**	**D**	Fixed Link-16 GESs must comply with standing Industry Canada spectrum regulations and Link-16 operational restrictions set out by DND Frequency Spectrum Management (FSM). *Note. Some or all of these restrictions may be relaxed to support specific operational or exercise requirements, on a case-by-case basis.*
B.1.3.14	**M**	**D**	Fixed Link-16 GESs must be capable of operation in compliance with standing DND Link-16 deconfliction regulations in accordance with DAOD 6002-4, Radio Frequency Spectrum Management.
B.1.3.15	**M**	**D**	The Fixed Link-16 GES network must be capable of monitoring Link-16 networks for frequency spectrum compliance.
B.1.3.16	**HD**	**I**	The Link planning tool should provide the capability to validate, disseminate, and brief the link plan.
B.1.3.17	**HD**	**I**	The Link planning tool should support Link-11 and Link-16 planning, including, but not limited to JREAP planning.
B.1.3.18	**HD**	**I**	The Link planning tool should provide the capability to define information exchange requirements.
B.1.3.19	**HD**	**I**	The Link planning tool should provide the capability to perform link network design.

Table B.2 Deployable GES Requirements

Table B.2 Deployable GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.2.1 Background			
B.2.1.1	**M**		Key deployable RCAF units, as identified in section B.2.2 of this Table, must be capable of ingesting Link-16, Link-11 and SV information and distributing it to RCAF C2 Centres and/or other operational centres.
B.2.1.2	**Info**		There are two types of deployable RCAF units. C2 (TCRs and 8 ACCS) and Non-C2 (DMSC).
B.2.1.3	**Info**		The deployable GES capability is intended to provide a means of extending Link-16 coverage beyond what will be provided by fixed GESs including areas within Canada that are outside fixed coverage areas, areas within Canada affected by fixed GES outages and areas in deployed theatres of operation outside of Canada.
B.2.2 Key Deployable RCAF Units			
B.2.2.1	**Info**		The key deployable RCAF units requiring Deployable GES capabilities are listed below:
B.2.2.2	**M**	**D**	12e Escadron de radar / TCR Squadron (3 Wg Bagotville)
B.2.2.3	**M**	**D**	42 Radar Squadron / TCR Squadron (4 Wg Cold Lake)
B.2.2.4	**M**	**D**	8 ACCS (8 Wg Trenton)
B.2.2.5	**M**	**D**	DMSC (E) (14 Wg Greenwood)
B.2.2.6	**M**	**D**	DMSC(W) (19 Wg Comox)
B.2.3 Requirements			
B.2.3.1	**M**	**D**	Deployable GESs must be capable of receiving and transmitting Link-11 information over HF

Table B.2 Deployable GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
			and UHF.
B.2.3.2	**M**	**D**	Deployable GESs must be capable of monitoring Link-16 networks for frequency spectrum compliance.
B.2.3.3	**M**	**D**	Deployable GESs must be capable of injecting simulated data items into a Link-16 network.
B.2.3.4	**M**	**D**	Deployable GESs must be capable of acting as a network gateway between Link-16 and Link-11.
B.2.3.5	**M**	**D**	Deployable GESs must be capable of accepting track data from TCR radar systems and shall be capable of correlating the received track data with Link information.
B.2.3.6	**M**	**D**	Deployable GESs must have the ability to receive SV feeds from capable, RCAF, NORAD and NATO airborne platforms and distribute the SV feeds in a format compatible with DND video distribution systems (STANAG 4609).
B.2.3.7	**D**	**I**	Deployable GESs should have the ability to receive SV feeds from any airborne platforms that make use of the L and S transmission bands and distribute these feeds in a format compatible with DND video distribution systems (STANAG 4609).
B.2.3.8	**M**	**I**	Deployable GESs must be capable of compressing received SV on an as required basis, to enable its distribution over available data connections to C2 networks.
B.2.3.9	**M**	**D**	The Reception range of SV receivers must be no less than 120nm under optimal conditions.
B.2.3.10	**M**	**I**	SV distribution must be capable of providing C2 Users with access to recorded video in the same format and quality level it is received from airborne platforms.
B.2.3.11	**M**	**D**	Deployable GESs must be capable of receiving and synchronizing with a GPS based External Time Reference (ETR).
B.2.3.12	**M**	**D**	The time required to prepare the Deployable GES components for transport must be no worse than that for the current capability.
B.2.3.13	**M**	**D**	All shipping and transport containers (herein referred to as transit cases) required for transport of the Deployable GES must be provided with the Deployable GES.

Table B.2 Deployable GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.2.3.14	**M**	**D**	When the Deployable GES components are packed in the transit cases, the transit cases must meet the requirements for transport in the current RCAF fleet of transport aircraft.
B.2.3.15	**M**	**D**	No modification to transport aircraft must be required to accommodate Deployable GES equipment.
B.2.3.16	**M**	**D**	No special loading or handling equipment must be required to accommodate Deployable GES equipment.
B.2.3.17	**M**	**D**	When the Deployable GES components are packed in the transit cases, a maximum of four persons must be able to move any single transit case.
B.2.3.18	**M**	**D**	Deployable GES equipment must be capable of being transported and/or stored in the non-operational temperature ranges, humidity ranges, low pressure levels, and sand and dust levels defined in MIL-STD-810G.
B.2.3.19	**M**	**D**	Deployable GESs must be capable of being operated in the operational temperature ranges, humidity ranges, and sand and dust levels defined in MIL-STD-810G.
B.2.3.20	**M**	**D**	Deployable GESs must include the ability to locally display received Link information.
B.2.3.21	**M**	**D**	Deployable GESs must include the ability to configure, control, and monitor the TDL network (network management, health of network, etc.).
B.2.3.22	**M**	**D**	Deployable non-C2 Link GESs must be capable of being controlled and configured remotely.
B.2.3.23	**M**	**D**	Deployable GESs must provide the operator the ability to filter tracks for local display and forwarding to other systems.
B.2.3.24	**M**	**D**	Deployable GESs must not require a building, vehicle or other structure to support their antennas, masts or cables.
B.2.3.25	**M**	**D**	Deployable GESs must be capable of forwarding two SV feeds simultaneously.

Table B.2 Deployable GES Requirements			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.2.3.26	**M**	**D**	Deployable GESs must be capable of interfacing with Wideband Global SATCOM.
B.2.3.27	**M**	**D**	Deployable GESs must be capable of transmitting received data and SV via external, commercial networks and carriers, on an as required basis, including the ability to utilize PSTN lines for Link-16 information.
B.2.3.28	**D**	**I**	Deployable GESs should be capable of accepting track data directly from Canadian Army Air Defence radars, and shall be capable of correlating the track data with Link information.
B.2.3.29	**M**	**D/I**	RCAF Maintenance personnel must receive training as required to enable continuous, high tempo operations.
B.2.3.30	**M**	**D/I**	The Link-16 component of deployable GESs must be compliant with one or both of MIL-STD-6016E and STANAG 5516(E4). Where a system is only compliant with one of these standards a list of differences must be provided.
B.2.3.31	**M**	**D**	The Link-16 component of deployable GESs must be capable of transmitting information using the JREAP B and C protocol in compliance with one or both of MIL-STD-3011 and STANAG 5518. Where a system is only compliant with one of these standards a list of differences must be provided.

Table B.3 CC150 Polaris
Multi-Role Tanker Transport (MRTT) Link-16

Table B.3 CC150 Polaris –MRTT Link-16			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.3.1 Background			
B.3.1.1	**Info**		The MRTT Link-16 capability will enable the use of existing CC150 Polaris Tanker assets to: (1) Connect geographically-separated TDL networks and extend Link-16 coverage; (2) Provide SA to the CC150 Tanker crew; and (3) Provide fuel receivers with SA related to Tanker position and status. A report will be generated to detail the suitability of the MRTT Link-16 capability for use on the CC130, CP140, CC177 and CH147.
B.3.2 Location			
B.3.2.1	**M**	**I**	The MRTT Link-16 capability will be installed on CC150 aircraft when in operation.
B.3.3 Requirements			
B.3.3.1	**M**	**I**	The MRTT Link-16 capability must be capable of displaying SA data to the CC150 crew.
B.3.3.2	**M**	**I**	The MRTT Link-16 capability must support simultaneous use by up to three aircrew positions (Pilot, Co-pilot, and Flight Refuelling Specialist).
B.3.3.3	**M**	**I**	The MRTT Link-16 capability must be capable of relaying Link-16 network information (data and voice) to other Link-16 capable platforms within LOS without Aircrew interaction.
B.3.3.4	**M**	**I**	The MRTT Link-16 capability must support transmissions at the maximum range for LOS Link-16.
B.3.3.5	**HD**	**I**	The MRTT Link-16 capability should allow aircrew to input data.

Table B.3 CC150 Polaris –MRTT Link-16			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.3.3.6	**M**	**I**	The MRTT Link-16 capability must not adversely impact the flight certification of the CC150, nor introduce any new safety of flight hazards.
B.3.3.7	**M**	**I**	The MRTT Link-16 capability components must conform to allocated size, weight, and power budgets. Budgets will be defined during TIC3 Air Project Definition phase.
B.3.3.8	**M**	**I**	The MRTT Link-16 capability must be capable of deleting all data upon power down.
B.3.3.9	**M**	**I**	The MRTT Link-16 capability must be capable of rendering itself unclassified through the removal of cryptographic keying material and any retained classified information.
B.3.3.10	**M**	**I**	The MRTT Link-16 capability must be operable in all CC150 operating environments.
B.3.3.11	**M**	**I**	When powered off, the MRTT Link-16 capability must be capable of surviving all CC150 operational and non-operational (storage) environments.
B.3.3.12	**M**	**I**	The MRTT Link-16 capability must be operable in the CC150 cockpit in ambient light conditions ranging from bright sunlight to dark overcast and night conditions.
B.3.3.13	**M**	**I**	Any changes in aircrew workload due to the MRTT Link-16 capability must not adversely impact flight safety. *Note: In order to achieve the above requirement, it is expected that the MRTT Link-16 capability should require minimal crew interaction, with little to no interaction required by the pilot and co-pilot.*
B.3.3.14	**M**	**I**	The MRTT Link-16 capability must have the ability to filter displayed Link-16 track data, in accordance with aircrew requirements.
B.3.3.15	**M**	**I**	The MRTT Link-16 capability must be compliant with one or both of MIL-STD-6016E and STANAG 5516(E4). Where a system is only compliant with one of these standards a list of differences must be provided.
B.3.3.16	**HD**	**I**	The MRTT Link-16 capability should be capable of transmitting information using the JREAP C protocol in compliance with one or both of MIL-STD-3011 and STANAG 5518. Where a system is

Table B.3 CC150 Polaris –MRTT Link-16			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
			only compliant with one of these standards a list of differences must be provided.
B.3.3.17	**M**	**I**	The MRTT Link-16 system must provide the capability for the Flight Refuelling Specialist to manually enter existing CC150 fuel levels.
B.3.3.18	**M**	**I**	The MRTT Link-16 system must be capable of transmitting Flight Refuelling Specialist entered fuel levels to Link-16 network participants.
B.3.3.19	**M**	**I**	MRTT equipment must be certified for installation and use on the CC150 tanker.
B.3.3.20	**M**	**I**	The MRTT Link-16 capability must provide sufficient built-in diagnostic capabilities to support the achievement of the maintainability and MTTR requirements identified in the TIC3 Air Request For Information Draft Requirements.
B.3.3.21	**M**	**I**	The MRTT Link-16 capability must have MTBF levels consistent with the reliability requirements to support continuous, high tempo operations.
B.3.3.22	**HD**	**I**	The MRTT Link-16 capability should be capable of transmitting information using the JREAP A protocol in compliance with one or both of MIL-STD-3011 and STANAG 5518. Where a system is only compliant with one of these standards a list of differences must be provided.
B.3.3.23	**M**	**I**	The MRTT Link-16 capability must be certified to operate on a CC150, in accordance with DND and applicable civil regulations.
B.3.3.24	**M**	**I**	The MRTT Link-16 Capability must comply with standing Industry Canada spectrum regulations and Link-16 operational restrictions set out by DND Frequency Spectrum Management (FSM). Note. *Some or all of these restrictions may be relaxed to support specific operational or exercise requirements, on a case-by-case basis.*
B.3.3.25	**D**	**I**	The MRTT Link-16 capability should support an interface to an Integrated Broadcast System (IBS) via UHF SATCOM and Enhanced National Tactical Receiver (ENTR).
B.3.3.26	**M**	**I**	The suitability report must detail any work or modification required for the MRTT Link-16 system to be operated onboard other RCAF aircraft including, as a minimum, the CC130, CC177, CP140

Table B.3 CC150 Polaris –MRTT Link-16			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
			and CH147.
B.3.3.27	**M**	**I**	The MRTT Link-16 system must not degrade the performance of other existing CC150 aircraft systems.
B.3.3.28	**M**	**I**	The MRTT Link-16 system must be capable of being installed and set to work onboard a CC150 aircraft within 2 hours by a single trained technician.
B.3.3.29	**M**	**I**	The MRTT Link-16 system must be capable of being uninstalled from a CC150 aircraft within 2 hours by a single trained technician.
B.3.3.30	**M**	**I**	The MRTT Link-16 system must require a maximum of three persons to load or unload from a CC150 aircraft.

Table B.4 Fixed Streaming Video Site

Table B.4 Fixed Streaming Video Site			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.4.1 Background			
B.4.1.1	**Info**		Fixed Streaming Video (SV) GESs will transmit SV from appropriately equipped military platforms to designated RCAF Intelligence and C2 Centres. The TIC3 Air project will also deliver the capability to distribute, store and view the SV in real and non-real time.
B.4.2 Location			
B.4.2.1	**Info**		The following locations require Fixed SV GES Coverage, however this coverage may be provided by a GES in the vicinity of, but not necessarily located within the following locations:
B.4.2.2	**M**	**I**	19 Wing Comox
B.4.2.3	**M**	**I**	4 Wing Cold Lake
B.4.2.4	**M**	**I**	3 Wing Bagotville
B.4.2.5	**M**	**D**	14 Wing Greenwood
B.4.2.6	**HD**	**I**	GES at 427 sqn Petawawa
B.4.3 Requirements			
B.4.3.1	**M**	**D/I**	Fixed SV GESs must be capable of receiving SV from at least one airborne asset at a time per GES.
B.4.3.2	**M**	**I**	Fixed SV GESs must be capable of simultaneously distributing a minimum of 2 SV feeds to DND C2 networks. *Note: With respect to Paragraph B.4.3.1, some aircraft may simultaneously transmit multiple video streams.*
B.4.3.3	**M**	**I**	Fixed SV GESs must record maintain and make available in non-real-time copies of received SV feeds from airborne assets in the format and with the quality in which they are received.

Table B.4 Fixed Streaming Video Site			
Rqmt #	**Priority**	**Stage**	**Capability Statement**
B.4.3.4	**M**	**I**	Video streams received by Fixed SV GESs must be made available to C2 network users with minimal latency, allowing users to select between the received video quality levels or a lower bandwidth decimated quality level.
B.4.3.5	**M**	**D**	Fixed SV GESs must not interfere with other Wing ATC and Navigational Aid equipment.
B.4.3.6	**M**	**D**	Fixed SV GESs will have the ability to receive SV feeds from capable RCAF airborne platforms and distribute these feeds in a format compatible with DND video distribution systems (STANAG 4609).
B.4.3.7	**D**	**I**	Fixed SV GESs should have the ability to receive SV feeds from expected future airborne platforms that make use of the L and S transmission bands and distribute these feeds in a format compatible with DND video distribution systems (STANAG 4609).
B.4.3.8	**HD**	**I**	Fixed SV GESs should be capable of being remotely operated by CADS.
B.4.3.9	**M**	**D**	Fixed SV GESs must comply with all relevant DND security policies.
B.4.3.10	**M**	**D**	Fixed SV GESs must have system availability sufficient to support operational training levels.
B.4.3.11	**M**	**D/I**	RCAF Maintenance personnel must receive training as required to enable the operational availability of Fixed SV GESs as defined in requirement B.4.3.10.
B.4.3.12	**M**	**D/I**	RCAF Operators must receive training as required to enable operational use of Fixed SV GESs.
B.4.3.13	**M**	**D/I**	All Fixed SV GES documentation must be made available in both official languages (English and French).
B.4.3.14	**M**	**I**	The SV distribution capability must support the simultaneous distribution of a minimum of two video streams to C2 and/or analysis centres, including, but not limited to, the CAOC, CADS, CJOC, NDHQ, and any processing, exploitation, and dissemination (PED) centres.

Annex A - Ground-Air-Ground Radio System Requirements

1 Concept of Operations (CONOPS)

The Ground-Air-Ground (G/A/G) Radio portion of the TIC3 Air Project will replace the existing Air Traffic Management (ATM) and Canadian Air Defence Radio System (CADRS) G/A/G radios with a network of modern, reliable ATM and Air Defence (AD) G/A/G radios. The Project will also add secure voice capability to the AD portion of the Radio System and anti-jam capabilities to select sites. The complete list of radio sites, including the capabilities the project will deliver to each, is listed in Tables A and B.

