Report on a Database of CSC Potential Suppliers

Prepared for:

Atlantic Canada Aerospace and Defence Association

Submitted by:

CFN Consultants (Atlantic) Inc.
1701 Hollis Street, Suite 800
B3J 3M8

ACADA
CSC Supplier Data Base Project
Report- Phase 1

Introduction

1. The Atlantic Canada Aerospace and Defence Association (ACADA) is interested in acquiring better information to inform the ongoing development of business development strategies that will result in more rapid growth of member companies that wish to access supply chains linked to Major Crown Projects (MCP) including the Canadian Surface Combatant (CSC) program. It is recognized that timely, accurate and relevant information on companies who are potential suppliers to the prime and Tier One contractors of many of these projects is a critical component of the support that ACADA can provide its members interested in becoming part of the supply chain for a particular program.

2. ACADA's member ship includes companies that produce advanced goods and services for the military for use on land, air, and sea as well as commercial aircraft, engines, propulsion units, auxiliary equipment, and parts. Other members work in related sectors such as Ocean Technology and the Marine Industries and Shipbuilding sectors.
In order to advance this ACADA initiative, the Association has determined that it intends to use the CSC project as Phase One of three phases Phase One can be considered as a pilot project to determine opportunities for its membership. Follow on phases will focus on other complex MCP's.

3. By selecting the CSC as Phase One of this project, ACADA has recognized that it is the project most relevant to its membership at the moment. Given the complexity of the CSC project, which is now underway with a competition to determine which of 12 contending companies will provide the initial design of the CSC and its Combat System, it has been difficult for ACADA's members to access the Prime Contractor –Irving Shipbuilding Incorporated (ISI) and the potential Tier One companies who will provide the ship design and the combat system integration. It is just as difficult to access the Tier Two suppliers that will provide weapon, sensor and ship systems required for the successful design. ACADA, reflecting the concerns of its members and its own assessment that local companies need to focus further down the supply chain, has decided to develop a data base on the potential suppliers to the CSC particularly at the Tier Two, and Three levels.

Purpose

4. The purpose of this database is to provide a listing of the potential suppliers to major crown projects that will be used as a tool to assist member companies in accessing complex supply chains with a focus on lower tier suppliers to these major crown projects and in assisting companies in developing a Value Proposition that will be of interest to MCP Supply chains whose participants will incur ITB obligations.

Tasks

5. . The Statement of Work(SOW) for this project required the database include the following:

   a. Company name, address and contact information:
   b. Region (as described in ITB policy)
   c. Relevant Tier Level
   d. Description of operations and products and/or services offered
   e. Sub-sector e.g. Combat Systems, Ship Systems etc
   f. Company specialization, expertise and other lines of business
   g. Key Industrial Capabilities-Released on a project by project basis as part of an RFP. They will be included in each RFP in the form of an Enhanced Priority Technical List (EPTL) that is project related. As such, it will not be possible to include this in the database at this point.
   h. ITB Requirements

6. Other requirements of the SOW include the following:
   a. Identify all pre-qualified companies who are currently developing their proposals
   b. Assess potential for teaming among those companies
   c. Identify each team's potential high level suppliers including Canadian companies
   d. Develop a generic high level list of requirements for major systems and sub-systems in the potential designs, grouping them into logical groupings and sub-groupings such as Combat System, Hull and Fittings, Main Propulsion System etc

Methodology

7. **Database**. In order to fulfill the purpose of Phase I of this project to create a database, a number of sources were accessed to provide the data required including various industry association membership databases, in house databases, websites, various publications and related sources. The list of companies includes some from all regions of the country with the exception of the territories. However, ACADA members, by and large have not been included as it is considered that they would be aware of the capabilities of their fellow members. . Furthermore the list is not considered exhaustive, but it does represent a good cross section of the relevant companies from coast to coast. The database, which is attached as a separate Excel table includes the information listed in paragraph 5a as required by the SOW. The following notes will assist in interpreting the information listed in the table:

a. The address and contact information is based on the company's primary location of its business operations in Canada and the main contact at that location. Most of the contacts listed work within the Business Development section or in the case of smaller companies, senior executives are included. Their classification is self explanatory and is related to the type of work these companies can be expected to pursue on the CSC project. In some cases, the companies listed do not have significant operations in Canada at the moment, but most do have Canadian offices through which they carry out their proposal development. Again, the products or services these companies offer are self explanatory and include products and services they could expect to deliver to the CSC project.

b. The Department of Innovation, Science and Economic Development (ISED) has identified specific regions across Canada that are applicable to the Industrial and Technological Benefits policies. The regions are as follows:
   i. Atlantic Canada(AC)- Newfoundland and Labrador, Nova Scotia, New Brunswick, Nova Scotia and Prince Edward Island. The Atlantic Canada Opportunities Agency (ACOA) promotes the region within the Federal Government.
   ii. Quebec (QC). The Economic Development Agency of Canada for the Regions of Quebec (CED-Q) promotes the region within the Federal Government.
   iii. Southern Ontario (SO) -Ontario south of Sudbury including Toronto. The Federal Economic Development Agency for Southern Ontario (FedDev Ontario) promotes the region within the Federal Government.
   iv. Northern Ontario (NO)- Ontario north of Sudbury including the Muskoka region. The Federal Economic Development Initiative for Northern Ontario (FedNor) promotes the region within the Federal Government.
   v. Western Canada-Manitoba, Saskatchewan, Alberta, and British Columbia. The Western Economic Diversification Canada (WD) promotes the region within the Federal Government.