1.1 ATM Radios

ATM radios are located across Canada at fixed sites including Air Force Wings, Canadian Coastal Radar sites, Forward Operating Locations, CFS Alert, Fort Eureka, and NAVCAN sites. Some sites are controlled by the Canadian Armed Forces (CAF), while other sites are controlled by civilian authorities. The air traffic consists of a varying mix of both military and civilian aircraft.

1.2 AD Radios

AD radios are located at remote, un-manned CADRS sites, most of which happen to be Department of National Defence (DND) or NAVCAN sites. All AD radios are remotely operated by the Canadian Air Defence Sector (CADS) Headquarters located in North Bay, Ontario (ON).

2 Concept of Support (CONSUP)

2.1 System Design and Installation

DND provides a high quality telecommunications installation and engineering support service via the Aerospace and Telecommunications Engineering Support Squadron (ATESS) located at Trenton ON. The TIC3 Air Project will procure all required equipment, including all required hardware, software, and publications, including all required technical documentation and training material. DND will either utilize DND resources for final system design and installations, acquire a turn-key solution from industry, or use a combination of the two options.

2.2 Maintenance

The current CONSUP consists of 1st and 2nd level maintenance provided by military technicians, and 3rd level maintenance provided by ATESS. NAVCAN sites provide their own maintenance via authorized NAVCAN technicians.

The CONSUP has not been finalized for the new Radio System, but it is expected to be similar to the current CONSUP as these core military support capabilities are still required by DND. However, 1st and 2nd level maintenance by local technicians will be limited to testing and swapping Line Replaceable Units (LRUs). Non-serviceable units will then be sent to ATESS for further testing, and then sent to the OEM for 3rd level maintenance.

2.3 Training

DND has a robust training capability, and will continue to train technicians and operators at Canadian Forces training establishments. For the new Radio System, DND will require train-the-trainer level courses for initial cadre training, training packages (bilingual), and technical data packages.

3 Overview of GAG Radio System Requirements

3.1 GAG Radio System (ATM and AD)

3.1.1 Radio Capabilities

Required radio capabilities are detailed in the enclosed spreadsheet "Requested Costing Breakdown" which details the performance and component requirements. Capabilities include VHF, UHF, and VHF/UHF multiband, as well as transmitters, receivers, and transceivers. Some radios must also be "securable" in that they can be used in combination with external crypto devices, but no embedded crypto will be included in the project and crypto devices will be acquired separately. The AD radios must be securable. Select AD radios shall be capable of anti-jam operation using HAVEQUICK II in accordance with STANAG 4246S, and possibly SATURN Edition 3 in accordance with STANAG 4372 (rated requirement). The nominal range requirement is 200 NM.

3.1.2 Networking

All radios must be Internet Protocol (IP) capable, and delivered as a coherent radio system including a Radio Control & Monitoring System (RCMS) for remote access, monitoring, and management. Radios must also be Commercial-off-the-shelf (COTS), software defined, and support both digital and analog interfaces. The RCMS must be capable of operating over Public Switched Telephone Network (PSTN) (the current connectivity available) and IP (future connectivity upgrade). The radio system must be Radio-Over-IP (ROIP) ready to allow for future system upgrades.

3.1.3 Component Technical Requirements

Requirements for specific components are detailed in the enclosed spreadsheet.

3.1.4 Configuration

The current Radio System configuration is expected to remain for the most part unchanged. However, the opportunity for simplification and optimization at each site will be considered by the Project Team. The level of operational availability must be maintained, but the number of sub-sites and equipment at each sub-site can be rationalized. A high level description of a notional radio site, including all possible radio capabilities, is provided at Figure 1. The geographic locations of the radio sites in Table 1 will remain unchanged. A summary of the radio capabilities required at each site is also listed in that table.

3.2 AD Radio System

The AD Radio System will be operated in accordance with paragraph 1.2 and maintained in accordance with paragraph 2.2.

3.2.1 AD System Technical Requirements

In order to satisfy all operational requirements, the following technical requirements apply to the AD Radio system.
Secure voice operation

a. (Mandatory). The AD radio network must provide the capability to transmit and receive secure Level II Classified UHF radio communications from any CADRS site (listed in Table 2);

b. (Mandatory). When secure voice is used, the crypto device will be located at the Central Site, located at CADS. No encryption devices will be located at the radio sites; and

c. (Information). The Level II encryption devices will be provided as Government Furnished Equipment (GFE).

3.2.1.1 Anti-jam operation

a. (Mandatory). The AD radio network must provide the capability to transmit and receive in HAVE QUICK II anti-jam mode as per STANAG 4246, from selected sites as detailed in Table 1;

b. (Mandatory). The AD radio network must support operation in any of the following modes:
   i. Clear voice without anti-jam;
   ii. Clear voice with anti-jam (selected sites only);
   iii. Secure voice without anti-jam; and
   iv. Secure voice with anti-jam (selected sites only).

c. (Desirable). The AD radio network should provide the capability to transmit and receive in SATURN anti-jam mode as per STANAG 4372 (Edition 3 or later), from the selected anti-jam CADRS sites;

d. (Information). The AD radio network will support use of HAVE QUICK II and possibly SATURN capabilities in Training Mode, as described in the above STANAG Standards. The distribution of the Training Word of the Day (WOD) from the command centre to the remote sites will be over an unclassified channel. Distribution and protection of Combat WOD at AD sites is out of scope for this project however radio equipment must be capable of Combat WOD operation should arrangements be made for it to be loaded.

3.2.1.2 User interface

a. (Mandatory). The RCMS shall be a general purpose management system that provides an interface capability to:

   i. The radios acquired under the TIC3 Air project; and

   ii. The remote site facility monitoring (Desirable).

b. (Mandatory) The RCMS shall provide the following functionality:

   i. Remote device loading/distribution (WOD, Net IDs, frequency assignments, establishment of nets, etc.) as applicable;

   ii. Remote control and monitoring of radio parameters (e.g. frequency selection); and

   iii. Remote monitoring of complete radio communication network (e.g. network performance).

c. (Mandatory) The RCMS shall be accessible to maintenance staff, as per section 2.2;

d. (Mandatory) The remote management capability will be manufacturer agnostic and support Simple Network Management Protocol (SNMP). The capability will be provided for newly acquired radios only.

e. (Information) SNMP capabilities are envisioned to allow potential usage of the remote management system with radios that are currently in the DND inventory and radios that may be acquired as part of future procurements.

f. (Information). The RCMS traffic will be passed on an unclassified channel between CADS and the remote sites.

3.2.1.3 Connectivity between central site and remote sites

a. (Desirable). The AD radio network should support connectivity between CADS and the remote sites, and be implemented as a two pair PSTN connection (while also configurable to an IP network);

b. (Mandatory). The Air Defence radios must be capable of functioning in all modes identified in para 3.2.1.2, regardless of network connectivity (PSTN or IP). This will ensure compatibility for any future upgrades to the system connectivity (e.g. future adoption of VoIP);

c. (Mandatory). The AD radio system shall support IPv6 operations;

d. (Information). When secure voice is used, the ground portion crypto device will be located at CADS; and

e. (Information). It is acceptable to use a single port connection on the radio for both voice and RCMS traffic.

3.2.1.4 Timing

a. (Mandatory). Remote sites shall be capable of maintaining a local time reference suitable to enable anti-jam operation (HAVE QUICK II and possibly SATURN); and

b. (Information). CADS will be equipped with a SAASM GPS receiver and a stand-alone atomic clock time reference, serving as a Network Timing Protocol (NTP) server on the AD radio network.

3.2.2 AD Preliminary Design

A preliminary design has been created by the Project Team in order to satisfy the technical requirements (see Figure 2).

4 Assumptions

4.1 Infrastructure

The TIC3 Air Project will ensure that building and telecommunications infrastructure will support the future radio system. This includes the antennae masts, cable support structures, building heating, ventilation and air conditioning (HVAC), grounding, and power. Respondent may offer their own infrastructure recommendations for minimum standards and site refurbishment.

4.2 Security

Some radio sites currently utilize external crypto devices, and have rack space and secure cabinet considerations. These requirements are detailed in the enclosed spreadsheet. Embedded crypto is not included in this project.
Select AD sites will be equipped with anti-jam radios as per paragraph 3.2.1.2, therefore respondent recommendations to meet the physical security requirements for International Traffic in Arms Regulations (ITAR) Controlled Items at unmanned, remote locations is requested (e.g. secure cabinets/racks, infrastructure security features).

4.3 Equipment

Respondents must provide all equipment necessary "from Antennae to Radio". This must include the antennae, RF link, radio, cabinets, interfaces, accessories, software, and ancillary equipment. These equipment requirements are detailed in the enclosed spreadsheet. Specific quantities and equipment selection is at the discretion of the respondent solution.

4.4 Configuration

The geographic location of the GAG radio sites must remain unchanged (as per Table 1), but respondents may propose recommendations on each site configuration to reduce initial and life cycle costs. The configuration must maintain the current level of operational availability (e.g. rationalizing multiple single-channel radios into a single multi-channel radio is acceptable only if the resulting system availability is no less than the current system.

4.4.1 AD Radio System Configuration

The Project Team has developed a preliminary AD Radio System design to satisfy all technical requirements, however respondents are requested to provide recommendations on whether this is a feasible and optimal system design and alternative designs if deemed necessary to meet the requirements laid out in this document, in particular para 3.2.1.
Two phone lines (PSTN) are available at each remote site, and currently used to transmit data (basic radio control / frequency selection) and voice to and from the remote site and CADS.

4.5 Services

In order to determine the best course of action for implementation, respondents are requested to provide both an itemized equipment cost estimate for the notional GAG radio system, and a separate cost estimate for related engineering, installation (including site acceptance tests) and support for the entire GAG Radio system.

5 Questions to Respondents

5.1 Essential Information

Respondents are requested to provide the following information:

1. **Please provide a general description of your proposed system solution.**

   Respondents are requested to provide a general description of their proposed solution, and any applicable diagrams. Suggested deviations from the CONOPS, CONSUP, Requirements, or Assumptions should be listed, as well as the reason for deviation (e.g. feasibility, optimization).

2. **Please provide specifications for the products included in your proposed system solution.**

   Specification sheets are requested for any products included in the respondent solution. Please include the life expectancy of the equipment, any standards which the radios have been certified to, and a high-level overview of the Preventative Maintenance (PM) required. The PM list should list the activities required, provide a short description, the required frequency and man-hours, and whether the activity can be performed remotely through the RCMS.

3. **Please complete the costing information in the Cost Breakdown spreadsheet.**

   Respondents are requested to provide an itemized cost breakdown of the equipment required for the "Notional Radio Site" and the national level Radio System equipment, as well as a cost breakdown of services for the GAG Radio System and for selected sites. The enclosed spreadsheet lists all equipment and services that should be included in the breakdown.

4. **Are "cavity filters" necessary?**

   Note that "cavity filters" are included in the equipment breakdown. These will be purchased as required. Please indicate the cost per cavity filter and the circumstances under which it is required by the proposed respondent equipment.

5. **Are special cabinets or racks required for anti-jam radios? Is any other access control required (e.g. door locks, electronic access control)?**

   The respondent should specify the type of cabinets required by the proposed anti-jam radios. These radios shall not include COMSEC components, but they are expected to be classified as "Controlled Items" according to ITAR. Any physical security requirements driven by the specific radios chosen (such as ITAR) must be indicated. The respondents shall also comment on any potential infrastructure considerations necessary to meet these security requirements (e.g. door locks electronic access control).

6. **Does the respondent's solution present additional technical requirements or conflict with project stated requirements?**

   Any additional requirements introduced by the respondents' solution should be described (particularly if they are contrary to the project stated requirements). This may include requirements for configuration, infrastructure, connectivity, security, equipment quantity or type. Please include dependencies, assumptions, and expectations.

7. **Is the AD System design in Figure 2 feasible?**

   Respondents are requested to comment on the feasibility of the Preliminary AD Radio System design in Figure 2. The system must satisfy all technical requirements from para 3.2.1 and the following two technical issues must be addressed:

   a. **Can timing be maintained between the centrally located crypto devices in CADS and the remote anti-jam radios, such that the radio system can be operated in secure mode with and without anti-jam enabled?**

   b. **Will existing PSTN connectivity be appropriate and offer sufficient bandwidth for the respondents provided RCMS, including the ability to remotely operate anti-jam radios and load hop sets (WOD, Net IDs, frequency assignments, establishment of nets, etc)? If not what would be the impact of using existing connectivity and what would the minimum acceptable connectivity solution to meet all requirements be?**

   Respondents should describe whether this design is feasible, and whether their products used in this design can satisfy all technical requirements from para 3.2.1 and the two technical issues stated above.

8. **If there is a feasibility issue, can the respondents introduce a product(s) to solve the problem?**

   In the event that the preliminary design does present a feasibility issue, respondents are requested to propose and cost a solution with required engineering services, new configurations and/or hardware products.

9. **Is there an impact to the AD System feasibility if SATURN radios are used in place of HAVEQUICK II radios?**

   The current AD Radio System design includes HAVEQUICK II radios, but the option will be presented to provide SATURN radios (rated requirement). The respondents should indicate whether this affects their responses to questions 8-10, particularly the feasibility issues of timing and connectivity.

10. Which features are included in your SATURN radios?

Respondents are requested to list which SATURN features are included with their SATURN radios, as STANAG 4372 has a number of optional features. Respondents are also requested to describe their timing synchronization features for anti-jam radios. The following is of particular interest:

a. **Is over-the-air distribution of TOD (a.k.a. a "mickey" feature) available? How does it operate (operationally and technically) and does it introduce any system requirements?**

b. **Is a "late-entry" feature available? How does it operate (operationally and technically) and does it introduce any system requirements?**

c. **Do these features require the continuous reception of GPS time?**

d. **Do these features require any additional hardware or software (e.g. antennae)?**

5.2 Optional Information

Respondents are invited to provide the following information on an optional basis:

11. Are there additional ways to improve the GAG Radio System?

Respondents may offer recommendations to optimize the GAG Radio portion of the TIC3 Air Project, particularly in the interest of operational availability and cost (both initial and life cycle). This may include comments on the CONOPS, CONSUP, Requirements, or Assumptions.

Recommendations to optimize the "Notional GAG Site Design" may be presented. These recommendations may include configuration for the entire GAG radio system, for the "Notional Radio Site", or for sub-sites (e.g. Transmitter Sites). Recommendations regarding infrastructure, security, connectivity, interfaces, remote management, equipment quantity or type are also welcome.

12. Can the number of radios at the "Notional GAG Site" be rationalized to a smaller number?

Rationalization of the "Notional GAG Site" in order to reduce the number of radios may be presented, as well as how this new design would maintain or improve the level of operational availability (e.g. avoiding single points of failure). Please provide separate costings for the number of radios listed in the spreadsheet, and any proposed rationalized quantity.

13. What are the recommended preventive maintenance tasks? What is the recommended level of sparing?

What are the recommended training courses for both operational and maintenance staff and what is the training cost (train the trainer course)?

The answer will provide the cost to provide a train the trainer course for a notional group of eight people. For cost planning and comparison, the answer should include both the options to have the training in Trenton, ON or at the provider location. The training package will include the course itself with all relevant training information and related documentation to enable the RCAF to run training in house afterward.

Annex A – Radio System References

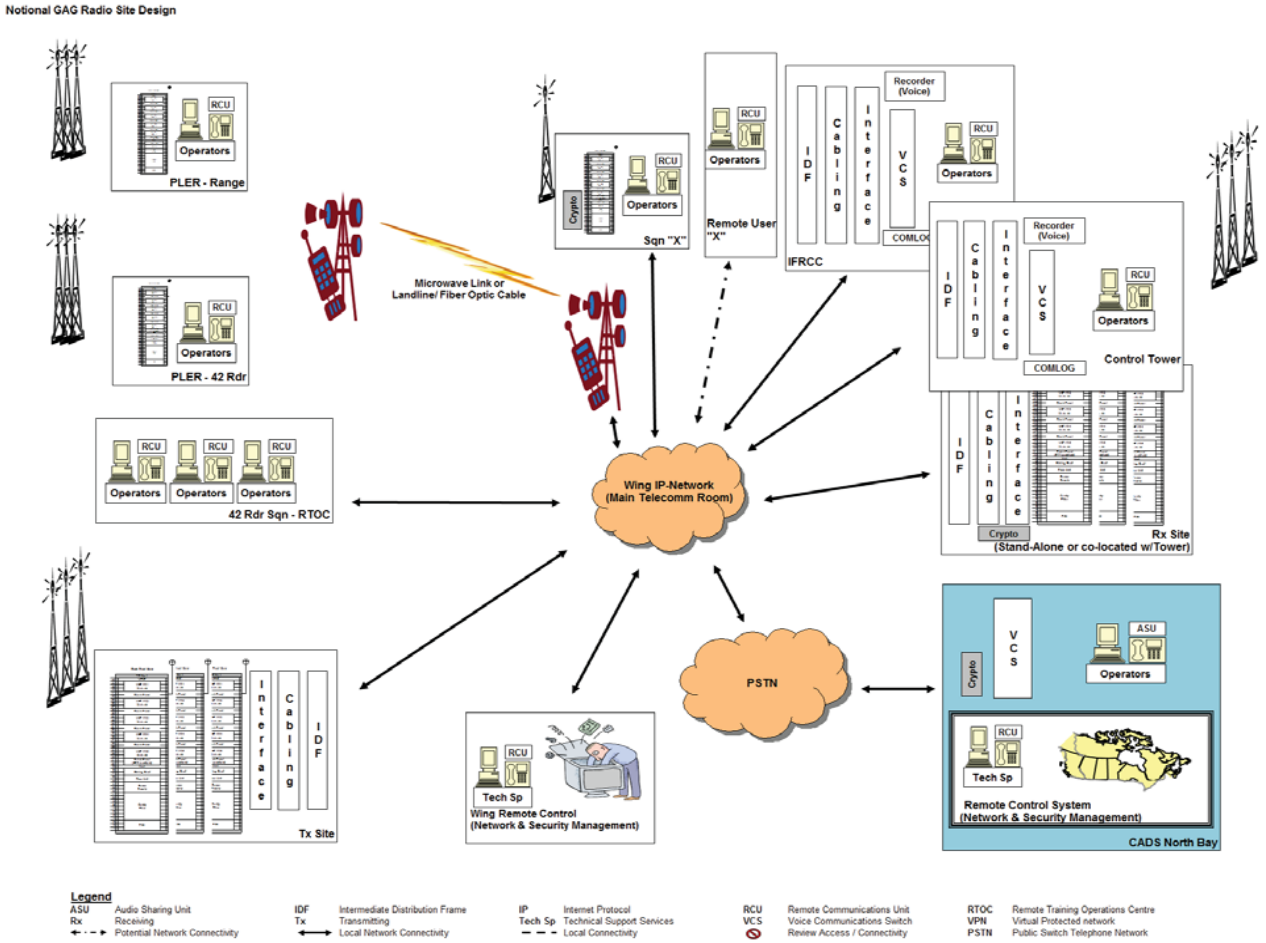


Figure 1 - Notional GAG Radio Site Design

	Radio Capability	VHF Tx	VHF Rx	VHF Multi-Channel Txcvr	UHF Unclass Tx	UHF Unclass Rx	UHF Securable Txcvr	UHF Multi-Channel Txcvr	Anti-jam Radios	Multi-band Txcvr (VHF/UHF)	Total Radios by Site
	4 Wing - Cold Lake (Notional Site)	13	12	5	42	43	12	6	0	32	**165**
	3 Wing - Bagotville	13	11	2	31	32	12	0	0	4	**105**
	5 Wing - Goosebay	15	14	4	19	19	6	3	0	0	**80**
	8 Wing - Trenton	11	10	1	14	14	18	3	0	3	**74**
	9 Wing - Gander	3	3	0	10	10	1	0	0	0	**27**
	12 Wing - Shearwater	8	7	2	15	14	6	3	0	0	**55**
	14 Wing - Greenwood	10	7	4	14	14	6	1	0	0	**56**
	17 Wing - Winnipeg	2	2	0	4	5	6	0	0	0	**19**
	19 Wing - Comox	10	9	1	21	19	6	5	0	4	**75**
Canadian Costal Radar Sites	CCR Barrington	2	2	0	9	9	1	0	0	0	**23**
	CCR Sydney	2	2	0	6	6	1	0	0	0	**17**
	CCR Holberg	2	2	0	7	7	1	0	0	0	**19**
	22 Wing - North Bay	0	0	0	0	0	6	0	0	0	**6**
1 Wing Kingston - Tactical Helicopter Squadrons	400 Sqn - Borden	3	3	0	2	3	0	0	0	0	**11**
	403 Sqn - Gagetown	4	4	0	5	5	0	0	0	1	**19**
	408 Sqn - Edmonton	5	5	1	7	7	0	0	0	0	**25**
	427/450 Sqns - Petawawa	7	7	0	8	8	0	0	0	2	**32**
	430 Sqn - Valcartier	3	3	0	3	3	0	0	0	2	**14**
	438 Sqn - St. Hubert	1	1	0	1	1	0	0	0	1	**5**
Forward Operating Locations	FOL Inuvik	0	0	0	0	0	1	2	0	1	**4**
	FOL Rankin Inlet	0	0	0	0	0	1	1	0	1	**3**
	FOL Yellowknife	0	0	0	0	0	1	0	0	0	**1**
	FOL Iqaluit	0	0	0	0	0	1	0	0	0	**1**
	CFS Alert	0	0	2	0	0	1	0	0	0	**3**
	Eureka	0	0	1	0	0	1	0	0	0	**2**
	CADRS Sites (52 sites listed below)*	0	0	0	0	0	0	0	36	32	**68**
	Total Radio Capabilities	**114**	**104**	**23**	**218**	**219**	**88**	**24**	**68**	**51**	**909**

Table 1 - Radio System Capability Summary

TABLE 2 - Complete List of CADRS Sites

CADRS Sites* (There are 52 sites and a total of 68 Radio sets. HAVEQUICK (HQ) radio requirements they are categorized as follow, E=Essential, HD= Highly Desirable, D=Desirable and NR Not Required)

CADRS Site	Location Name	HQ Requirements	Latitude	Longitude
East 01	St. Anthony (L'Anse aux Meadows), NL	NR	51.34.340 N	55.29.464 W
East 02	St. John's (Robin Hood Bay), NL	NR	47.26.718 N	52.40.185 W
East 03	Fortune Head (Mount Pleasant), NL	NR	47.04.048 N	55.50.842 W
East 04	Port Aux Basques, NL	NR	47.34.316 N	59.07.946 W
East 05	Shearwater, NS	D	44.38.23 N	63.29.58 W
East 06	Saint John (Red Head), NB	NR	45.14.01 N	65.59.05 W
East 07	Newport, QC	NR	48.13.404 N	64.47.503 W
East 08	Havre St. Pierre, QC	NR	50.16.033 N	63.40.759 W
East 09	Mont-Joli (Ste Flavie), QC	NR	48.36.413 N	68.13.550 W
East 10	Trois Rivieres (Ste Marthe du Cap), QC	NR	46.23.821 N	72.27.205 W
East 11	CFB Kingston, ON	NR	44.14.60 N	76.26.48 W
East 12	North Bay, ON	NR	46.21.510 N	79.25.107 W
East 13	Ottawa, ON	D	45.19.45 N	75.40.27 W
East 14	Toronto, ON	D	43.45.138 N	79.28.189 W
East 15	Montreal, QC	D	45.31.065 N	73.25.508 W
East 16	Moncton, NB	NR	46.13.54 N	64.47.38 W
East 17	Quebec City (Valcartier), QC	D	46.54.142 N	71.30.090 W
East 19A	Greenwood, BC	E	44.59.04 N	64.55.01 W
East 19B	Greenwood, BC	E	44.59.04 N	64.55.01 W
East 20A	Trenton, ON	HD	44.07.08 N	77.31.41 W
East 20B	Trenton, ON	HD	44.07.08 N	77.31.41 W
East 21A	Bagotville, QC	E	48.19.50 N	70.59.47 W
East 21B	Bagotville, QC	E	48.19.50 N	70.59.47 W
East 21C	Bagotville, QC	E	48.19.50 N	70.59.47 W
East 21D	Bagotville, QC	E	48.19.50 N	70.59.47 W
East 21E	Bagotville, QC	E	48.19.50 N	70.59.47 W
East 21F	Bagotville, QC	E	48.19.50 N	70.59.47 W
East 23	Charlottetown, PE	NR	46.13.54 N	63.08.38 W
East 24	Meaford, ON	NR	44.39.509 N	80.40.109 W
East 25	London, ON	NR	43.00.93 N	81.13.840 W
West 01	CFB Suffield, AB	NR	50.01.28 N	111.10.05 W
West 02	Hinton (Mount Athabasca), AB	NR	53.24.542 N	117.47.295 W
West 03	Cranbrook, BC	NR	49.36.833 N	114.47.182 W
West 04	Penticton (Campbell Mountain), BC	NR	49.30.337 N	119.32.762 W
West 05	Quesnel, BC	NR	52.57.589 N	122.29.144 W
West 06	CFB Aldergrove, BC	NR	49.04.303 N	122.28.436 W

CADRS Site	Location Name	HQ Requirements	Latitude	Longitude
East 01	St. Anthony (L'Anse aux Meadows), NL	NR	51.34.340 N	55.29.464 W
East 02	St. John's (Robin Hood Bay), NL	NR	47.26.718 N	52.40.185 W
East 03	Fortune Head (Mount Pleasant), NL	NR	47.04.048 N	55.50.842 W
West 07	Esquimalt (Victoria), BC	D	48.25.770 N	123.25.739 W
West 08	Ucluelet, BC	NR	48.5.331 N	125.32.458 W
West 09	Sandspit, BC	NR	53.08.621 N	131.58.020 W
West 10	Winnipeg, MB	HD	49.53.977 N	97.14.823 W
West 11	Calgary, AB	D	51.00.937 N	114.07.283 W
West 12A	Edmonton, AB	D	53.40.26 N	113.27.37 W
West 12B	Edmonton, AB	D	53.40.26 N	113.27.37 W
West 13	Vancouver, BC	D	49.15.947 N	123.11.633 W
West 14A	Comox, BC	E	49.42.39 N	124.53.12 W
West 14B	Comox, BC	E	49.42.39 N	124.53.12 W
West 15A	Cold Lake, AB	E	54.24.18 N	110.16.46 W
West 15B	Cold Lake, AB	E	54.24.18 N	110.16.46 W
West 15C	Cold Lake, AB	E	54.46.00 N	109.45.00 W
West 15D	Cold Lake, AB	E	54.46.00 N	109.45.00 W
West 15E	Cold Lake, AB	E	54.46.00 N	109.45.00 W
West 15F	Cold Lake, AB	E	54.46.00 N	109.45.00 W
West 16	Moose Jaw, SK	NR	50.20.319 N	105.33.492 W
North 01	Norman Wells, NT	NR	65.15.014 N	126.40.422 W
North 02	Fort Simpson, NT	NR	61.47.115 N	121.15.628 W
North 03	Yellowknife, NT	HD	62.27.087 N	114.27.115 W
North 04	High Level, AB	NR	58.37.17 N	117.09.33 W
North 05	Wollaston Lake (Collins Bay), SK	NR	58.09.875 N	103.45.002 W
North 06	Rankin Inlet, NT	NR	62.48.325 N	92.06.522 W
North 07	Iqaluit, NT	E	63.43.362 N	68.32.172 W
North 08	Kuujjuaq, QC	NR	58.05.958 N	62.25.084 W
North 09	Schefferville, QC	NR	54.49.277 N	66.47.660 W
North 10	Wabush, NL	NR	52.55.597 N	66.52.394 W
North 11A	Goose Bay, NL	E	53.17.743 N	60.32.416 W
North 11B	Goose Bay, NL	E	53.17.743 N	60.32.416 W
North 11C	Goose Bay, NL	E	53.17.743 N	60.32.416 W
North 11D	Goose Bay, NL	E	53.17.743 N	60.32.416 W
North 11E	Goose Bay, NL	E	53.17.743 N	60.32.416 W

Table 2 - Complete List of CADRS Sites

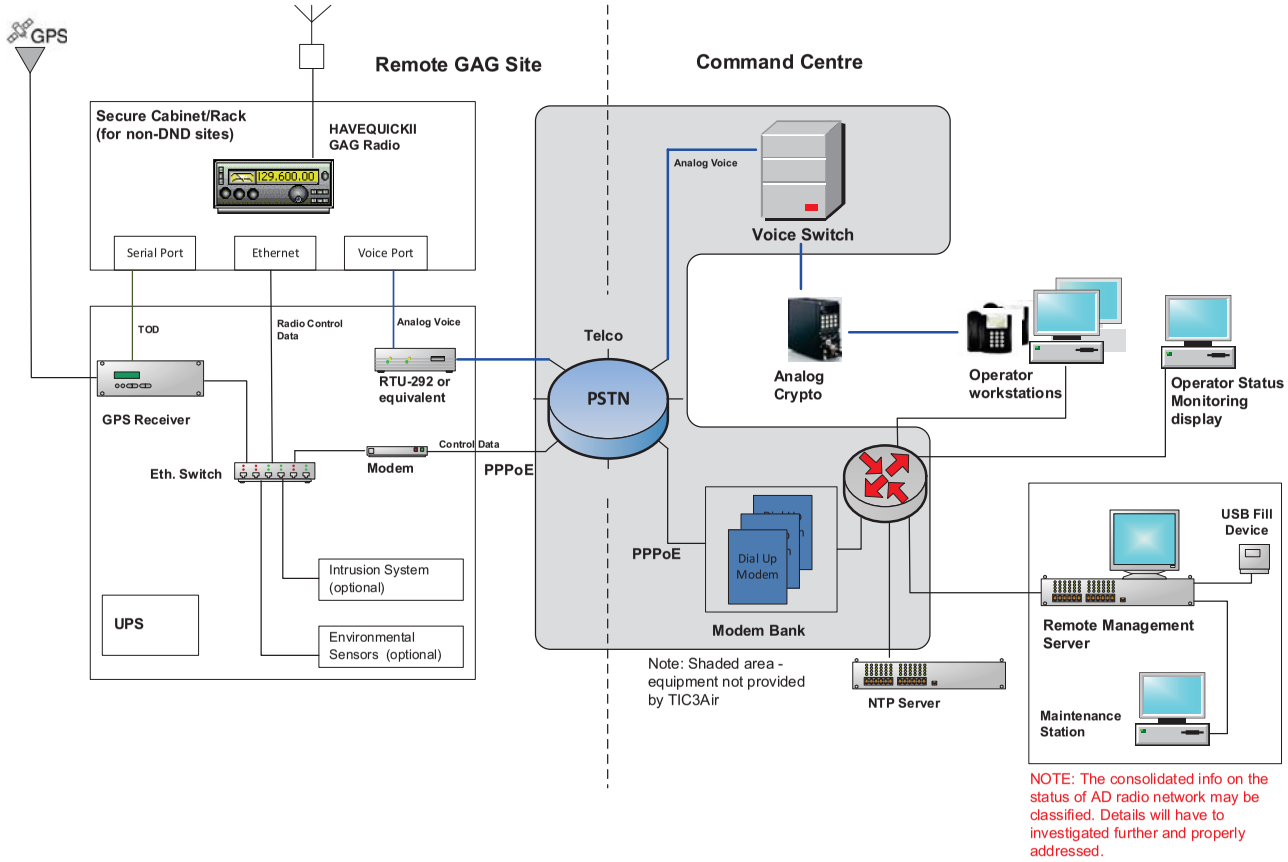


Figure 2 - Preliminary AD Radio System Design

Annex B – Tactical Data Link (TDL) System Requirements

1 CONCEPT OF OPERATIONS

1.1 Canadian Fixed Link-16 Infrastructure

The fixed TDL Ground Entry Station (GES) component of TIC3 Air will be comprised of sixteen unmanned Link-16 GESs that will be used to provide ground based beyond line of sight Link-16 coverage over Canada's highly populated areas and several areas of strategic importance. These sites will be remotely operated from the North American Aerospace Defense Command (NORAD) Canadian Air Defense Sector headquarters (CADS) in 22 Wing (Wg) North Bay. This system will provide Link-16 capabilities for NORAD requirements, training and domestic operations.

Fixed GESs will provide coverage of six Wings (3, 4, 8, 14, 19, and 22 Wing) and ten unattended locations (Winnipeg, Montreal, Shearwater/Halifax, Toronto, Edmonton, Yellowknife, Inuvik, Ft St John, St Johns NL, Tofino). The fixed sites will be operated without local personnel. Rather these sites will be operated from a central TDL Hub located at the Canadian Air Defence Sector (CADS) in North Bay Ontario.

The Canadian Fixed Link-16 capability will consist of two major sub-systems: the central control hub located at CADS and the 16 remote sites controlled by CADS. The CADS sub-system will provide the means to add the remote Link-16 picture to the recognized air picture managed by operational personnel using Battle Control System – Fixed (BCS-F), the CADS command and control (C2) tool. Note that the TIC3 Air project does not include changes to BCS-F, which will remain the core C2 tool used at CADS.

The second sub-system will consist of the 16 fixed, remotely operated Link-16 GESs. These will be further divided into two categories based on security requirements: those located in Department of National Defence (DND) controlled facilities and those located in non-DND facilities.

1.1.1 Central Site at CADS

The primary C2 system used at 22 Wing is the BCS-F. The main purpose of the Fixed TDL GES system is to provide Link-16 information to BCS-F.

BCS-F supports the ingestion of Link-16 information through the use of protocols such as MIL-STD-3011 (Joint Range Extension Application Protocol (JREAP)-B and JREAP-C), the STANAG 5602 Standard Interface for Multiple Platform Link Evaluation (SIMPLE), and the legacy RS-232 Serial-J protocol.

TIC3 Air will provide CADS with a TDL Integrator that will monitor and control the Link-16 Terminals located at each of the 16 remote sites. This Integrator will also connect to

BCS-F using JREAP-C and thereby act as a bridge between BCS-F and RCAF platforms that are in range of any of the 16 remote sites.