c. Companies are identified as Tier One to Tier Four. While the definitions of each tier can vary, the following guidelines have been used to determine to which tier a company belongs:
   i. Prime Contractor- Overall responsibility for managing and delivering the project. For CSC, the Prime has been identified as Irving Shipbuilding Inc.
   ii. Tier One- Responsible for either one or both of the key elements of the reference design, namely Warship Design or Combat Systems Integrators. In some cases, such as BAE or LM, they could also provide complete systems or sub-systems and could be considered as Tier Two or Three suppliers.
   iii. Tier Two- Supplies major systems either to the Prime or Tier One supplier who then integrate that system into the ship or combat system
   iv. Tier Three- Supplies complete or partial sub-systems to the higher Tier suppliers
   v. Tier Four – Supplies parts and material to the higher Tier suppliers. Also, they could provide lower level assemblies such as wiring harnesses.

d. The table also identifies potential ITB obligations that each company may incur. In general, only Tier One and Two suppliers will incur such obligations, but that will depend on the level of obligations flowed down by the Prime Contractor and

the Tier One contractors.

e. There is a second tab to this table labelled as current Reference Design Suppliers. This table identifies each one of the designs that are expected to be submitted to the Government and ISI as part of the individual proposals. In order to limit the costs and risks associated with modifying the designs to meet Canadian requirements, it is expected that the Warship Designers and their CSI partner would work with their existing supply chain, particularly for combat systems and high level main propulsion systems. This table includes most of the known suppliers to each Warship Design team, some of whom already have Canadian subsidiaries. These known suppliers will incur ITB obligations, which will require them to identify transactions to address those obligations.

8. This report includes a number of tables that address the requirements of the SOW. While the tables are generally self explanatory, the following notes may assist in their interpretation.

a. **Table 1** includes those potential suppliers for the CSC project approved by the Government of Canada earlier in the project. The suppliers include companies that focus on warship design, those whose main role is combat system integration or those such as BAE or DCNS that can perform both roles.

b. **Table 2** identifies teams that may have formed that would allow the team to submit a comprehensive proposal that addresses all of the requirements. Initially, the Government had discouraged the formation of such teams, but appears to have accepted the reality that a team will be better placed to respond to the RFQ. It should be stressed that not one of the teams has been formally identified so this table represents our best assessment of what teams have been formed.

c. **Table 3** offers an assessment of the high level requirements of the CSC project. In the case of most complex procurements, the Government of Canada does not release the Statement of Requirements (SOR) to anyone except the approved bidders. This table represents our best assessment of the requirements based on an examination of publicly available documentation, material provided during government briefings, and other sources. It does not purport to be exhaustive, but should be considered as representative as a summary of the high level requirements. Most SOR's issued by DND tend to be highly prescriptive and specify requirements down to the lowest possible level where appropriate.

d. **Table 4** provides a list of those Canadian technologies that the Government of Canada has identified as being applicable to the CSC project. The release of this list generated a number of negative comments from industry and industry associations. Most commentators did not think that the list offered a comprehensive overview of the technologies available from Canadian industry. Some compared it negatively to the last major shipbuilding program in Canada, when the Government specified that the design must include a number of technologies developed by DRDC in conjunction with Canadian industry. Many of those companies are now supplying technologies base on the CPF program to navies around the world. Unfortunately, the procurement strategy selected by the Government did not allow for the inclusion of designated Canadian developed systems in the CSC project.

Market Opportunities

9. During the past few years, the Government of Canada has made it clear that it sees defence procurement as an opportunity to stimulate the economy and in so doing encourage innovation. The previous government introduced a new Defence Procurement Strategy (DPS) that was intended to transform defence procurement through the introduction of a rated Value Proposition applicable to every MCP with a value of $100M or more. As part of that policy, all bidders were required to submit plans focused on defence, Research and Development, Small and Medium size enterprises (SME) and exports. For Atlantic Canada, this policy was important because of the predominance of SME's in the region's economy, particularly in the defence sector.

10. While it cannot be ascertained in detail, it is anticipated that the Value Proposition will play a key role in the Phase One evaluation of the compliant bids. It is understood that bidders have been sending out RFP's across Canada in selected areas to obtain cost and delivery data on a number of systems, mostly those identified in Table 4. It appears that the Value Proposition will comprise 25% of the total score for Phase One. The two bidders with the highest score in Phase I plus those within 5 points of the second highest score will advance to the next phase where the bids will be examined in detail for compliance with the technical specifications, design maturity, software approach and capacity. Scores at Phase two will be combined with those from Phase 1 to determine the winner who will be awarded a design contract.

11. Based on reports to date, it is understood that the Value Proposition is intended to motivate investments that will increase Canada's advanced manufacturing capability in any sector of the economy. Given that approximately 15% of the ship's systems other than the hulls will actually consist of Canadian designed, developed and built systems and ship systems, direct opportunities for Atlantic Canadian companies will perforce be limited. However, it should be noted that the Government of Canada expects the successful bidder to achieve the following objectives:

    a. Maximize the amount of professional services to be performed in Canada by Canadians directly on the Canadian Surface Combatant, including design, engineering, integration and project management
    b. Maximize the amount of manufacturing activity undertaken in Canada by Canadians to produce and, in some cases maintain, systems and equipment
    c. Provide additional supplier development opportunities for Canadian companies to obtain work in areas outside of the Canadian Surface Combatant procurement, in any sector of Canada's economy
    d. Create new export opportunities for companies in Canada in any sector
    e. Invest in research and development in Canada in any sector

    The intentions of the Government to distribute ITB's to any sector of the economy would suggest that ACADA members should be open to proposing any relevant advanced technologies and capabilities to the winning bidder and not necessarily just those relevant to defence. Ocean technology, a sector in which Atlantic Canadian companies

are particularly strong should be one of those technology areas of interest to the successful bidding team.