CADS will also be provided with the equipment required to extend J-voice to the remote sites, to remotely rekey the Link-16 Terminals, to remotely monitor and control the Link-16 Terminals, to remotely manage and monitor the Link-16 network for frequency clearance agreement (FCA) compliance, and to remotely monitor the security and environment of the remote sites. CADS will also be provided with ancillary capabilities including a network time server, the ability to record all Link-16 traffic for post mission analysis and the ability to inject simulated link-16 messages to support training.

A design goal of the project is to minimize the maintenance burden at the remote sites including minimizing the equipment located at each. Equipment will be preferentially installed at CADS where possible. Figure 1 below provides a notional design of the envisioned solution for Central Site at CADS. The proposed solution may differ.

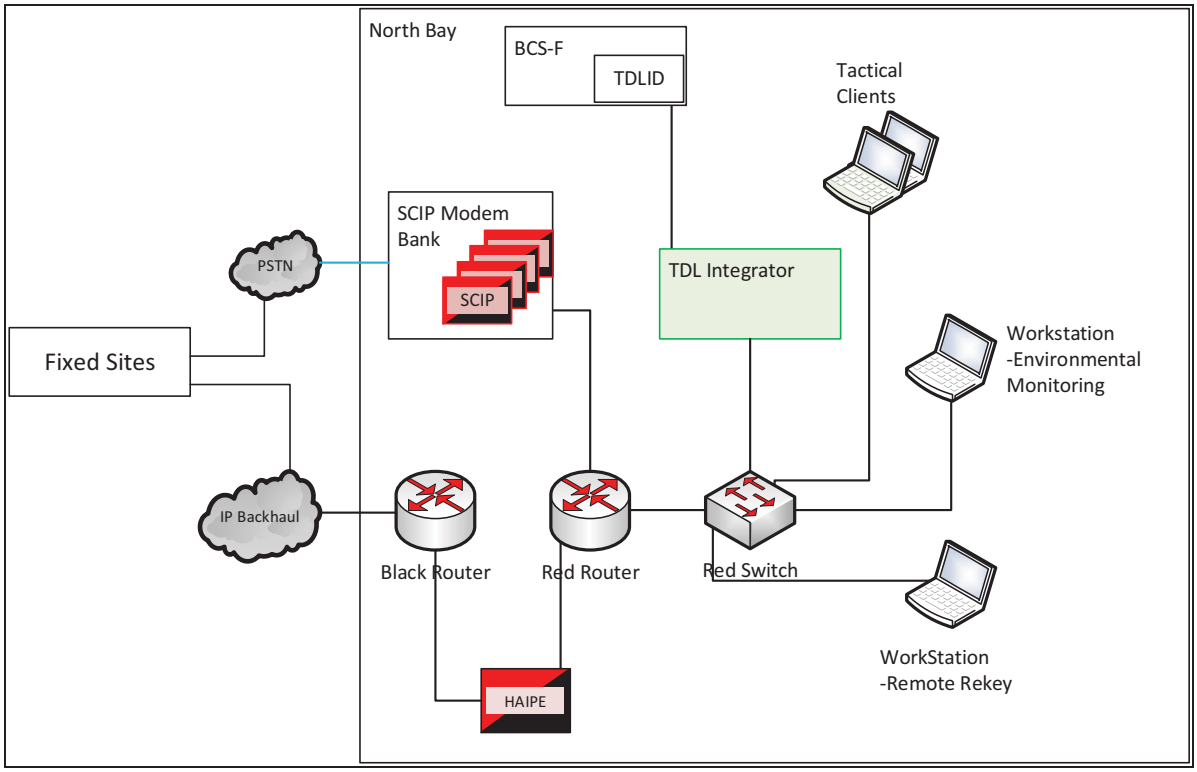


Figure 1 - Notional Design for Central Site at CADS

1.1.2 Fixed Sites

Each fixed Link-16 GES will be equipped with a single Link-16 Terminal, mast and antenna, remote ends for each of the functions (J-voice, remote rekey, remote monitor and control of terminals, remote monitor of the security and environment), a network time server, and whatever site specific equipment is required to house and protect the equipment based on the unique security requirements of each remote site.

A seventeenth site will be created mirroring a typical Link-16 remote site for maintenance training purposes. There is no plan to use that site for operational purposes at this point.

There is no requirement for GESs to locally include a capability to view the air picture or provide Link-16 services to local units (for example when the remote site is located on a Wing). However, there is a requirement for access to J-Voice for maintenance purposes.

Figure 2 below provides a notional design of the envisioned solution at fixed sites. The proposed solution may differ.

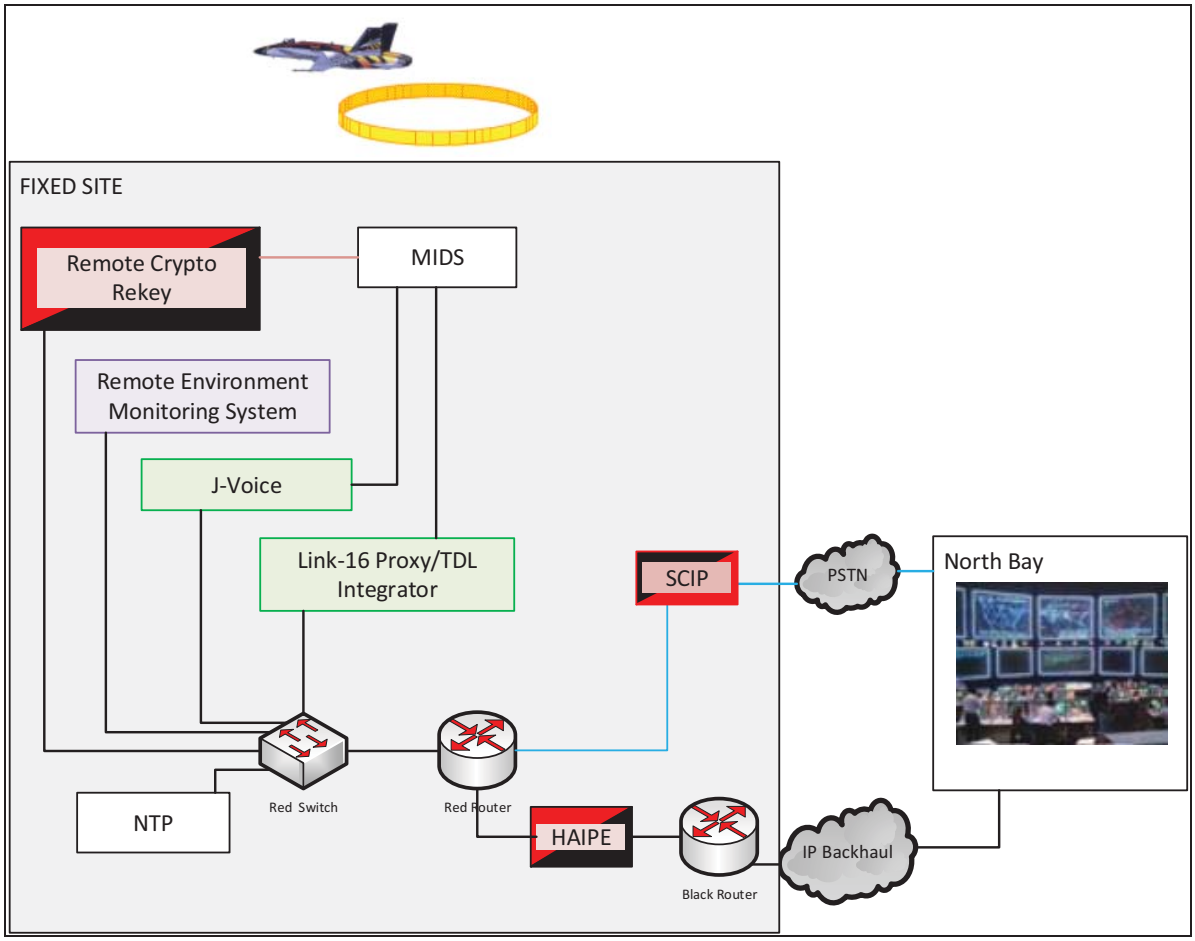


Figure 2 - Notional Design of a Fixed Site

1.1.3 System Operation

Each of the 16 Remote sites will be connected to CADS by two means. The primary bearer will be IP either by terrestrial means or SATCOM. The secondary bearer will be a serial line typically provided by the public switched telephone network (PSTN).

Communication between CADS and the remote sites is categorized as: 1: Link-16 Data Traffic, 2: Link-16 Monitor and Control Traffic, 3: Environmental Monitor and Control, 4: Remote crypto rekey, and 5: J-voice. The secondary link must support category 1: Link-16 Traffic, and a subset of category 3: Environmental Monitor and Control traffic (security messages). However the other categories may only be supportable by the IP bearer.

Link-16 Terminals are Controlled Cryptographic Items (CCI) that require keymat to operate. Link-16 keymat is valid for 24 hours but is usually loaded with two keys (today/tomorrow pair) at a time. Consequently, keymat must be loaded into a Link-16 Terminal every 24-48 hours. Operators at CADS will remotely re-key any terminal that is

scheduled for use using a Black Remote Crypto Rekey system that the proposed solution must include.

The 16 remote GESs will run in a quiescent state until such time as an RCAF platform is operating within the range of the site. This means that the 16 Link-16 Terminals are powered off most of the time and are only powered up when needed. When a remote site is brought on line the operators at CADS will:

1. Remotely Power on the Link-16 Terminal
2. Remotely Load a Link-16 Network Load File into the remote Terminal
3. Remotely Re-key the terminal
4. Bring the Terminal Online
5. Monitor the frequency compliance of the Remote terminal.

1.2 Deployable GES

Deployable GES capabilities will be provided to the following five Royal Canadian Air Force (RCAF) deployable units: 8 Air Communications and Control Squadron (8 ACCS), 12 Radar Squadron (12 Rdr Sqn), 42 Radar Squadron (42 Rdr Sqn), Deployable Mission Support Center (East) (DMSC(E)), and Deployable Mission Support Center (West) (DMSC(W)).

This new capability will increase each unit's situational awareness (SA) by allowing them to generate and display a local air picture. The units will also be able to distribute their local air picture to CADS and other operation centers within the North Atlantic Treaty Organization (NATO) forces when required. These systems will support domestic and overseas missions.

TIC3 Air deployable GESs will integrate Link-11, Link-16 (from a Link-16 terminal and/or JREAP-B and/or JREAP-C sources,) and radar plots and/or tracks from a collocated Tactical Control RADAR into a consolidated air picture. That picture will then be used locally for SA and, should the mission warrant it, will be distributed to other operation centers using MIL-STD-3011 JREAP-B and JREAP-C.

Additionally, TIC3 Air deployable GESs will be capable of simulating Link-16 tracks for training purposes. Deployable GESs will also be capable of J-Voice operation, monitoring and controlling Link-11 radios, monitoring and controlling Link-16 terminals, managing and monitoring the local Link-16 network including Frequency Clearance Agreement (FCA) compliance, and recording and playback of the Link-16 Integrator log. Note that there is no requirement for deployable units to relay J-Voice to CADS.

Each deployable GES will include a Link-16 Terminal with ancillary equipment (including, but not limited to a cooling tray and power supply); a TDL Integrator; a GPS network time protocol server (to provide an external time reference to the Link-16 Terminal); a high gain Link-16 antenna with ancillary equipment (such as mast, cables, etc.); and any other equipment required to deliver the desired capability.

The deployable GES capability has the following design goals: to minimize the personnel requirement for setup, maintenance, and operation; to make it as small and lightweight as possible, to have it draw as little power as possible (minimum Size-Weight-and-Power (SWAP) factor); to have it scalable, using an open architecture, and upgradable as much as possible; and lastly, to minimize downtime during system failure.

Figure 3 provides a notional design of the envisioned solution at a deployable GES. The proposed solution may differ.

1.2.1 System Operation

Deployable GESs will be connected to operation centers by one of two means whichever is most convenient at the deployed location. The preferred bearer will be IP either by a terrestrial link or SATCOM. The alternate bearer will be a serial line typically provided by the public switched telephone network (PSTN).

In a deployed environment, the Link-16 Terminal will be in use 24 hours per day, seven days per week and may be deployed for prolonged periods. During a prolonged deployment, all maintenance requirements will be performed in the theatre of operation. When in garrison, the Link-16 Terminal will typically be used for eight hours per day, five days per week. Operators will locally fill the keymat in the Link-16 Terminal as required both when deployed and in garrison.

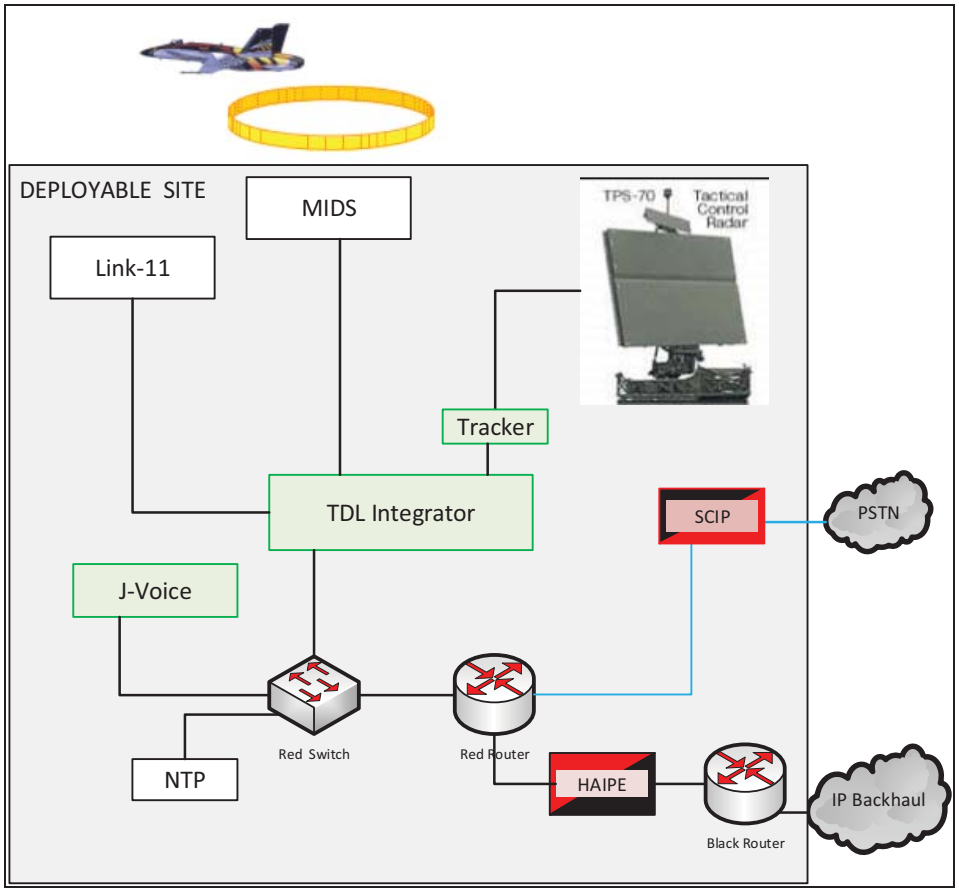


Figure 3 - Notional Design of a Deployable GES

2 Concept of Support

2.1 Canadian Fixed Link-16 Infrastructure

2.1.1 Installation

The plan is to complete the installation of the fixed system in two phases. In the first, DND personnel would perform the installation at CADS and three fixed sites (Bagotville, Inuvik and Trenton) with on-site support from the respondent. Installation of those prototype sites would be performed early during the Definition phase of the project. In the second, DND personnel would perform the installation at each of the remaining 13 sites with on-call support from the respondent. Those installations would occur during the Implementation phase of the project.

Due to the nature of the work performed in the Canadian Armed Forces, conflicting priorities may emerge. For that reason, the respondent may be required to perform the installation at one or more (potentially all) sites. For planning purposes, respondent should include the costs to perform the installation at CADS, Bagotville, Inuvik, and Trenton (as separate items). The planning assumption for the Implementation phase assumes the cost for Trenton will remain similar for the other sites.

It is important to note that the installation support provided by the respondent will continue until all sites have completed a successful site acceptance test and the system has reached its final operating capability stage.

2.1.2 Maintenance

Responsibility for the maintenance of the Remote sites will be shared between CADS and the Wings. CADS will be responsible to monitor the system 24 hours per day, seven days per week and will be responsible to perform all remote maintenance and troubleshooting activities required to sustain the system. The proposed solution will provide CADS with the tools required to accomplish this role.

Wings will be responsible for any routine support activities requiring an onsite visit, such as cryptographic fill. A Wing was assigned to each Remote site based on its proximity to the fixed site. Table 1 – Fixed Link-16 GES site caretaker details, states which Wing is responsible for each Remote site. The proposed solution should ensure that each Wing that is assigned responsibility for one or more fixed sites, is equipped with support equipment. The support equipment should provide the Wings with the ability to confirm the proper configuration and serviceability of GES equipment. The support equipment should also support first line troubleshooting with the intent of ensuring that any equipment returned to the respondent for third line repair is confirmed as being faulty.

Table 1- Fixed TDL site caretaker

Location	Caretaker
Bagotville	3 Wg
Calgary	4 Wg
Cold Lake	4 Wg
Comox	19 Wg
Fort St John	4 Wg
Greenwood	14 Wg
Inuvik	4 Wg
London, Ontario	8 Wg
Montreal	3 Wg
North Bay	22 Wg / CADS
Trenton (School)	8 Wg (School)

Shearwater/Halifax	12 Wg
St Johns	9 Wg
Tofino	19 Wg
Trenton	8 Wg
Winnipeg	17 Wg
Yellowknife	17 Wg

Any hardware and software support required, beyond what is required for first line support will be coordinated through the Life Cycle Materiel Manager's (LCMM) office. That office will be responsible for managing the support contract and for coordinating and authorizing liaisons with the respondent for support. The submission must include all second and third line maintenance costs (yearly licensing fees, parts, labor, shipping, etc.) for the first two years of operation of the proposed system with an option for longer term support. This may include respondent visits on an as required basis. The maintenance costs must also include the provision of help desk support to DND personnel providing first line support. The minimum required help desk support is eight hours per day, five days per week.

2.1.3 Training

A seventeenth site will be constructed to support maintenance training. This training site will mirror a typical fixed Link-16 site. The current plan is that this site will be installed in Trenton, but it may change during the definition phase.

The respondent will be responsible to deliver a single train-the-trainer course that includes all relevant training information and related documentation to enable the RCAF to develop in-house training packages that will be used in RCAF led ongoing regenerative training.

2.2 Deployable GES

2.2.1 Installation

The intent is to have DND personnel accept assembled and configured deployable kits after successful onsite respondent acceptance testing.

2.2.2 Maintenance

The deployable units will perform first line maintenance on the deployable GESs. The proposed solution should ensure that each deployable unit is equipped with support equipment. The support equipment should provide the Wings with the ability to confirm the proper configuration and serviceability of Link equipment. The support equipment should also support first line troubleshooting with the intent of ensuring that any equipment returned to the respondent for third line repair is confirmed as being faulty.

Second line maintenance will be provided by the respondent under a support contract managed by the LCMM. This may include FSR visits on an as required basis. Third line maintenance will be provided by the respondent through a support contract managed by the

LCMM. The submission must include all second and third line maintenance costs (yearly licensing fees, parts, labor, shipping, etc.) for the first two years of operation of the proposed system with an option for longer term support. The maintenance costs must also include the provision of help desk support to DND personnel providing first line support. The minimum required help desk support is eight hours per day, five days per week.

2.2.3 Training

Fundamentals of Link-16 operations will be taught using the fixed Link-16 training site. The specificities of deployable units will be taught by these deployable units to their incoming personnel using the units' equipment. There is no plan at this point to create a sixth deployable GES kit for the sole purpose of training.

The respondent will be responsible to deliver a single train-the-trainer course that includes all relevant training information and related documentation to enable the RCAF to develop in-house training packages that will be used in RCAF led ongoing regenerative training.

3 Overview of TDL System Requirements

Proposed Link-16 systems must be compliant with one or both of MIL-STD-6016E and STANAG 5516(E4). Where a system is only compliant with one of these standards a list of differences must be provided.

Proposed Link-16 systems must be compliant with one or both of MIL-STD-3011B and STANAG 5518 (JREAP). Where a system is only compliant with one of these standards a list of differences must be provided.

Note that a requirement does not exist for both the Remote sites and deployable units to be provided with identical equipment, nor even with equipment from the same vendor.

3.1 Canadian Fixed Link-16 Infrastructure

TIC3 Air systems must adhere to strict regulations in order to be authorized to perform unattended classified processing. From an emission security (EMSEC) perspective, any Commercial Off The Shelf (COTS) equipment will only be used in an EMSEC Level 3 area. Any other classified equipment must either be rated as Telecommunications Electronics Material Protected from Emanating Spurious Transmissions (TEMPEST) level 1 or be housed in an enclosure rated to TEMPEST level 1. Wherever possible the project will provide an EMSEC Level 3 secure room for classified equipment. However, this may not be feasible either from an infrastructure or financial point of view at each location.

TIC3 Air will determine EMSEC feasibility during a series of site surveys that will be conducted during the definition phase. Sites where it is not possible to provide an EMSEC Level 3 secure room will be resolved by adding an approved secure TEMPEST Level 1 19 inch rack capable of housing all classified equipment; the rack may need to be connected to the Remote Environment Monitoring System (REMS) (for intrusion detection for

example). Since the number of sites that would require this to be done is unknown at this point, the cost should be provided for one site both with a TEMPEST rack included, and without. The planning assumption will be that costs will increase linearly based on the number of 19 inch racks of each type required.

3.2 Deployable GES

Deployable GESs will connect to Link-11 equipment and forward Link-11 messages on Link-16 in compliance with MIL-STD-6020B. The standard used for Link-11 is STANAG 5511 Edition 5. The deployable GES will also have the capability to interface and ingest a tactical control radar feed. As a minimum, the provided solution must fully support the following protocols: TPS-70 proprietary 9-bit serial format, ASTERIX CAT32/48, and CD-2C.

From a setup point of view, it will take four persons or less to setup (ideally two or less). It must be contained in transit cases during transport. Those transit cases will each require four persons or less to carry (ideally two persons or less) and will not require any special handling equipment. Ideally, those transit cases should be big enough to leave all the patch cords connected when carried around for ease of setup in the area of operations.

The proposed system must be able to sustain harsh environmental conditions, especially during transport. The RCAF currently uses ECS transit cases (the Case Loadmaster TSC Rackmount, 7907 – item number T0000502) which are MIL-STD 810G compliant, which meet all of the environmental requirements during transport.

4 Assumptions

Respondent can assume the following requirements will be met for their proposed system. Respondent is still responsible to provide their system's actual requirement, it is simply meant to exclude these items from the proposed solution.

For planning purposes, the assumption will be that all cost figures provided will be in Canadian dollars, unless mentioned otherwise in the return.

4.1 Electrical Power

Power for the fixed Link-16 GES will come from the Canadian power grid through the associated building's electrical distribution system and it will support the current drawn by the proposed system. For the deployable GES, power will be provided by generators and will support the current drawn by the proposed system. Uninterruptible power supplies (UPS) are the responsibility of the respondent in their proposed solution.

4.2 Heating, Ventilation, And Air Conditioning (HVAC)

Fixed Link-16 GESs will be operated from an area with HVAC. The main exclusion to that assumption is the TEMPEST 19 inch rack where the respondent's solution will

incorporate proper cooling mechanisms for the equipment housed inside the rack. Deployable kits will operate in a wide variety of environmental conditions; HVAC systems as required will be provided as Government Furnished Equipment (GFE).

4.3 Network Connectivity

A network point-of-presence will be provided as the primary means of exchanging information between the fixed Link-16 GESs, the deployed GESs, CADS, and other headquarters as required. Respondent should state the minimum and the ideal bandwidth required by their proposal to operate both a fixed Link-16 GES and a deployed GES. Inuvik and Yellowknife will have limited bandwidth and will have an expected latency of 500-700 ms.

4.4 PSTN Line

A single phone line is currently available at each fixed Link-16 GES to be used as a backup to the network connection point-of-presence as stated in the Concept of Operations. Respondent must indicate whether their proposed system can function using one PSTN line, and any resulting system limitations when doing so.

4.5 Foreign Military Sale

Any items that must be procured through foreign military sale (FMS) will be procured separately by the project office. However, the respondent must identify the item requiring an FMS and provide a cost estimate for the item (excluding FMS administration fees, or multifunctional information distribution system (MIDS) International Program Office fees if applicable).

5 Questions for Respondent

5.1 Canadian Fixed Link-16 Architecture

1. **What system would you propose?**
   The answer will provide a clear idea of what the major components of the system are; which manufacturer builds these components; what capability your system has; and the system's architecture.

2. **What are your proposed system's main advantages and disadvantages?**
   The answer will provide a clear idea of the advantages and disadvantages of the proposed solution.

3. **What is the estimated cost of initial training (train the trainer course)?**
   The answer will provide the cost to provide a train the trainer course for a notional group of eight people. For cost planning and comparison, the answer should include both the options to have the training in Trenton, ON or at the provider location. The training

package will include the course itself with all relevant training information and related documentation to enable the RCAF to run training in house afterward.

4. **What is the estimated cost for a support contract providing second and third line support, inclusive of any proposed help desk, covering the first two years of operation?**
   The answer will provide the cost for a support contract that includes help desk support to DND personnel providing first line maintenance, as well as all second and third line maintenance costs (yearly recurring fees, parts, labor, shipping, etc.) for the first two years of operation of the proposed system with an option for longer term support. Details on the level of support provided by your help desk and its hours of operation, as well as what would actually be considered second and third line support (and exclusions) in the proposed solution must be provided.

5. **What are the preventative maintenance requirements?**
   The answer will provide an itemized list of all the preventative maintenance required to operate the fixed Link-16 GES architecture with the expected man-hour requirement to complete each item on the list. The list should also include the cost if you were asked to perform the preventative maintenance for that item in the list.

6. **How much time will your proposed solution take to activate a site from its quiescent state?**

7. **What is the pedigree of the proposed solution?**

   The TIC3 Air project prefers to acquire proven systems that have been used by other organizations. The proposal should include a list of units around the world currently using the proposed solution and should include a point of contact through which DND could receive feedback.

5.1.1 Central Site at CADS

8. **What equipment would your solution have located at the central site at CADS?**

   The answer will provide an itemized list of hardware and software the proposed solution will locate at the central site at CADS.

9. **What maintenance tools would your solution have located at the central site at CADS?**

   The answer will provide an itemized list of hardware, software, and associated costs the proposed solution will provide to the central site at CADS.

10. **What is the estimated cost for the solution equipment (hardware and software)?**

The answer will provide, as a minimum, a total for all the equipment and software at the central site at CADS, a cost per item for all the major components (both hardware and software), and a consolidated cost for all the other items. The addition of the costs for the major components with the consolidated cost for all the other items must add up to the total for all the equipment and software at that site. The respondent will be responsible for the shipping. If an item has an associated shipping cost, the shipping fee must be clearly identified.

The ideal answer will provide a total cost for all the equipment and software at that site, and the individual cost for each item (software and hardware) located at that site.

11. What is the estimated cost to provide on-site support during a potential DND installation?

The answer will provide the costs to have on-site support while DND personnel perform the installation at the central site at CADS. The support would last until the completion of a successful site acceptance test.

12. What is the estimated cost to provide installation?

The answer will provide the cost for the respondent to perform the CADS installation in case it is not viable to have DND personnel perform this.

13. What are the requirements for the proposed installation at the central site at CADS?

The answer should state as a minimum, but should not be limited to, the following requirements: HVAC, electrical power, physical space requirement, and floor weight bearing.

5.1.2 Fixed Sites

5.1.2.1 Fixed Sites with a Secure EMSEC Level 3 Room

14. What equipment is proposed for installation at fixed sites with a secure EMSEC Level 3 room?

The answer should provide an itemized list of hardware and software proposed for installation at one site of this type.

15. What maintenance tools will be provided to each wing with an assigned fixed site?

The answer should provide an itemized list of hardware, software, and associated costs the proposed solution will provide to a wing with an assigned fixed site. The planning assumption is that the costs and items will be the same for all the wings.

16. What is the cost for the equipment (hardware and software)?

The answer will provide, as a minimum, a total for all the equipment and software at one site with a secure EMSEC Level 3 room, a cost per item for all the major components (both hardware and software), and a consolidated cost for all the other items. The addition of the costs for the major components with the consolidated cost for all the other items must add up to the total for all the equipment and software at that site. The respondent will be responsible for the shipping. If an item has an associated shipping cost, the shipping fee must be clearly identified.

The ideal answer will provide a total cost for all the equipment and software at that site, and the individual cost for each item (software and hardware) located at that site.

17. What is the cost to provide on-site support during the installation?

The answer will provide the costs to have on-site support while DND personnel perform the installation at one site with a secure EMSEC Level 3 room. The support would last until the completion of a successful site acceptance test.

18. What is the cost to provide on-call support during the installation?

The answer will provide the costs to have on-call support while DND personnel perform the installation at one site with a secure EMSEC Level 3 room. The support would last until the completion of a successful site acceptance test.

19. What is the cost if installation is included in the proposal?

The answer will provide the costs for the respondent to perform the installations at Bagotville, Inuvik, and Trenton (not the school) with a secure EMSEC Level 3 room. This is meant to be an option, in case DND personnel are not available to complete the installation. The answer should also indicate applicable volume discount should DND opt to do a certain number of sites in this manner.

20. What are the requirements for the proposed installation at a fixed site with a secure EMSEC Level 3 room?

The answer will say as a minimum, but should not be limited to, the following requirements: HVAC, electrical power, floor weight bearing, bandwidth requirement for the network connection, and if one PSTN line will suffice as a backup connection or if more PSTN lines will be required.

5.1.2.2 Fixed Sites with a Secure Room Only

21. What equipment is installed at a fixed site that has a secure room only?

The answer will provide an itemized list of hardware and software the proposed solution will use at one site of this type. Proof that the selected enclosure would satisfy the TEMPEST Level 1 requirement must be provided.

22. What is the cost for the equipment (hardware and software)?

The answer will provide, as a minimum, a total for all the equipment and software at one site with a secure room only, a cost per item for all the major components (both hardware and software), and a consolidated cost for all the other items. The addition of the costs for the major components with the consolidated cost for all the other items must add up to the total for all the equipment and software at that site. The respondent will be responsible for the shipping. If an item has an associated shipping cost, the shipping fee must be clearly identified.

The ideal answer will provide a total cost for all the equipment and software at that site, and the individual cost for each item (software and hardware) located at that site.

23. What is the cost to provide on-site support during the installation?

The answer will provide the costs to have on-site support while DND personnel perform the installation at one site with a secure room only. The support would last until the completion of a successful site acceptance test.

24. What is the cost to provide on-call support during the installation?

The answer will provide the costs to have on-call support while DND personnel perform the installation at one site with a secure room only. The support would last until the completion of a successful site acceptance test.

25. What is the cost if installation is included in the proposal?

The answer will provide the costs to perform the installation as part of the proposal at Bagotville, Inuvik, and Trenton (not the school) with a secure room only. This is meant to be an option, in case DND personnel are not available to complete the installation. The answer will also mention if there would be a volume discount should DND opt to do a certain number of sites in that manner.

26. What are the requirements for installation at a fixed site with a secure room only?

The answer will say as a minimum, but should not be limited to, the following requirements: HVAC, electrical power, floor weight bearing, bandwidth requirement for the network connection, and if one PSTN line will suffice as a backup connection or if more PSTN lines will be required.

5.2 Deployable GES

27. What system is proposed?

The answer will provide a clear idea of what the major components of the system are; which manufacturer are intended for these components; what capability the system has; the system's architecture; how long it takes to set it up; and how many people it takes to transport and set it up. If the solution includes a small form factor Link-16 terminal, information must be included to enable the comparison between its range and anti-jamming characteristics and those of an MIDS Low Volume Terminal 11 (MIDS-LVT(11)).

28. What are your proposed system's main advantages and disadvantages?

The answer will provide a clear idea of the advantages and disadvantages of the proposed solution.

29. What equipment will be in a deployable GES?

The answer will provide an itemized list of hardware and software your solution will use in one deployable GES.

30. What maintenance tools are recommended for deployable units?

The answer will provide an itemized list of hardware, software, and associated costs the solution will provide to one deployable unit. The planning assumption will be that the costs and items will be the same for all deployable units.

31. What is the cost for the equipment (hardware and software)?

The answer will provide, as a minimum, a total for all the equipment and software for one deployable GES, a cost per item for all the major components (both hardware and software), and a consolidated cost for all the other items. The addition of the costs for the major components with the consolidated cost for all the other items must add up to the total for all the equipment and software in deployable GES. The respondent will be responsible for the shipping. If an item has an associated shipping cost, the shipping fee must be clearly identified.

The ideal answer will provide a total cost for all the equipment and software in one deployable GES, and the individual cost for each item (software and hardware) located in it.

32. What are the requirements for the proposed deployable GESs?

The answer will say as a minimum, but should not be limited to, the following requirement: HVAC, electrical power, physical space requirement, and weight.

33. What is the cost to provide on-site support during the installation?

The answer will provide the costs to have on-site support while DND personnel will assemble one deployable GES. The support would last until the completion of a successful site acceptance test.

34. What is the cost for the train the trainer course?

The answer will provide the cost to provide a train the trainer course for a notional group of eight people. The training package will include the course itself with all relevant training information and related documentation to enable the RCAF to run in house training afterward.

35. What is the cost for a second and third line of support contract covering the first two years of operation?

The answer will provide the cost for a support contract that includes all second and third line maintenance costs (yearly recurring fees, parts, labor, shipping, etc.) for the first two years of operation of the proposed system with an option for longer term support. Details on what would actually be considered second and third line support (and exclusions) in the proposed solution must be provided.

36. What maintenance tasks are required to be performed to support a Deployed TDL system that is deployed for a prolonged period of time?

The answer will provide all routine maintenance required for one deployable GES during a period of 18 months. An example of a routine maintenance requirement could be a yearly licensing requirement.