12. In addition, in keeping with In keeping with the government's broader objectives under the National Shipbuilding Strategy and Innovation Agenda, bidders have a particularly strong incentive to make supplier, export and research and development commitments that align with government priority areas: in clean technology; cyber security; and the marine sector. For Atlantic Canada, this approach offers some real opportunities but not necessarily in the defence sector. Furthermore, while bidders must submit a complete VP with their submission, it only has to include 30% as firm commitments, with indications of how they plan to achieve the remainder. Once the successful bidder is identified, that company will then have to identify transactions to satisfy its commitments. If local companies were not included in the original bid, they will have a chance after the winner is announced. Moreover, announcement of the successful bidder will also include the selection of the ship design and the identity of many of the combat and machinery systems that will be installed in the ship. This will provide another source of potential work as most of those suppliers will have ITB obligations flowed down to them from the Prime Contractor. With the expected duration of the CSC programme of more than 20 years, the foreign suppliers can be expected to look to invest in Canada either by utilizing existing subsidiaries, or by establishing new subsidiaries or by transferring technologies to Canadian companies.

13. In 2013, the report on Leveraging Defense Procurement through Key Industrial Capabilities, otherwise known as the Jenkins Report, proposed that defence procurement be used to promote the Canadian Defence Industry through a focus on Key Industrial Capabilities (KIC). Selection and identification of KIC's would be assessed against three perspectives leading to criteria:
    a. Specific needs identified by the Canadian Forces—the operational requirements perspective.
    b. Success in penetrating global markets—the market opportunity perspective.
    c. Potential for new or improved (i.e. innovative) products—the innovation perspective.
Rather than waiting for a lengthy period of analysis, the Jenkins Report proposed six KIC clusters for consideration by the Government that would be updated following detailed analysis as follows:
    a. Arctic and Maritime Security
    b. Protecting the Soldier
    c. Command and Support
    d. Cyber-Security
    e. Training Systems
    f. In-Service Support
While relatively little has been heard of KIC's recently, there is little doubt that the inclusion of one or more KIC's in a value proposition will enhance the acceptance and thus a higher score for the VP. Fortunately, many Atlantic Canadian firms are active in most of these clusters, a point that should be emphasised in their marketing strategy.

Business Development Strategy

14. Given the situation outlined above, the following factors should be considered in developing a business development strategy related to CSC for both ACADA and its member companies:

   a. Accessing the existing ISI supply chain can be difficult, but it can be done. But in order to do so, companies must first register on the ISI supplier website, paying particular attention to the list of technologies contained in Table 4. Obtaining Controlled Goods Certification is a necessity for obtaining work on the CSC as is ISO 9001 registration. Government assistance is available to obtain these certifications.

   b. Companies should also register on the supply chain websites of all of those potential suppliers to the various designs listed at Tab 2 to the Database. These companies will be looking for Atlantic Canada suppliers to address their ITB obligations.

   c. Companies need to assess their key strengths and weaknesses relative to the list in Table 4, and identify potential opportunities. The company's BD plan can then use this analysis as the basis for developing a strategy going forward.

   d. It will be easier to determine those companies that may be in the ultimate CSC supply chain once the winner has been announced. However, companies should not wait for that decision, which may not happen until late in 2018. In the meantime, ACADA members will need to take action now to ensure that the potential suppliers are aware of their capabilities.

   e. In addressing opportunities for CSC, companies then need to formulate the key messaging needed to convince the target that they have the capability, capacity, management team and past record to deliver the products on time, on budget with the high quality expected for this programme. It is expected that more supplier development events will be held in Atlantic Canada during which ACADA members will have an opportunity to deliver their message in 15 minutes or less, which means that the message must be clear, focused and succinct such that the target company will want to arrange a follow on meeting. These events should be considered as essential to attend.

   f. In preparing their messaging strategy, firms should address KIC's as well as the application of their key technologies to the government's priority sectors of clean technology, cyber security and the marine sector.

   g. The database attached to this report has identified a number of Tier One and Two suppliers who may be part of the winning bidder's supply chain. These companies should be considered as key opportunities that will need a focused and individualized pursuit strategy.

   h. Given the focus on reducing cost and minimizing risk, ACADA member

companies should consider teaming with other members in order to offer complete assemblies or sub-assemblies to the selected CSC team. While it is recognized that such arrangements can be complex, particularly with regard to which company will be the lead for the contract, they should be pursued as such arrangements may offer a better chance of being selected for ITB obligations. Going up the supply chain is a good strategy for all SME's to pursue.

    i. Foreign companies may be open to developing teaming agreements with local companies that would enable them to produce components or larger assemblies to weapon systems that foreign suppliers wish to sell to Canada. These arrangements would include technology transfer and the opportunity to participate in global supply chains. Again, while these arrangements may be difficult to develop, they offer significant benefits to both parties.

    j. ACADA has an excellent relationship with ACOA that works to the benefit of all members. ACOA is an excellent source of contacts with both Canadian and foreign firms and is always willing to assist local companies in their business development. Thus ACOA should always form part of a company's BD strategy.

Workshop

15. To date, ACADA's intentions with regard to communicating the results of this project have yet been determined. But one possibility would be to hold a workshop with interested members to discuss the key findings to include a round table to discuss best practices for developing an effective business development strategy. If this recommendation is accepted, it is suggested that this workshop be held before DEFSEC Atlantic to be held in early September, which would assist members in their BD efforts at the show.