37. What is the pedigree of the proposed solution?

The TIC3 Air project prefers to acquire proven systems that have been used by other organizations. The proposal should include a list of units around the world currently using the proposed solution and should include a point of contact through which DND could receive feedback.

38. What are the preventative maintenance requirements?

The answer will provide an itemized list of all the preventative maintenance required to operate the deployable GES, both in garrison and deployed, with the expected man-hour requirement to complete each item on the list.

ANNEX C - STREAMING VIDEO (SV) SYSTEM REQUIREMENTS

1. CONCEPT OF OPERATIONS

1.1 Fixed SV Ground Entry Stations (GES)

The TIC3 Air project will provide five fixed ground entry stations (GESs) with Streaming Video (SV) capabilities. The SV Equipment Suite will be employed within the Canadian Armed Forces (CAF) as a means of receiving streaming video from appropriately equipped military platforms and distributing it to Command and Control (C2) / decision-making centres in near-real time. A SV GES includes long range directional tracking and short range Omni-directional capabilities supporting as a minimum the C and Ku bands, a conditioning system, storage, distribution equipment and secure network connectivity.

The TIC3 Air project will install the fixed SV Ground Entry Sites at the following wings:

a. 3 Wing Bagotville;
b. 4 Wing Cold Lake;
c. 12 Wing Shearwater; and
d. 19 Wing Comox.

This will provide local flying units with the ability to send streaming video to DND's Consolidated Secret Network Infrastructure (CSNI) on a daily basis enabling continued, uninterrupted operations and training. A fifth SV Equipment Suite will be provided to 8 Wing Trenton for maintenance training purposes.

1.2 Deployable SV GES

For a total of 10 deployable kits, the TIC3 Air project will also provide 2 deployable SV equipment suites each to five units located at:

3 Wing Bagotville;
a. 4 Wing Cold Lake;
b. 8 Wing Trenton,
c. 14 Wing Greenwood; and
d. 19 Wing Comox.

This will provide the RCAF with a capability to receive SV from operations outside of fixed coverage areas in Canada and deployed locations outside of Canada.

2. CONCEPT OF SUPPORT

2.1 Installation

Installation of the fixed SV GESs will be performed by DND personnel with support from the contractor as required. However, the respondent is requested to provide a cost estimate for a complete installation service so that this option can be evaluated.

The deployable SV GES must be able to be unpacked and setup by a team of maximum four persons. It is desirable that the deployable SV GES be unpacked and setup by a team of maximum two persons. The deployable SV GES components must be able to be packed in a maximum of four transit cases for shipping. The largest of these transit cases will be moveable by a team of two persons (two person lift) as per the two man lift limit from MIL-STD-1472F.

2.2 Maintenance

The TIC3 Air Project will establish a Life Cycle Materiel Management (LCMM) plan for the different parts of the SV system. Respondent is requested to propose a maintenance plan including number of personnel and costing, with their solution.

2.3 Training

DND has a robust training capability, and will continue to train technicians and operators at Canadian Forces training establishments. For the new SV GESs, DND will require train-the-trainer level courses for initial cadre training, training packages (bilingual), and technical data packages.

3. SV GES requirements

3.1 General SV GES requirements

The respondent's proposed system must be able to be positioned to perform initial signal acquisition by multiple means (e.g., manual entry of position, Link 16 Precise Participant Location and Identification (PPLI), etc.). The respondent's proposed system must be capable of tracking a signal once acquired by multiple means (e.g. Link 16 PPLI, STANAG 7085 link management channel positional data, feedback tracking algorithms, etc.). Upon link loss, the respondent's proposed system must notify the operator of the loss of link, and automatically attempt to reacquire the signal.

3.2 Fixed SV GES requirements

The Fixed SV GESs include one (or more) long range directional tracking antenna (LRDTA) system(s), one (or more) short range omnidirectional antenna systems, a

Streaming Video conditioning system, a domestic storage capability, and a distribution system with network connectivity to CSNI.

The SV GES equipment that TIC3 Air will obtain from respondent is the LRDTA and the omnidirectional antenna systems. The remainder of the SV system will be supplied as government furnished equipment (GFE).

RCAF platforms primarily use Ku band Tactical Common Data Link (TCDL) and Analog C-Band systems. It is currently planned that some of the Analog C-band systems will be replaced by Digital C-band Systems within the lifetime of the ISR GES.

Depending on the location, some sites will require both C Band and Ku Band capabilities, therefore the respondents are requested to propose a solution that, as a minimum, meets both requirements. Details on each location are included in section 3.5.

Some RCAF platforms have an L and S band capability that is not currently used. Respondent is requested to include L and S band capabilities as options in their proposal.

The Fixed SV GESs will be installed and remain in place for years where they will be subject to harsh Canadian weather. Consequently, it is expected that the LRDTA will be installed in a protective enclosure such as a radome. Respondent is requested to provide their requirements to protect the Fixed SV GES equipment.

Detailed requirements for Fixed SV GESs are listed in the 'Draft General Project Requirements' at Table B.4 'Fixed Streaming Video Site'.

3.3 Deployable SV GES requirements

Deployable SV GES equipment suite requirements are listed in the 'Draft General Project Requirements' at Table B.2 'Deployable GES Requirements'.

Deployable SV GES equipment suites must operate in the Ku Band and C band as a minimum, with L and S bands as options.

RCAF deployable kits are designed in a modular fashion in order to allow deploying units to deploy with the minimum amount of equipment required to conduct their mission. For example, a unit that is deploying to support a CP-140 mission would take a Ku/TCDL SV GES but would leave the C-band components in garrison. Thus all SV GES equipment should be modular.

3.4 Interoperability with CAF platforms

SV equipment must be interoperable with CAF platforms and other NATO platforms. SV GESs will meet STANAG 7085 for TCDL links. TCDL waveforms will meet US DoD CDL standards, as a minimum CDL-Rev F and upgradable to CDL-Rev H.

Respondent is also requested to provide a plan to upgrade their proposed systems to utilize Bandwidth Efficient CDL (BE-CDL).

Specifications for waveforms and frequencies for each platform are included in the attached document: *TIC3 Air Ground Data Link System Requirements*.

3.5 Fixed SV GES Locations

3.5.1 Infrastructure

Infrastructure requirements will vary for each Fixed SV GES location. Specific infrastructure requirements will be determined during the site surveys. Respondent may provide infrastructure recommendations with their proposed solutions.

3.5.2 3 Wing Bagotville and 4 Wing Cold Lake

These two sites are primarily training centers for CF188 Fighters that currently operate with analog C-Band transmitters. These Fixed SV GES will predominantly use C-Band equipment with Ku-band equipment being reserved for visiting platforms. Respondent is requested to propose a solution, including antennas that will operate in the C and Ku bands as a mandatory requirement. Respondent may include additional options for L and S band which are rated requirements.

3.5.3 12 Wing Shearwater and 19 Wing Comox

Those two sites are primarily training centers for the CP-140 Auroras (Ku-Band) and the CH-124 Sea-Kings (Ku-Band and C-Band).

These Fixed SV GESs will use both C-Band and Ku-band equipment on a regular basis. Respondent is requested to propose a solution, including antennas that will operate in both C-Band and Ku-band as mandatory requirements. Respondents may include additional options for L and S band, which are rated requirements. Finally, TIC3 Air is interested in determining the availability of a single antenna, multiband solution that includes C, Ku, L and S bands.

3.5.4 8 Wing Trenton

Trenton is a training center for SV equipment. In order to support the Ground Maintenance training requirement this Fixed SV GES must include both C-Band and Ku-band equipment. Respondent is requested to propose a solution, including antennas that will operate in both C-Band and Ku-band as mandatory requirements. Respondent may include additional options for L and S band which are rated requirements. Finally, TIC3 Air is interested in determining the availability of a single antenna, multiband solution that includes C, Ku, L and S bands.

4. ASSUMPTIONS

4.1 Infrastructure (Fixed SV GES)

The TIC3 Air project is responsible to ensure that building and telecommunications infrastructure supports any new SV GES equipment. This includes the antennae masts (if required), concrete pads (if required), secure room, building heating, ventilation and air conditioning (HVAC), grounding & bonding, and power. Respondent may offer their own infrastructure recommendations for minimum standards and site refurbishment.

4.2 Security

Currently all RCAF platforms transmit SV data in the clear. Respondent is not expected to provide cryptographic equipment as part of their proposals.

4.3 Equipment

Respondent must provide all hardware necessary from Antenna to the input of the Streaming Video conditioning equipment. The aforementioned conditioning equipment is network equipment that interfaces to the antenna system via IP traffic. Therefore the output of the respondent provided equipment must be demodulated signals that are carried by IP. This must include the antennae, Radio Frequency Equipment (RFE), modem, interfaces, accessories, software, and ancillary equipment or any required equipment. The respondent's proposed solution must be capable of supporting an external modem. Respondent should include a solution for extreme weather to protect the deployable SV equipment suite.

Specific quantities and equipment selection is at the discretion of the respondent solution. Respondent is requested to provide cost estimates for this equipment. A list of suggested equipment is provided in Appendix C2.

4.4 Configuration

4.4.1 SV Fixed Site System Configuration

The TIC3 Air project has developed preliminary Conceptual SV Network designs, included in Appendix C1. Respondent is requested to provide detailed diagrams for their proposal for the Fixed SV GES for solution.

4.5 Services

In order to determine the best course of action for implementation, respondent is requested to provide both an itemized hardware cost estimate for the notional fixed and deployable SV GESs and a services cost estimate that includes an optional cost for respondent provided site installation.

5. QUESTIONS TO RESPONDENTS

5.1 General Description of the proposed system

1. **What system would you propose?**
   Respondent is asked to provide a general description of their proposed solutions, including detailed diagrams. The description can include recommendations on CONOPS and CONSUP to improve system availability and reduce Total Cost of Ownership.

2. **What are your proposed system's main advantages and disadvantages?**
   The answer will provide a clear idea of the advantages and disadvantages of the proposed solution.

3. **What is the pedigree of the proposed system?**
   The TIC3 Air Project prefers to acquire proven systems that have been used by other organizations. The proposal should include a list of units around the world currently using the proposed solution and should include a point of contact for each through which DND could receive feedback.

5.2 Configuration

5.2.1 SV LRDTA Specifications

4. **Does your proposed system's LRDTA meet the requirements as detailed in Sections 3 and 4 of this document?**
   Respondent is asked to review the list of specifications for their proposed LRDTA and indicate if there are any which their system does not meet. Respondent may offer recommendations for additional requirements to increase availability and reduce costs.

5. **What bands is your proposed system's LRDTA capable of transmitting in?**

6. **Are there multiple possible options for the configuration of the LRDTA? If so, what are they?**
   Respondent is asked to provide their proposed solution for different configuration options, for example, multiple antennas versus a single multi-band antenna, one radome for each antenna versus multiple antennas under a single radome, etc.

7. **What methods is your proposed system capable of using for initial signal acquisition?**

8. **What methods is your proposed system capable of using for tracking a signal once acquired?**

9. **What methods is your proposed system capable of using to reacquire a signal after link loss?**

5.2.2 Fixed SV GES Configuration

10. What is your system's configuration for the Fixed SV GES?
Respondent shall specify if their design can satisfy all technical requirements. If feasibility is an issue, respondents should recommend a solution with new configurations and/or hardware products (e.g. proprietary switches/adapters/interfaces).

5.2.3 Deployable SV GES Configuration

11. What is your system's configuration for the Deployable SV GES?

Respondent shall specify if their design can satisfy all technical requirements. If feasibility is an issue, respondent should recommend a solution with new configurations and/or hardware products (e.g. Proprietary switches/adapters/interfaces).

5.3 Proposed system requirements

12. Are there any other requirements that a SV GES system should have? If so, what is the rationale behind them?
Respondent are asked to propose new SV GES requirements that will help to improve the final procurement specification by covering gaps in the current RFI. Any requirements proposed by the respondent solution should include the rationale behind the proposed requirement.

5.4 Costs breakdown structure

13. What is the cost breakdown for the hardware and services necessary to support your proposed system?
Respondent is asked to provide an itemized cost breakdown for hardware and services required for Deployable SV GES Equipment Suites and Fixed SV GESs. The spreadsheet in Appendix C2 suggests a list of all hardware and services that should be included in the breakdown as a minimum.

Additional cost estimates to address SV GES feasibility, including hardware solutions and engineering services, are also requested.

5.5 Maintenance

14. What are the preventative maintenance requirements of the proposed system?
Respondent is asked to provide an itemized cost breakdown for the maintenance requirements and recommended sparing levels for the Deployable SV GES Equipment Suites and the Fixed SV GESs.

5.6 Security

15. **How difficult would it be to incorporate cryptographic equipment into your system?**
    It was stated in Section 4.2 that SV is currently transmitted from RCAF platforms in the clear. It is foreseen that these platforms will eventually be required to encrypt this data, thus the respondent's Fixed SV GES design and Deployable SV GES design should support the insertion of cryptographic equipment.

    Respondent is also asked to provide recommendations on ISR/SV security options.

5.7 Training

16. **What are the costs associated with providing initial training (Train the Trainer course) for your proposed system?**
    Respondent is requested to provide a cost estimate to send one or two trainers from their company to the DND training facility in Trenton, Ontario, to provide train-the-trainer courses for both the Fixed SV GES and Deployable SV GES kits, for Ku Band and C Band Technical Training and Ku Band and C Band Operator Training, as a minimum. In addition, respondent is requested to provide a cost estimate for L and S Band Technical and Operator training, if their proposed solution includes these capabilities.

Appendix C1

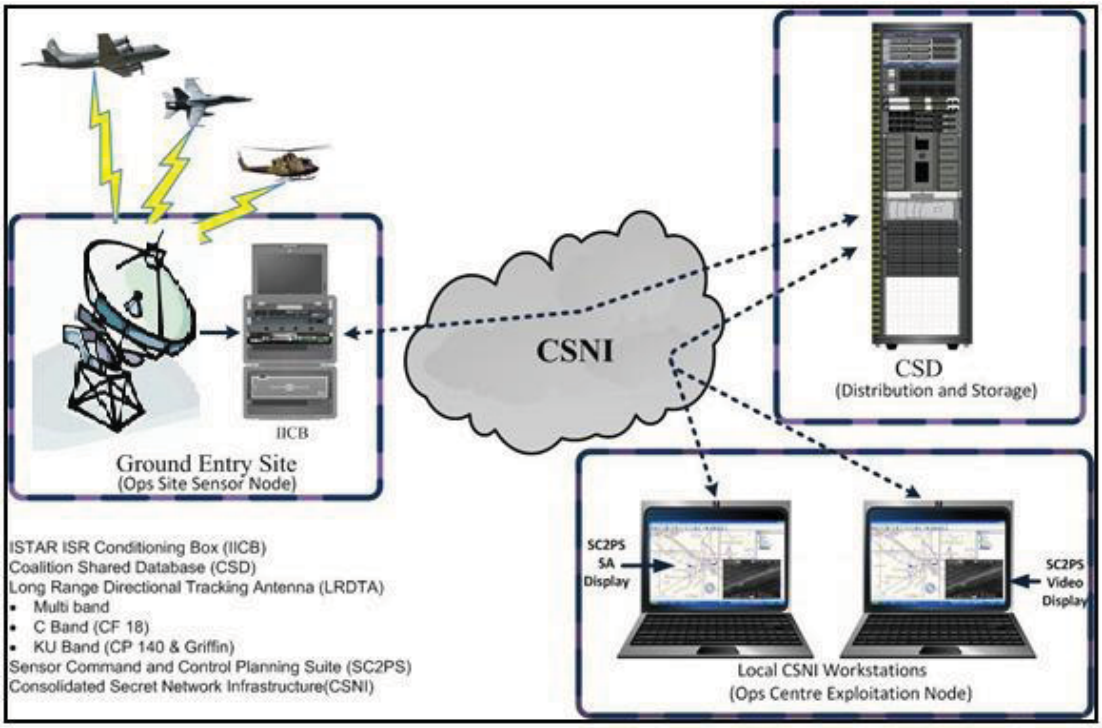


Figure 1 Conceptual ISR/SV Network Block Diagram

Appendix C2

List of Equipment for the SV GES
Fixed GES
C Band short range omni antenna
C Band long range directional antenna
C Band Spare parts
C Band Technical Training
C Band Operator Training
Ku Band short range omni antenna
Ku Band long range directional antenna
Ku Band Spare Parts
Ku Band Technical Training
Ku Band Operator Training
Ku & C Band short range omni antenna
Ku & C Band long range directional antenna
Radome
Installation services
Any RFE, modem, interfaces, accessories, and/or ancillary equipment
Deployable GES (2 kits per site, 10 total)
Multiband LRDTA (Ku and C band)
Extreme weather protective equipment
Any RFE, modem, interfaces, accessories, and/or ancillary equipment

Appendix C3

Fixed ISR/SV GES Locations
19 Wing Comox
4 Wing Cold Lake
3 Wing Bagotville
14 Wing Greenwood (now changed to 12 Wing Shearwater)
GES at 427 sqn Petawawa
Deployable ISR/SV GES Locations
12 Escadron Radar / TCR Squadron (3 Wg Bagotville)
42 Radar Squadron / TCR Squadron (4 Wg Cold Lake)
8 ACCS (8 Wg Trenton)
DMSC (E) (14 Wg Greenwood)
DMSC(W) (19 Wg Comox)

ANNEX D - CC150 RELAY REQUIREMENT

1 CONCEPT OF OPERATIONS

The CC-150 Polaris Multi-Role Tanker Transport (MRTT) Link-16 capability of the TIC3 Air project has three main objectives. The first is to extend a Link-16 network's Line-Of-Sight (LOS) reach to increase Situational Awareness (SA) available to Commanders and decision makers. The second objective is to provide Link-16 SA to CC-150 Polaris Tanker crews including the Pilot, Co-pilot and Flight Refuelling Specialist. The third objective is to allow the CC-150 Polaris Tankers to participate in a Link-16 network; thus allowing them to publish their Precise Participant Location and Identification (PPLI) information and fuel status to Link-16 equipped allied aircraft.

The proposed solution must be modular allowing for it to be added to or removed from a CC-150 in accordance with the following requirements:

1. A maximum of three persons must be able to load or unload the MRTT Link-16 system to/from a CC-150 aircraft.
2. A single trained technician must be able to install, configure and commission the MRTT Link-16 system onboard a CC-150 aircraft within 2 hours.
3. A single trained technician must be able to uninstall the MRTT Link-16 system from a CC-150 aircraft within 2 hours.

2 CONCEPT OF SUPPORT

2.1 Installation

Directorate Aerospace Equipment Program Management (Transport) 4 (DAEPM (T) 4) is the Accredited Technical Organization (ATO) for the CC-150 Polaris Tanker. This organization is responsible for the in-service engineering management support, contract support with the maintenance contractors and the original manufacturer of the aircraft. The primary support contractor for CC-150 Polaris is L-3 Military Aviation Services (MAS) in Mirabel.

All CC-150 modifications are coordinated by DAEPM (T) 4 and follow an engineering change process conducted by L-3 MAS. Development of modification instructions and Aircraft-kits (A-kits) is the primary responsibly of the Link-16 equipment vendor. However, it is expected that this work will require close cooperation between the vendor, L-3 MAS, and DAEPM (T) 4. Installation will be performed by L-3 MAS with on-site support provided by the Link-16 equipment vendor's personnel.

2.2 Maintenance

First line maintenance will be performed by L-3 MAS maintenance personnel. For second and third line support the proposed solution will include all-inclusive support (yearly licensing fees, parts, labor, shipping fees, etc.) for the first two years of operation. However, the following constraint applies: Support for equipment integrated into the aircraft will have to be coordinated with DAEPM (T) 4 and may have to be performed by the company already providing support to the aircraft based on the terms of the existing CC-150 support contract. For other second and third line support requirements, any support required from the support contract will be coordinated through and authorized by the Life Cycle Materiel Manager's (LCMM) office created by this project.

2.3 Training

The contractor must deliver a single train-the-trainer course that includes all relevant training information and related documentation to enable the Royal Canadian Air Force (RCAF) to develop in-house training packages that will be used in RCAF led ongoing regenerative training.

3 CC-150 POLARIS MRTT LINK-16 SYSTEM REQUIREMENTS

The proposed MRTT Link-16 system must be compliant with one or both of MIL-STD-6016E and STANAG 5516(E4). Where a system is only compliant with one of these standards a list of differences must be provided.

The proposed MRTT Link-16 system must be compliant with one or both of MIL-STD-3011B and STANAG 5518 (JREAP). Where a system is only compliant with one of these standards a list of differences must be provided.

The MRTT Link-16 capability installation must be of minimum impact to both the airframe and the Flight Mission Software (FMS). Additionally, MRTT Link-16 components must have a Size, Weight, and Power (SWaP) factor to fit available platform space.

The MRTT Link-16 displays must be provided to the pilot, co-pilot and flight refueling specialist. It must be useable both in low light and strong sunlight. It must allow the aircrew to apply filters to Link-16, both inbound and outbound as required.

From a security perspective, when the system is turned off, there must be an easy way to ensure no secure information stays resident on the system. This excludes the Link-16 Terminal that has specific handling procedures as a cryptographic controlled item (CCI).

The proposed system must have the ability to withstand the environmental extremes of aircraft in flight and on the ground. Equipment used in the proposed solution must have been previously qualified for use on aircraft.

The proposed solution must include test equipment that allows maintenance personnel to differentiate between equipment failures and configuration errors. Additionally it must be possible to isolate faults to the line replaceable unit (LRU) level. Historically many Link-16 terminals have been incorrectly diagnosed as faulty, and been unnecessarily sent to second and third line maintenance.

4 ASSUMPTIONS

Installation of the system must require minimal changes to the aircraft. Specifically, the system must utilize available aircraft power, and not require aircraft provided avionics cooling or modifications to the aircraft's exterior.

All components that can only be procured via government to government will be procured by the project office separately. The proposed solution must clearly identify any items that must be procured via government to government.

5 QUESTIONS FOR INDUSTRY

1. **What is the proposed system?**
   The answer will provide a clear idea of what the major components of the system are; which are the intended manufacturers for these components; what capabilities the system will have; and how it is intended to be used (concept of operations).

2. **What are the proposed system's main advantages and disadvantages?**
   The answer will provide a clear idea of the advantages the proposed solution has over its known main competitors. It will also provide a clear idea of the disadvantages the proposed solution has over its known main competitors.

3. **What is the cost for the equipment (hardware and software)?**
   The answer will provide, as a minimum, a total for all the equipment and software, a cost per item for all the major components (both hardware and software), and a consolidated cost for all the other items. The addition of the costs for the major components with the consolidated cost for all the other items must add up to the total for all the equipment.

   The ideal answer will provide a total cost for all the equipment and software, and the individual cost for each item (software and hardware).

4. **What is the recommended level of sparing to support both domestic and deployed operations?**

5. **What are the proposed maintenance tools?**
   The answer will provide an itemized list of hardware, software, and associated costs the proposed solution will provide.

6. **What are the preventative maintenance requirements?**

The answer will provide an itemized list of all the preventative maintenance required to operate the MRTT Link-16 system, both on and off the CC-150 Polaris, with the expected man-hour requirement to complete each item on the list.

7. **What is the cost for help desk support to maintenance personnel performing first line support, as well as a second and third line support contract covering the first two years of operation?**
The answer will provide the cost for a support contract that includes all second and third line maintenance costs (yearly recurring fees, parts, labor, shipping, etc.) for the first two years of operation of the proposed system with an option for longer term support. It must also include the costs to provide help desk support to DND personnel providing first line support. Details on what would actually be considered second and third line support (and exclusions) in the proposed solution must be provided.

8. **What are the recommended training courses for both operational and maintenance staff, and what is the training cost (train the trainer course)?**
The answer will provide the cost to provide a train the trainer course for a notional group of eight people. For cost planning and comparison, the answer should include both the options to have the training in Trenton, ON or at the provider location. The training package will include the course itself with all relevant training information and related documentation to enable the RCAF to run training in house afterward.

9. **What is the pedigree of the proposed solution?**
The TIC3Air project prefers to acquire proven systems that have been used by other organizations. The proposal should include a list of units around the world currently using the proposed solution and should include a point of contact through which DND could receive feedback.

ANNEX E - SATCOM TERMINALS REQUIREMENTS

1 CONCEPT OF OPERATIONS (CONOPS)

To support the Tactical Data Link (TDL) and Streaming Video (SV) portions of the Tactical Integrated Command, Control, and Communications (TIC3) Air Project, a backhaul capability is needed. The TIC3 Air Project will deliver deployable Satellite Communications (SATCOM) terminals to each of five Royal Canadian Air Force units receiving deployable TDL/SV Systems, thus creating deployable Ground Entry Stations (GESs).

These deployable units will operate worldwide in a field environment in support of operations and training, providing TDL and SV capabilities to the RCAF. The primary SATCOM service provider will be Wideband Global SATCOM (WGS) using anchor stations operated by DND. It is desirable to be able to use commercial-Ka and Ku band providers in an event where WGS would not be available.

Trained military technicians will deploy, setup, and operate the deployable SATCOM terminals.

2 CONCEPT OF SUPPORT (CONSUP)

2.1 Maintenance

The CONSUP for TIC3 Air Project SATCOM has not been fully defined, but will follow the typical Department of National Defence (DND) concept of 1st and 2nd line support provided by military technicians, and 3rd line support provided by the contractor. This CONSUP calls for maximum use of Line-Replaceable-Units (LRU).

2.2 Training

DND intends to train technicians and operators at Canadian Armed Forces training establishments. As such, DND will require train-the-trainer level courses for initial cadre training on the new SATCOM terminals, training packages (bilingual), and technical data packages.

3 SATCOM TERMINAL REQUIREMENTS

3.1 Terminal Capabilities

In order to support operations, the SATCOM terminals must be capable of carrying two simultaneous, high-definition video streams of approximately 5 Mbps each for a total throughput of 10 Mbps. The terminals will be equipped with WGS certified Digital Video Broadcasting - Satellite - Second Generation (DVB-S2) compliant modems. The terminal dish size is expected to be approximately 1.4 m.

One of these terminals will be required for each deployable unit, for a total of five terminals. Additionally, a sixth larger terminal will be required for 8 Air Communication and Control Squadron (8ACCS) to support the TDL/SV backhaul capability, as well as the additional data and voice requirement of a deployable camp. The total throughput for the larger terminal will be 20 Mbps, therefore the dish size is expected to be approximately 2.4 m.

3.2 Networking Context

The primary mode of operation of the SATCOM terminals will be in the context of connecting a deployed IP network to a DND enterprise network through SATCOM services provided by WGS and Mercury Global Anchor Stations and through network services provided by the existing Network Access Gateway.

The deployable SATCOM Terminal kit is composed of three parts shown in Figure . These are the Terminal/Antenna, Modem and Spoke Kit. The SATCOM Modem and Spoke Kit will be provided as Government Furnished Equipment (GFE). The modem will be compliant with the DND DVB-S2 modems (using Generic Stream Encapsulation for IP traffic) used in DND anchor stations. The spoke kit is a standard DND design that provides type 1 protected access to DND enterprise networks through a central Network Access Gateway. The terminals are primarily intended to be used with WGS satellites thus must operate in the X and Military-Ka bands (non-simultaneous). It is desirable that the terminal also operate in the Civilian-Ka band and Ku band to allow use with commercial SATCOM providers.

The intent of this document is to describe DND requirements for the Terminal/Antenna part of Figure .

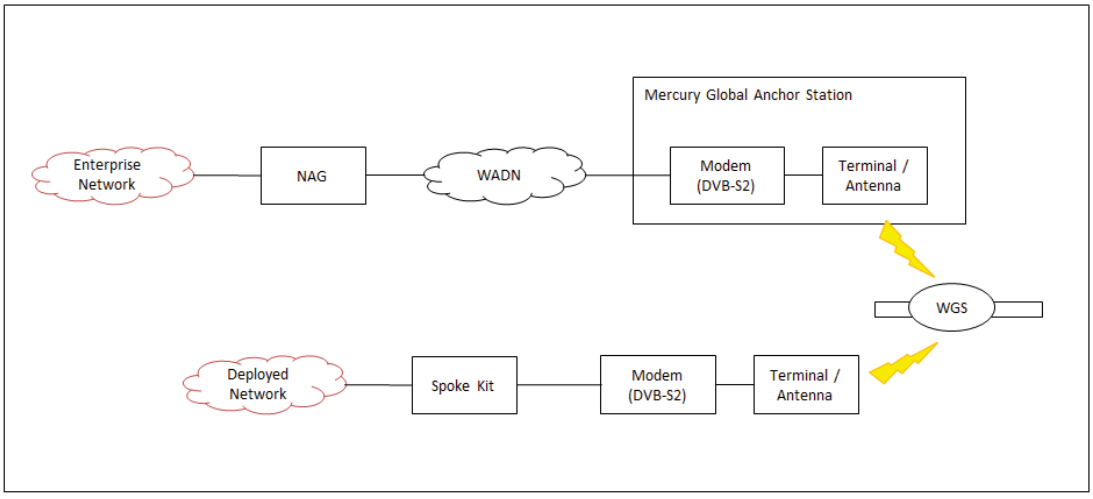


Figure 1 - Terminal in the context of DND Networking

3.3 Technical Requirements

3.3.1 "Smaller" Terminal Requirements (approx. 1.4 m dish)

To achieve the required capability and adhere to the CONOPS, the five "smaller" terminals (approx. 1.4 m dish) must meet the following technical requirements:

3.3.1.1 Physical Requirements

a. The terminal must come with transportable cases;
b. The terminal, when disassembled, must be transportable using no more than five transportable cases;
c. Each transportable case must weigh no more than 84 lbs (38 kg), as per the two man lift limit from MIL-STD-1472F;
d. Transportable cases must not be wider than 25 inches in any direction; and
e. There must be a minimum of 12 inches of clearance between the lowest movable point on the terminal and the ground when set to a zero degree beam elevation look angle.

3.3.1.2 Operating Requirements

a. The terminal must have X-Band and Military-Ka-Band modular interchangeable Frequency Band Feed Kits (FBFK)s that allow the antenna to switch operation between those bands; and
b. If Civilian-Ka-band and/or Ku-band capable, the terminal must have modular interchangeable FBFKs that allow the antenna to switch between bands.

3.3.1.3 Setup/Acquisition Requirements

a. The terminal antenna must support manual pointing and satellite acquisition while an automatic acquisition feature is desirable;
b. A trained technician must be able to setup, acquire signal, and exchange data in 30 minutes or less;
c. The SATCOM terminal must be capable of pointing to geostationary satellites at any look angle between 0° and 90° above the horizon while on level ground; and
d. Any licenses & software required to operate, configure, control & monitor the terminal must be included in the delivery of each terminal.

3.3.1.4 Performance Requirements

a. The terminal must have a minimum X-Band EIRP of 53 dBW at the P1dB point;
b. The terminal must have a minimum Military Ka-Band EIRP of 60dBW at the P1dB point;
c. If a Ku-Band terminal is proposed, then it must have a minimum EIRP of 58 dBW at the P1dB point;
d. If a commercial Ka-Band terminal is proposed, then it must have a minimum EIRP of 60 dBW at the P1dB point;
e. The terminal must have a minimum X-Band G/T of 16db/K;
f. The terminal must have a minimum Military Ka-Band G/T of 20dB/K; and

g. If a Ku-Band terminal is proposed, then it must have a minimum G/T of 20dB/K.
h. If a commercial Ka-Band terminal is proposed then it must have a minimum G/T of 20dB/K.

3.3.1.5 SATCOM Service Provider Requirements

a. The SATCOM terminal must be certified for use with WGS Satellites, in accordance with MIL-STD-188-164B;
b. The SATCOM terminal must be WGS certified for manual alignment;
c. The SATCOM terminal must be certified for use with Skynet Satellites, in accordance with TX-MA-00136-S-PDGM; and
d. The SATCOM terminal must be capable of transmitting and receiving on non-WGS satellite systems via commercial Ku and Ka bands.

3.3.1.6 User Interface Requirements

a. The terminal must be capable of remote monitoring and tuning, via an IP based GUI or a "remote head" device.

3.3.1.7 Environmental Requirements

a. All testing must be in accordance with MIL-STD-810F.

3.3.1.8 Training Requirements

a. Terminal operator and maintainer training at the “train-the-trainer” level must be provided; and
b. Operator and maintainer training packages must be provided for the development of CAF steady state training courses by personnel having completed the “train-the-trainer” training.
c. Unit-level training packages must be provided for the receiving units to conduct refresher and pre-deployment training.
d. All training materiel developed for steady state operator, maintainer, and unit-level training must be in bilingual format.

3.3.2 “Larger” Terminal Requirements (approx. 2.4 m dish)

To achieve the required capability and adhere to the CONOPS, the one “larger” terminal (approx. 2.4 m dish) must meet the same technical requirements as the smaller dish (Section 3.3.1), with the following exceptions:

3.3.2.1 Physical Requirements

a. The terminal, when disassembled, must be transportable using no more than six transportable cases.

3.3.2.2 Setup/Acquisition Requirements

a. A trained technician must be able to setup, acquire signal, and exchange data in 45 minutes or less.

3.3.2.3 Performance Requirements

a. The terminal must have a minimum X-Band EIRP of 53 dBW at the P1dB point;
b. The terminal must have a minimum Ka -Band EIRP of 60 dBW at the P1dB point;
c. If proposed then a Ku -Band terminal must have a minimum EIRP of 58 dBW at the P1dB point;
d. If proposed, then a commercial Ka -Band terminal must have a minimum EIRP of 60 dBW at the P1dB point;
e. The terminal must have a minimum X-Band G/T of 22 db/K;
f. The terminal must have a minimum Ka-Band G/T of 26 dB/K; and
g. If proposed, then a Ku-Band terminal must have a minimum G/T of 26 dB/K.
h. If proposed, then a commercial Ka-Band terminal must have a minimum G/T of 26 dB/K.

4 ASSUMPTIONS

The modem will be acquired separately as Government Furnished Equipment (GFE) from the approved DND anchor station modem list. To support a SV role and a high-bandwidth return channel, the modem will use full duplex DVB-S2 GES with Adaptive Modulation and Coding.