Conclusion

16. As requested by ACADA, the attached database and tables offer members an insight into the CSC project and the competition that is now underway. Anecdotal evidence suggests that SME's with some exceptions have had some issues with obtaining work from ISI on the AOPS project. It is important that a similar situation does not occur with CSC. It is hoped that this database will assist ACADA members in developing targeted business development strategies to access CSC opportunities over the next twenty years or so.

17. The release of the Defence Policy Review earlier in June has updated the budget for CSC to a more realistic level that should ensure that the project moves forward in the future. The DPR also stressed the role of SME's as playing a key role in the defence industrial base, but key government departments involved in defence procurement need to be reminded of this element of the DPR on a regular basis, which is considered a key role for ACADA in its advocacy role on behalf of its members.

Tables:

1. List of Approved CSC Bidders
2. CSC Teaming Arrangements
3. CSC High Level Requirements
4. Canadian Technology Areas

Table 1

CSC Approved Bidders

Company	Role	Nationality	Canadian Presence
Alion Science and Technology Corp	Warship Designer(WD)	US	Yes. Major design and engineering office
Atlas Elektronik GmbH	Combat System Integrator	Germany	Yes. Limited presence, mainly BD personnel
BAE Systems Surface Ships Ltd	WD &CSI	UK	Yes. Extensive support to RCN on submarines
DCNS SA	WD &CSI	France	Yes. Limited presence for BD as well as participation in Bay of Fundy hydro project
Fincantieri S.p.A. Naval Vessels Unit	WD	Italy	No. Employs consultants
Lockheed Martin Canada	CSI	Canada	Yes. CSI for HCM as well as for original CPF.
Navantia SA	WD	Spain	No. Employs consultants
Odense Maritime Technology	WD	Denmark	Yes. Limited presence in Halifax in support of AOPS project.
Saab Australia Pty Ltd	CSI	Australia/Sweden	No. Parent company has Cdn subsidiary to support HCM.
Leonardo S.p.A.	CSI	Italy	No.
Thales Nederland B.V.	CSI	Holland	Yes. Works through Canadian subsidiary
ThyssenKrupp Marine System GmbH	WD	Germany	Yes. Limited engineering and

			BD team to support JSS

Table 2

CSC Teaming Arrangements: Very little public information on teaming arrangements has been released. The following data has been compiled from a variety of sources:

Companies	Proposed Design	International Experience	Comments
LMC/BAE	Type 26	None with this design. Under contract to RN to build first 3 of projected 8. Competing for RAN SEA 5000 project	Originally, any design proposed for CSC was supposed to be in service and at sea. Requirement was relaxed to include Type 26
DCNS	FREMM	In service with French Navy. Air Defence versions sold to Morocco and Egypt.	Combat system provided by DCNS with weapons and sensors from number of suppliers including Thales. It is probable that DCNS will offer the Italian FREMM, designed and built by Leonardo, which is larger and is considered more robust
OMT/Thales	Ivor Huitfeld	None to date, but ship in service with RDN.	OMT may work with Huntingdon Ingalls and Raytheon on this project
Alion Technologies	TBD. Royal Dutch Navy De Seven Provincien may be	None to date, but 4 AAW frigates built	Alion is viewed as a long shot, but they are the

	proposed. Also, USCG National Security Cutter design	for RNLN early in this century.	design authority for the Seaspan OFSV now under construction for the CCG.
TKMS/Atlas	Type 125. Under construction for German Navy	None to date	There have been suggestions that TKMS may not respond to the RFP
Navantia/SAAB	Derivative of F105 Class now under construction for Spanish Navy	5 F104 derivative AAW frigates for Norway. 3 AWD for RAN	The F104 AWD with many F105 modifications considered a good fit for RCN requirements.

Table 3
CSC High Level Requirements: High level requirements for CSC have not been publicly released but it is assessed that the following will be included. It should be noted that the following list does not purport to be comprehensive, but is meant to be representative for the use of ACADA member companies to assist them in identifying potential opportunities:

	System	Sub-System	Components and sub-assemblies	Cdn Supplier
A	**Combat Management System**			
1		Command and Control, networked processing, mission system management and custom software to meet Canadian requirements	Processors -Redundant fibre network -Weapon / sensor data distribution system -Server Racks (Real Time & Non Real Time) -Network Switches -Video Distribution Racks/Servers -Control & Montioring / Maintenance Terminal -Large Screen Displays -CMS Worskstations -Electronic Stateboards -Data Recording & Analysis Equipment	Yes
2A	**Integrated Communications and Data Systems**	Integrated internal communications systems	-Internal phones -Comms terminals -Public Address -Alarms -Wireless/portable communications -Entertainment system -Ships Clock -Processing equipment -Red/black distribution -Routers -Switches	Yes
2B		Integrated external communication systems	-UHF Tx/Rx, - HF Tx/Rx, -VHF Tx/Rx,	Yes at the highest level, but compone

			-Satellite Communications systems, - Integrated switching and antennae control systems -Mulitplexers /Demutiplexers -Visual communications, including lights, flags, -Portable systems for internal and external communications, -Battle Damage Control System -Emergency internal communications as part of BDCS	nt systems such as UHF are not built in Canada
3		C4I System (Command Support System)	C4I System separate from CMS, but hosted at CMS consoles. Hosts databases, applications and planning / support tools for CMS operators. -Multi-level security networks, switches, servers and routers for Command Support System -Planning aids and applications -Database licenses	Yes, but some high level equipment may only be available from foreign sources
4		Multi Link System (processor)	-Below deck equipment for merging Link 11, 16, and 22 feeds, encryption and decryption, system processing, power -Antennas (if separate from External Comms) -System Processing Cabinet	Some elements may be available in Canada
5		Integrated multiple computer link systems including Link 11, 16 and 22	-Link 11: -Data Terminal Set -Data Encryption Device (KG-40) -Interface Unit -Remote Panel -Link 16: -Network Control Cabinet	No

			-Class 2 Data Cabinet or MIDS Cabinet -Link 16 Antenna -Link 22: -Operator Interface System (TDS/DLP) -SNC Processor Hardware -Signal Processing Controller (SPC) -Data Encryption Device (KG-40) -Interface Unit -Remote Panel	
6		Encryption systems for all communication systems		No
B	**Above Water Warfare(AWW)**	Combination of Passive, and Active Sensors, AAW Weapon Systems, ASuW and Land Attack systems , including Cooperative Engagement Capabiliry		
1		Box Launchers	-Launcher -Below deck equipment for system processing and power -Local control and maintenance panel -Mission planning system software and licence	No, but could have some local content
2		Close In Air Defense System (CIADS)	-CIADS mount -Ammunition magazine -Below deck equipment for system processing, power and environmental control -Local and remote control panels	No
3		Fire Control systems for missile, gun and related systems	-Radar arrays -Below deck equipment for system processing, power, and environmental control	No

4		EO/IRST - AAW Defense	-IRST sensor -Cameras -Local control and maintenance panel -Below deck equipment for system processing, power, and environmental control	Yes
5		Long Range Search 3 D Radar with track/scan capabilities and IFF(AESA preferable)	-Radar Antenna Arrays -Radar below deck equipment including: -System Processing Cabinets -Data Processing & Control Cabinets -Power & Distribution -Environmental Control -Maintenance Console (Laptop)	No
6		Medium Range Surveillance Radar	-Radar arrays -Below deck equipment for system processing, power, and environmental control	No
7		Non-acoustic periscope detection	-Radar arrays -Electronic equipment racks -Cooling -Remote control panel	No
8		Secondary Gun System for land attack, ASuW, and secondary AAW	-Secondary Gun Mounts including barrels -On-mount Ammunition Loading System -On-mount EO/IR sighting system including sensors -Remote control consoles -Local control panels -Below deck equipment for system processing, and power (including electronic equipment racks) -Safe to Rotate & Safe to Fire Switches	No
9		Vertical Launch System for medium range AAW, short range AAW and ASuW and land attack missiles	VLS Launch Cell Modules including Launch Controllers and Sequencers -Deluge system (if applicable)	No

			-Exhaust Control System -Local control and maintenance panels -Below deck equipment for system processing, power, and environmental control -Maintenance terminal -Safe to fire switches	
10		Missile Systems	- Long range SAM, with VLS for both missile systems -Short range self defence SAM	No
11		Self Defence Systems	-Remote weapon Systems for small arms including local ammunition storage and below decks control and electrical supply racks	Yes
12		Ammunition Elevator	-Electric/Pneumatic Motor -All doors/hatches -Carriage/car -Guide Rails -Control System	
13		Checkfire & Warning System	-Checkfire & Warning System -Firing circuit interrupts -Weapon veto panels -Weapon status panels -Electric relays in weapon firing circuits -Fire enable key switches.	
	Electronic Warfare	Integrated Electronic Intercept, Electronic Attack and Countermeasures systems		
1		Electronic Support Measures (ESM) Radar	-Antenna arrays -Software libraries -Below deck equipment including: -System processing -Operators Console -Power & Distribution -Environmental control -Maintenance Console (Laptop)	Yes

2		Active Electronic Attack (ECM) to jam communications, sensors and missile seeker head systems	-Antenna arrays -Technique and library software -Below deck equipment for system processing, power, and environmental control	No
3		Passive Electronic Attack to decoy ASSM and ASM seeker heads Communications Intercept, threat analysis, signals intelligence Cyber Warfare capability	-Antennas -Below deck equipment including: -Electronic Equipment Racks - Operators Console -Power & Distribution -Maintenance Console (Laptop)	Some available in Canada
4		Off board Decoy Systems	-Below deck equipment including: -Electronic Equipment Racks - Operators Console -Power & Distribution -Maintenance Console (Laptop	No
5		Cyber Warfare Capability- Offensive and Defensive	-Passive Intercept and analysis -Offensive and defensive analysis capabilities with active defensive capabilities -Software to provide required capabilities	Yes
6		EW Laser Sensors and Countermeasures	-Laser Dazzler -Electronic Equipment racks --Laser Warning Receiver Sensors	Yes
7		E	-	
C	**Underwater Warfare (UWW)**	Combination of active and passive sonar systems, all to be integrated with CH 148 Cyclone		
1A		Active Sonar: - Hull Mounted Sonar - Mine Avoidance sonar	-Sonar Domes -Retraction gear -Sonar transducer -Remote control panel -Below deck equipment for system processing and power	Yes

1B		Towed Low Frequency Active Sonar	Includes Passive Array -Active Transmitter (body or array) -Electronics Equipment Racks -Launch and Recovery equipment and controls -Local Control Panels -Winch	Yes
2		Passive Sonar: - Towed Array Passive sonar combined in bistatic system	See 1B above	Yes (after UWSU)
3		Launch System for passive and active sonobuoys	-Launcher -Electronic Equipment Racks –Sonobuoys -Local and Remote control panels -Sonobuoy lockers	Yes
4		Sonobuoy Processing System	-VHF Antenna -Electronic Equipment racks (Could be integrated into acoustic processing system for all acoustic data)	Yes
5A		Weapon Systems: - Launched torpedo hard kill weapons - Torpedo Acoustic Countermeasures Systems including towed decoys	-Launcher -Below deck equipment for system processing and power -Ammunition storage -Local control panel -Local Ammunition lockers	No
5B		Torpedo Launchers and handling system	-Pneumatic/Electric Motor -Traversing Rails -Electrical Control System (if applicable) -Traversing Assembly -Torpedo Chocks Double Surface Vessel Torpedo Tubes -Torpedo Launch Controllers -Local Control and Maintenance Panels -Torpedo Loading Crane Torpedo stowage racks	No