5 RETURN FORMAT

5.1 Essential Information

Respondents are requested to provide the following information:

5.1.1 General Description of the proposed system

1. **Please provide a general description of your proposed system solution.**
   Respondents are requested to provide a general description of their proposed solution, and any applicable diagrams. Suggested deviations from the CONOPS, CONSUP, Requirements, or Assumptions should be listed, as well as the reason for deviation (e.g. feasibility, optimization).

2. **Please provide specifications for the products included in your proposed system solution.**
   Specification sheets are requested for any products included in the respondent solution. Please include the life expectancy of the equipment, any standards which the terminals have been certified to, and a high-level overview of the Preventative Maintenance (PM) required. The PM list should list the activities required, provide a short description and the required frequency and man-hours.

3. **Please complete the costing information in the Cost Breakdown spreadsheet.**

Respondents are requested to provide an itemized cost breakdown of hardware and services for the five "smaller" terminals and one "larger" terminal in their proposed solution. The enclosed spreadsheet lists all hardware and services that should be included in the breakdown.

4. **What are the recommended training courses, and what is the training cost (train the trainer course)?**
   The answer will provide the cost to provide a train the trainer course for a notional group of eight people. For cost planning and comparison, the answer should include both the options to have the training in Trenton, ON or at the provider location. The training package will include the course itself with all relevant training information and related documentation to enable the RCAF to run training in house afterward.

6 Optional Information

Respondents are welcome to provide the following information:

6.1 Respondent Recommendations

Any recommendations by respondents to the CONOPS, CONSUP, or Technical Requirements described in this document are welcome (optional).

	A	B	C	D
1	**Annex F - Ground-Air-Ground Cost Breakdown Template**			
2	**Equipment Breakdown - Ground/Air/Ground (GAG) Radio System**			
3	**Capability**	**Requirements**	**Quantity**	**Total Cost**
4	**Notional Site (see Note 1)**			
5	**VHF Transmitters**		**13**	
6	Tower Radios	90 NM Range	2	
7	Tx Site Radios	200NM Range	8	
8	PLER Range Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles.	3	
9	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
10	Multi-couplers	Solution based		
11	Cavity Filters	Solution based		
12	Equipment Cabinets	Solution based		
13	Low Power Apparatus	Solution based		
14	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
15	IBBU	Solution based		
16	UPS (rack mounted)	Solution based		
17	Additional Equipment Required (see Note 2 below)	Solution based		
18	**VHF Receivers**		**12**	
19	Tower Radios		1	
20	Rx Site Radios		8	
21	PLER Range Site Radios	Remote over landline/fiber optic/microwave system to six consoles.	3	
22	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
23	Multi-couplers	Solution based		
24	Cavity Filters	Solution based		
25	Equipment Cabinets	Solution based		
26	Low Power Apparatus	Solution based		
27	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
28	IBBU	Solution based		
29	UPS (rack mounted)	Solution based		
30	Additional Equipment Required (see Note 2 below)	Solution based		
31	**VHF Multi-channel Transceivers**		**5**	
32	Tower Radios	90 NM Range	5	
33	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
34	Multi-couplers	Solution based		
35	Cavity Filters	Solution based		
36	Equipment Cabinets	Solution based		
37	Low Power Apparatus	Solution based		
38	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
39	IBBU	Solution based		
40	UPS (rack mounted)	Solution based		
41	Additional Equipment Required (see Note 2 below)	Solution based		
42	**UHF Transmitters**		**42**	
43	AETE Sqn Radios	50 NM Range	2	
44	Tower Guard/AICC Radio	90 NM Range	1	
45	Tx Site Radios	200NM Range	23	
46	PLER 42 Rdr Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles.	8	
47	PLER Range Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles.	8	
48	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
49	Multi-couplers	Solution based		
50	Cavity Filters	Solution based		
51	Equipment Cabinets	Solution based		
52	Low Power Apparatus	Solution based		
53	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
54	IBBU	Solution based		
55	UPS (rack mounted)	Solution based		
56	Additional Equipment Required (see Note 2 below)	Solution based		
57	**UHF Receivers**		**43**	
58	AETE Sqn Radios		2	
59	Tower Guard/AICC Radio		1	
60	Tx Site Radios		23	
61	PLER 42 Rdr Site Radios	Remote over landline/fiber optic/microwave system to six consoles.	8	

	A	B	C	D
3	**Capability**	**Requirements**	**Quantity**	**Total Cost**
62	PLER Range Site Radios	Remote over landline/fiber optic/microwave system to six consoles.	9	
63	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
64	Multi-couplers	Solution based		
65	Cavity Filters	Solution based		
66	Equipment Cabinets	Solution based		
67	Low Power Apparatus	Solution based		
68	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
69	IBBU	Solution based		
70	UPS (rack mounted)	Solution based		
71	Additional Equipment Required (see Note 2 below)	Solution based		
72	**UHF Securable* Transceivers**		**12**	
73	Tx Site Radios	200 NM Range. Securable* means that the radio has the capability to be used with an external crypto device.	12	
74	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
75	Multi-couplers	Solution based		
76	Cavity Filters	Solution based		
77	Secure Equipment Cabinets	Solution based		
78	Low Power Apparatus	Solution based		
79	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
80	IBBU	Solution based		
81	UPS (rack mounted)	Solution based		
82	Additional Equipment Required (see Note 2 below)	Solution based		
83	**UHF Multi-channel Transceivers**		**6**	
84	AFTTC Sqn Radios	200 NM Range.	1	
85	Tower Radios	90 NM Range	1	
86	Rx Site Radios	200 NM Range	2	
87	PLER 42 Rdr Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles at Radar Squadron.	1	
88	PLER Range Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles at Radar Squadron.	1	
89	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
90	Multi-couplers	Solution based		
91	Cavity Filters	Solution based		
92	Equipment Cabinets	Solution based		
93	Low Power Apparatus	Solution based		
94	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
95	IBBU	Solution based		
96	UPS (rack mounted)	Solution based		
97	Additional Equipment Required (see Note 2 below)	Solution based		
98	**Anti-jam Radios**		**8**	
99	410 Sqn Radios	200 NM Range. Must include HAVEQUICK II EPM function and be securable*	2	
100	CADRS Radios	200 NM Range. Must include HAVEQUICK II EPM function and be securable*	6	
101	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
102	GPS Receiver	Quantity solution based. Provide Network Time Reference (NTR) for anti-jam function.		
103	GPS AE	Quantity solution based. Max. 150ft RF link from equipment location.		
104	Multi-couplers	Solution based		
105	Cavity Filters	Solution based		
106	Equipment Cabinets	Specify whether special cabinets are required for ITAR controlled items in unmanned, remote locations.		
107	Low Power Apparatus	Solution based		
108	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
109	IBBU	Solution based		
110	UPS (rack mounted)	Solution based		
111	Additional Equipment Required (see Note 2 below)	Solution based		
112	**Multi-band Transceiver Radios (VHF/UHF)**		**32**	
113	AETE Sqn Radios	50 NM Range.	2	
114	42 Rdr Sqn Radios	200 NM Range.	1	
115	PLER 42 Rdr Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles at Radar Squadron.	19	
116	PLER Range Site Radios	200 NM Range. Remote over landline/fiber optic/microwave system to six consoles at Radar Squadron.	10	

	A	B	C	D
3	**Capability**	**Requirements**	**Quantity**	**Total Cost**
117	AE	Quantity solution based. Max. 150ft RF link from equipment location.		
118	Multi-couplers	Solution based		
119	Cavity Filters	Solution based		
120	Equipment Cabinets	Solution based		
121	Low Power Apparatus	Solution based		
122	AM-6155 Amplifier	Solution-based (10 watts, 50 watts, 100 watts, etc…).		
123	IBBU	Solution based		
124	UPS (rack mounted)	Solution based		
125	Additional Equipment Required (see Note 2 below)	Solution based		
126	**Remote Interfaces**		**32**	
127	Remote Control Units	8 different locations for remote radio users at the site (e.g. WOps)	22	
128	Radio Telephone Unit Interface	Allows North Bay to access radios via PSTN lines.	6	
129	Audio Sharing Unit Interfaces		1	
130	Communications Control Unit Interfaces	2 different locations	3	
131	**Local Remote Control & Monitoring System (RCMS)**		**1**	
132	Local RCMS	Part of the National RCMS connecting all GAG Sites	1	
133	**Additional Hardware (as proposed by vendor)**	**Any miscellaneous items not identified above that could improve availability.**	**?**	
134	AE Masts			
135	RF link Cables	Max 150ft. State type used.		
136	Front Panel Interfaces			
137	Accessories (power strips, associated shelves, cables, mounting hardware, I/O panels, blowers, etc.)			
138	Ethernet Interfaces	E.g., VoIP to ED-137.		
139	Serial (MARC - Data) Interfaces	E.g., RS422 Serial Port.		
140	Analogue (MARC - Voice) Interfaces	E.g.., 4-wire E&M 600 ohm audio.		
141	E1/T1 Interfaces	Based on E1/2.048 Mbit/s and T1/1.544 Mbit/s.		
142	Loudspeaker Interfaces			
143	Common Connector Layout Interfaces			
144	**Spares**		**10%**	
145	Spares for all hardware	10% unless otherwise recommended by the vendor.	10%	
146				
147	**National Level Equipment**			
148	**National Remote Control & Monitoring System (RCMS)**		**4**	
149	National RCMS	National RCMS connecting all ATC Sites. 4 National Level management locations required (Ottawa, Trenton, North bay, and Winnipeg).	4	
150	**Special Tools & Test Equipment (STTE)**	**Recommended special tools and test equipment (STTE)**	**2**	
151	STTE - 2nd Line (mini Depot)	Maintenance at a mini-depot / maintenance center for No Fault Found prior to shipping to OEM technical support facility for repair.	2	
152	Recommended STTEs	Any additional recommended STTE.	?	
153				
154	**Total Radio Quantity Costing (see Note 5)**			
155	VHF Tx	200 NM Range	115	
156	VHF Rx		105	
157	VHF Multi-Channel Txcvr	200 NM Range	23	
158	UHF Unclass Tx	200 NM Range	373	
159	UHF Unclass Rx		374	
160	UHF Securable* Txcvr	200 NM Range. Securable* means that the radio has the capability to be used with an external crypto device.	88	
161	UHF Multi-Channel Txcvr	200 NM Range	24	
162	HAVEQUICK II Anti-jam Radios	200 NM Range. Must include HAVEQUICK II EPM function and be securable*	73	
163	SATURN Anti-jam Radios (see Note 6)	200 NM Range. Must include SATURN EPM function and be securable*	73*	
164	Multi-band Txcvr (VHF/UHF)	200 NM Range	51	
165	Shipping Costs	See Note 7	1226	
166				
167	**Notes to be considered in your Quantities and Cost**			
168	*1. This notional site is the most complicated example in the National GAG System, requiring a variety of radio capabilities (VHF, UHF, multi-band, Rx, Tx, Transceivers, Securable*, and anti-jam) at a variety of sub-sites (Tx site, Rx site, Sqns, and*			
169	*2. Pricing for a "turn key system" (end-to-end) comprised of the following: Antenna + RF Link + Radio + full-equipped Cabinet including UPS+ Remote Communications Unit, and all required accessories, related software, and additional hardware*			
170	*3 Please provide an itemized hardware cost estimate for a 173 radio system site, including sub-components of the major parts (e.g., Radio, 150 Ft of RF Link, RCU, etc.).*			
171	*4. Consideration shall be given to Total Cost of Ownership (TCO) while ensuring availability and performance.*			
172	*5. In order to estimate the complete radio system cost, please provide the cost for all radios for the entire radio system (quantities are based on Table 1 - Radio System Capability Summary from the RFI). This does not include all ancillary equipment*			
173	*6. Anti-jam radios must be HAVEQUICK II capable, and there will be a rated requirement for SATURN capability. A total of 73 anti-jam radios are required, but for costing options purposes the vendor is aksed to provide the cost for 73 HAVEQUICK II*			

	A	B	C	D
3	**Capability**	**Requirements**	**Quantity**	**Total Cost**
174	*7. Please provide the shipping costs for all radios being shipped to the locations listed in the RFI - Annex A - Table 1 (the total number of radios includes 73 HAVEQUICK II or 73 SATURN radios, not both).*			

Service Breakdown - Ground/Air/Ground (GAG) Radio System					
Capability	**Requirements**	**Quantity**	**Hours Required**	**Labour Type**	**Total Cost**
Entire GAG Radio System (see Note 1)					
Installation Services					
Site Activation Coordination	Teleconferences, 1 kick-off meeting.				
Site Readiness Review	2-day meeting at Vendor's office.				
Installation	Contractor-lead.				
Site Acceptance Test	See Note 6				
Travel and Living Expenses	Expected travel and living expenses.				
Connect local site to National RCMS					
Program Management					
Contractor Program Management Service					
Maintenance Support					
Warranty	Include time around for repairs.				
Support Services					
HelpDesk Support	Telephone support (24/7), Web Access, Emails, Etc.				
Field Service Rep services (on-Site)	1 trip/3 days.				
Spare Parts (Initial)	Recommended initial spare part list.				
Engineering Services					
Design of the "Notional Site"	Survey (including RF), analyze, and provide a design of the Notional site to optimize radio system performance.				
Design of the GAG Radio System	Design of the complete GAG Radio System.				
Design of AD Radio System	Design of the AD portion of the GAG Radio System.				
Training Services/Package					
Operator Training - 10 candidates	Train-the-Trainer Approach.	2			
Operator Training Package	Training package to include briefing package and user manual.	2			
Maintainer Training - 10 candidates	Train-the-Trainer Approach.	2			
Maintainer Training Package	Training package to include briefing package and user manual.	2			
Technical Data Package					
Operator Manual(s)		11			
Maintenance Manual(s)		11			
Technical Data Package		1			
Selected GAG Radio Sites					
Notional Site Installation Services (see Note 2)					
Site Activation Coordination	Teleconferences, 1 kick-off meeting.				
Site Readiness Review	2-day meeting at Vendor's office.				
Installation	Contractor-lead.				
Site Acceptance Test	See Note 6				
Travel and Living Expenses	Expected travel and living expenses.				
Connect local site to National RCMS					
Trenton Site Installation Services (see Note 3)					
Site Activation Coordination	Teleconferences, 1 kick-off meeting.				
Site Readiness Review	2-day meeting at Vendor's office.				
Installation	Contractor-lead.				
Site Acceptance Test	See Note 6				
Travel and Living Expenses	Expected travel and living expenses.				
Connect local site to National RCMS					
Petawawa Site Installation Services (see Note 4)					
Site Activation Coordination	Teleconferences, 1 kick-off meeting.				
Site Readiness Review	2-day meeting at Vendor's office.				
Installation	Contractor-lead.				
Site Acceptance Test	See Note 6				
Travel and Living Expenses	Expected travel and living expenses.				
Connect local site to National RCMS					
Hinton CADRS Site Installation Services (see Note 5)					
Site Activation Coordination	Teleconferences, 1 kick-off meeting.				
Site Readiness Review	2-day meeting at Vendor's office.				
Installation	Contractor-lead.				
Site Acceptance Test	See Note 6				
Travel and Living Expenses	Expected travel and living expenses.				
Connect local site to National RCMS					

NOTES - To be consider in your Quantities and Cost
1. Please provide an itemized services cost estimate for the entire GAG Radio System. See the "Radio System Capability Summary" table in the RFI for a list of all GAG Sites and radio
2. Please provide an itemized installation services cost estimate for the Notional GAG Radio Site. See the "Radio System Capability Summary" table in the RFI for a list of radio capability
3. Please provide an itemized installation services cost estimate for the 8 Wing Trenton Site. See the "Radio System Capability Summary" table in the RFI for a list of radio capability
4. Please provide an itemized installation services cost estimate for the 427 Sqn Petawawa Site. See the "Radio System Capability Summary" table in the RFI for a list of radio capability
5. Please provide an itemized installation services cost estimate for the Hinton CADRS site. See the "Radio System Capability Summary" table in the RFI for a list of radio capability
6. Site Acceptance may require an iteration of testing (conducted by the vendor, under supervision by DND) and rework (on the part of the vendor) until successful SAT criteria (yet to be

Annex G - SATCOM Terminals Cost Breakdown Template

Items Purchased	Price ($ CAD)	Quantity	Total Cost
Hardware			
SATCOM Smaller terminal (~1.4m)		5	
SATCOM Larger terminal (~2.4m)		1	
Service and Support			
Spares: SATCOM Smaller terminal (~1.4m)			
Spares: SATCOM Larger terminal (~2.4m)			
Maintenance: SATCOM Smaller terminal (~1.4m)			
Maintenance: SATCOM Larger terminal (~2.4m)			
Training			
SATCOM Trg small terminal 1.4m - Course and trainer travel expenses		1	
SATCOM Trg small and large terminal 2.4m - Course and trainer travel		1	
Total			
		Total	

Notes
1. Hardware costs must include the cost of all equipment, including FBFKs, spoke kits, cables, licences, and software.
2. The modem will be provided as GFE, so please do not include a modem in the cost breakdown.
3. Vendors may recommend the necessary level of spares.