6		AWW Integrated Combat Management System	-Advanced integrated signal processing system for all acoustic data -Advanced Acoustic Display and analysis system integrated with CMS	Yes
E	**Main Propulsion System**	Integrated Propulsion System, with electric drive transmitting power to the shafts through precision reduction gearing		
1A		Diesel Engines	-Diesel engines inc. turbo, intake filters -Local control panels with remote interface access for IPMS -Engine Emissions Control System (IMO Tier III, Selective Catalytic Reduction system)	No
1B		Electric Propulsion	-Electric motors -Frequency converters or transformers for propulsion power conversion -Control panels -Propulsion power isolation equipment -Internal thrust bearing -Propulsion switchboard	Some may be available
1C		Gas Turbine	-Gas turbine unit -Gas turbine enclosure -Mounting arrangements for GT unit within enclosure -Local control panel with remote interface access for IPMS -Local fuel management systems	No
2A		Integrated Platform Management System(remote and local control)	-Combined Instrument Panels -Consoles -Integrated Control Systems -Portable Ship Control Units	Yes
2B		Degaussing System/Management	Degaussing control system, including:	Yes

			-Interface to INS and/or GPS for positional and motions/attitude data -Interface to or internal geomagnetic database -Power control equipment for managing coil power settings -Interface to IMPS for calibration control, or stand alone calibration interface	
3		Shafts and propellers	-Stub shafting between prime movers and gearboxes -Main shaftline assemblies -Propellers -CPP hydraulic systems -Clutches -Flexible couplings -Thrust bearings - Grounded Main shaft bearings -Stern tube seals /Stuffing box -Shaft bracket bearings -Brake -Shaft Locking Assembly -Lifting Gear -Water cooled bearing system	Some available
5		Steering and Rudder System along with primary, secondary and emergency steering systems	-Rudder Control Surface Structure -Rudder Stock Assembly and Fittings (including hydraulic nuts) -Bearings -Hydraulic Power Pack, including: -Primary & Backup motors -Control Units -Manual Backup steering assemblies -Rotary actuators/Rams -Hydraulic tank	Some
6		Platform management systems including:	-Control panels	Some

		-Acoustic monitoring and control -Cathodic Protection - Ship Signature management(upper deck openings)	- Power supplies and interfaces with IPMS -Sensors	
		Infrared Suppression systems for all main and auxiliary power sources	Temperature monitoring, instrumentation, and control system –Exhaust Eductor/Diffuser -Exhaust Mixing Fans - Nozzles	Yes
F	**Auxiliary Machinery**	Wide variety of complex support systems required to support crew, machinery, weapons, sensors, and combat management systems; all controlled through the IPMS		
1A		440 V Main and Auxiliary Electrical power generation systems including: - Auxiliary and emergency diesel generators and control systems - Emergency power generation and distribution system	-One emergency generator (if not dual purpose) -Diesel generators (prime mover and alternator integrated on skid) - Local control panels with remote interface access for IPMS -Integrated electrical control and distribution systems including switchboards, transformers, power conditioners, wiring etc to provide 440/220/120v as required throughout the ship -Switchboards with fully outfitted load centres -Arc Fault protector systems fitted to all boards and load centres	Some such as power management systems and control panels
1B		440V Main and Emergency Switchboards	-Emergency switchboard (if not dual purpose emergency generation)	Yes

			-Generator switchboards fully outfitted -Main distribution switchboards fully outfitted – Arc fault protection systems fitted to all boards and load centres -Frequency converters with distribution -Step down transformers	
1C		120 V UPS incl. Batteries	-UPS -Batteries	Yes
1D		Shore Power Alternative Maritime Power (AMP) – Shipborne	-Shore power AMP	Yes
2A		HVAC system to provide cooling, ventilation and heat throughout the ship as required including distributed air conditioning system and filtration systems to provide NBCD protection	-CBRN filter units/filters including detection -High-pressure supply fans -Cleansing Station exhaust fans -Valve and valve actuators	Yes
2B		Air Handling Systems including : -High Pressure Air Compressor -High Pressure Air Flasks -Low Pressure Air Compressor _Low Pressure Air Flasks	=Compressor -Dehydrator -Electrical Control System -Flasks -Flask Rack	Yes
2C		Air Handling Unit (Accommodation)	Fan-Coil Units (includes heater) -Air Handling Units (includes heater)	
2D		Duct Heater & Coolers	-In-Duct Heaters -Heater Thermostats and controls -Machinery Space Unit Heaters (includes fan, thermostat, controls) -Hangar Unit Heaters (includes fan, thermostat, controls) -Convection Heaters (no fan, includes thermostat and controls)	Yes

			-Duct Cooling Coils (Large Capacity Built Up Systems) -Gravity Cooling Coils -Self-Contained Air Conditioning Units	
2E		Refrigeration	-Chillers (condenser=seawater/refrigerion heat exchanger, evaporator=chilled water/freon heat exchanger, compressor, controls) -Chilled water pumps -Chilled water expansion tanks	Yes
3		Fresh Water supply system for cooling and domestic purposes to include a reverse osmosis water filtration system	-Chemical Injection Systems -Condensate Coolers -Condensers -Distilling Plant -Evaporators -Heaters -Meters -Reverse Osmosis Plants -Salinity Indicators -Ultra Violet Filters	Yes
4		Bilge water management system including oily water separation system	-Oily Water Separator -Oil in Water Sensor (MARPOL)	Yes
5		Sewage management system to minimize overboard black water, grey water and solid waste discharges.	-Treatment Units -Standalone Collection, Holding, and Transfer Tanks -Chemical Dosing Tanks - Aeration Pumps -Transfer/Discharge Pumps - Pipes, valves and pumps	Yes
6		Lighting system for all interior compartments, upper decks, machinery spaces, flight deck, weapons spaces		Yes
7A		Firefighting and damage control systems throughout the ship with automatic fire suppression, emergency flooding systems for main and	-Water Mist Pumping Units -Water Mist Freshwater Tanks -AFFF Tanks -AFFF Proportioner	Yes

		auxiliary machinery compartments, magazines, helicopter hangar, and other vulnerable spaces. Includes emergency breathing equipment, protective clothing, emergency communications equipment	-AFFF Nozzles	
7B		Fire Drencher Extinguisher system for: Helicopter weapons, magazines and pyro lockers,and for ready use lockers for CIADS and secondary gun	-Nozzles -Instruments -Strainers	Yes
8		Integrated NBCD management system along with distributed section bases to include emergency fire fighting, breathing and DC equipment	-NBCD processor and display system, at distributed section bases	Yes
9A		Fuel management and distribution system	- Distribution system throughout ship to provide fuel where needed for main and auxiliary machinery - -Storage for F-76 sufficient to provide specified range plus defined margin - Transfer systems between tanks - Capability to receive F-76 alongside and underway from AOR or comparable Automatic fuel control system managed through IPMS - Valves, pumps and pipes for above vessel - Emergency shut off system	Yes-Piping, valves and control systems
9B		Sliding RAS Padeye	-Electric Motor -Track with hull piece -Control Panel	No

10		Fuel Storage Tanks	-Instrumentation and control system -Pumps -Valves -Strainers -Stand-Alone Storage Tanks	
11		Hydraulic power systems		Yes
12		Water Handling Systems	Hot water heater, including: -Burners -Automatic Control System -Forced Draft Blowers -Motors -Ion Exchange Filter -Thermal Oil Recovery System (Exhaust Heat Boiler) -Salt Water pumps including controllers and motors -Electrical propulsion cooling system, with control relays, transformer, coolers and instrumentation and control systems	Yes
G	**Helicopter and Aviation Support**	Sufficient to operate and support at least one CH148 Cyclone		
1	-	- Hangar doors, large enough to shelter CH 148 as well as to provide space support the helicopter while at sea for 1st and 2nd line maintenance up to and including change of engines - Ammunition storage and handling - Cranes and specialized handling equipment	-Door actuating machinery - Crane Motor plus wire drum assembly -Brake – Trolley assembly -Traversing Rails set	Most should be available in Canada
2A		Flight deck equipment	-Flight deck communications -Flight Deck control including RAST control -Landing control system -Specialized firefighting equipment =Grounding system	Yes

2B		RAST (Recovery, Assist, Securing and Traversing) Haul down and securing system	-RAST track -RAST RSD (Rapid Securing Device) -RAST cable machinery	Yes
2C		Specialized flight deck lighting and visual landing aids	-Lineup lights -Floodlights -Deck status lights -Deck edge lights -Deck surface lights -Horizon bars -Pitch bar – Flight deck drop line lights -Touchdown spot lights -Homing beacon -Glideslope indicator -Wave-off lights	
3		Helicopter refuelling system for on deck and HIFR refuelling	-Fuel Pump -Fueling hose	
4		Briefing room and pilot ready room equipment	-Electronic status boards -Air Crew Lockers -Seats for 10 -Intercomm to rest of ship	Yes
H	**Deck Systems, Boats, Cranes**	Size of ship will dictate overall requirement for boats and for cranes for launching and recovery		
1		Ship's boats to include at least one standard RHIB with method for launch and recovery and one smaller boat		Yes
2		At least two ship's cranes with lift capacity to be specified	-Hydraulic Motor -Structural Elements (arm, base, etc.) -Control Cabinet/System	Yes
3A		Anchor handling, windlass and capstan equipment, towing equipment and storage for mooring lines	-Main Hydraulic Power Unit -Windlass -Control Panel -Break Hydraulic Power Unit -Anchor Chain	Yes
3B		Mooring Capstan	-Warping Head -Electric Motor -Control Cabinet/System	Yes

4		Bollards, fairleads for seamanship evolutions, securing alongside and miscellaneous requirements		Yes
5		Ladders, boat booms, etc		Yes
6		Personnel guard rails, stanchions and related equipment		Yes
7		Life rafts sufficient for crew with specified safety margin	-Rigid Containers	Yes
8		Davits	Rescue boat davit with capacity up to 1535 kg, including: -powering for davit operation (motors, accumulators) -winches -wire ropes and fittings -controls Launch and Recovery System (LARS) for boats with a capacity up to 1735 kg, including: -powering for LARS operation (motors) -winches -wire ropes and fittings -Control Panel	
	Accommodation and Crew Support	Sufficient to support specified crew expected to number 180-200 personnel		
1		Integrated galley and food preparation area including ovens, steam trays (if required), microwaves, etc	-Ovens -Dish washers -Fryers -Stand-alone refrigeration units -Ranges	Yes
2A		Refrigerated spaces, freezers, cool rooms etc for fresh produce, meat, dairy and bulk foods including tinned foods. Includes prepared food transfer from galley to cafeterias or messes	-Refrigeration Units (condenser=seawater/refrigerant heat exchanger, compressor, thermostat, controls) -Unit Coolers (and Heat Exchangers)	Yes
2B		Pantry/Provision lift	-Electric Motor -Carriage/car -Guide Rails	Yes

				-Control System	
3		Accommodation as required for specified crew size to include individual bunks, personal lighting, personal storage	-Laundry machines -Officer Berthing Area major equipment, including: -Furniture -Workstation chairs -Shelves/lockers		Yes for accommodation modules and interior furnishing and lights
4		Personal hygiene to include toilets, showers and wash places			Hardware should be available in Canada
5		Crew recreational spaces possible combined with cafeterias or as otherwise specified equipped to RCN Standards			Furniture available in Canada
6		Gym Equipment			Yes
7		Sickbay equipped as specified by CF Healthcare standards	-Examination tables -Patient bunks -Storage cabinet -Examination room high power lighting systems -Sterile storage cabinets -Sterilizer -Secure drug storage cabinets		Yes?
8		Internal WAN for administration, personnel and operational requirements Includes Internet access for official and personal communications (EMCON allowing)			Yes
9		Integrated personnel entertainment system for TV, movies, music etc, combined with WAN			Yes
J	**Integrated Ship Control, Ship Information Management and Navigation Systems**	Modern ship management system designed to minimize number of watch keepers required			

1		Inertial Navigation System(INS)	INS -Local Control Panels - Navigation Data Distribution System	No, although elements are available as part of Integrated Bridge Systems
2		Integrated Bridge System	-Automatic Pilot -Manual steering -Remote engine controls -Bridge displays for command and control data, radar data, machinery control and ship systems status - Warship Electronic Chart System(WECDIS) -Pelorus for taking bearings at the centerline, port and starboard bridge wings and to provide course heading data -Large course, speed and rudder angle displays -Gyrocompass control and display systems -Echo Sounder -Weather monitoring equipment -Internal and external communications systems including ship's main broadcast -Bridge Ship to ship VHF -Navigation radars Voyage Data Recorders -AIS-Antennae, Electronic racks -GPS -DGPS -Helm and propulsion control console -Navigations sensors (DF)	Some will be available in Canada, with overall Integrated Bridge systems made in country

3		- Chart storage and chart tables - ARPA radar for collision avoidance - Ship's navigation and upper deck lighting control panel		Yes
4		- Seating(Chairs) for CO, senior officer and others		Yes
5		Ships Information Management System (SIMS)	Servers -Routers -Switches -Fibre -Network Software -Database Software -Workstations -Tempest PC's for classified IMS -Red and black networks	Yes, in most cases
K	**Miscellaneous**	Workshops, repair spaces, offices		
1		Spares storage systems		
2		Monorails for Other Room (Non-Machinery Room) and Machinery Rooms	-Motor plus wire drum assembly -Brake -Trolley assembly -Traversing Rails set	Yes
3		Stores Elevator	-Electric Motor -Hydraulic Motor -All doors/hatche -Carriage/car -Guide Rails –Control System	Yes
3		XENON Searchlights	-Xenon Searchlights - Control switch panels	Yes
4		Data Collection System	-Recording software -Storage media	Yes
5		UAV Ground Data Terminal / Antennae & Infrastructure	-Antennas -MRAS Workstations	Yes
6		XENON Searchlights	-Xenon Searchlights	?
7		Marine Growth System	-Control System -Anodes	Yes
8		Thermal Destruction Device (Incinerator)	-Waste incinerator	Yes

9		Rope Reels	-Reels -HPU -Control Cabinet	Yes

Table 4

Potential Canadian Supplied Technologies

The following list includes those technologies that the Government of Canada has determined can be procured from existing suppliers in Canada. However, the extent of this list and additional equipment that could be procured in Canada will be determined by the design selected under the extant RFQ. If Canada decides to select a design that is largely "as is" with relatively few design changes for Canadian requirements such as a larger hangar to accommodate CH148 Cyclone, then for reasons of cost control and risk management, the opportunities for Canadian companies, will be limited. However, if the design is a MOTS ++ design with a large number of changes to satisfy Canadian requirements, then more opportunities will be opened up for Canadian companies remains to be seen what the final list will include. In the meantime, it is provided for the information of ACADA members.

Serial	Technology	Description
1	Accommodation and Workspace	Furniture, fixtures panels, cabinetry
2	Anti-Submarine Warfare	Sonobuoy Processing
		Sonar (Hull-Mounted)
		Sonar (Towed Sonar Suite)
3	Communication Systems	Internal Communications
		Digital Modular Radio
		Integrated Ship Network including internal and external telephones and internal and external wireless systems
4	Navigation Systems	

5	Power Generation & Distribution Systems	Batteries Switchboards Power switching and transformers
6	Fire Suppression Systems	
7	Deck Equipment	Anchor Windlass, Powered capstan
		Launch & Recovery Systems, Cranes
8	Doors and Hatches	
9	Environmental Systems	Chemical, Biological, Radiological and Nuclear Filters and Housings
10	Electro Optical/Infra-Red	Fire Control
11	Infrared Suppression	
12	Helicopter Support Systems	Ground Power Unit
		Hangar Doors
		Rapid Recovery and Haul Down system
13	HVAC	Heating, Ventilation, and Cooling
14	Shaft Bearings	Grounding system
15	Replenishment at Sea	Both for receiving and delivery
16	Ballast Water Management System	
17	Waste Management System	
18	Steering System	
19	Navigation Systems	
20	Hydraulic Systems	Hydraulic Power Units
21	Integrated Platform Management System	
22	Machinery and Auxiliary Equipment	Filters and oil separators
23	Doors and Hatches	