Final Report

Aerospace Review Secretariat

Industry Canada

Approaches to In-service Support (ISS)

Optimized Weapon System Support (OWSS)

and

Single point of Accountability (SPA)

July 13, 2012

COGINT

Business Intelligence – Insights – Options - Solutions

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1 EXECUTIVE SUMMARY

In-Service Support of military aircraft is all about getting value, long life, availability and reliability, and the ability to evolve fleets as missions and technology change.

The Canadian aerospace In-Service Support industrial sector is very concerned about its viability in the face of recent major acquisitions and changes in approach to contracting for new fleets. These fears are warranted; as a number of recent procurements have significantly shifted high value white collar engineering and program management work away from Canadian Industry and into the hands of foreign aircraft manufacturers.

Canada and DND already have an excellent In-Service Support Contract Framework (ISSCF) that takes a balanced and nuanced approach to fleet procurement and support. This framework encourages the creation of a Single Point of Accountability (SPA) and recommends creating performance based contracts to encourage and ensure high levels of support. It also recommends continued high levels of participation by Canadian Industry in ISS and requires the acquisition of data rights that enable domestic sovereign support of our critical aircraft fleets.

Accountability is an important business outcome that anyone would require. You expect a supplier to stand behind their product and to give you timely service. The Single Pont of Accountability need not, however always be the Original Equipment Manufacturer (OEM), nor always remain the OEM for the life of a fleet. What is important is that there is accountability.

The RCAF owns a highly diverse group of aircraft fleets. There is no one-size fits-all approach to in service support for such a diverse set of platforms. We own a small number of large C-17 transports. We also own hand launched unmanned aerial vehicles, helicopters that are uniquely equipped for Canada, and more. Our approach to maintaining and sustaining these aircraft will necessarily vary from type to type, and likely evolve as they age.

As sole source directed acquisitions, the CC-130J Hercules and CH-147 Chinook were procured under terms that return relatively little value added ISS work to Canadian companies, and that provide a framework that ties the Crown to the OEM for any changes.

There is widespread concern that the Canadian content on JSF could also be limited, and that competition for workshare during high rate production will be intense.

We have concluded that SPA is not the fundamental problem. The challenges that we face today are primarily the result of sole sourcing rather than SPA, and the inevitable reduction in buyer leverage.

The current situation is adversely effected by a number of global trends, including industry consolidation, pressure on domestic defence spending throughout the western world, the rising complexity of military aircraft, and the desire, on the part of OEMs, to retain IP and generate revenues from relatively high margin ISS work. This is further aggravated by a change in the way OEMs do business worldwide, procuring from a global supply chain, which is a substantial shift from previous business models. Accordingly, it is easier for OEMs to find offsets by selecting Canadian component suppliers for build-to-print work than finding partners for domestic ISS.

We have concluded that there are a number of procurement approaches that respect the objectives of SPA while ensuring that Canada has complete control over its military aircraft fleets.

It is possible to have SPA and a thriving support capability in Canada. It is also possible to shift SPA from the OEM to a Canadian ISS prime after the conclusion of the fleet acquisition phase. In this model, the Crown needs on-ramp approvals to ensure that set up criteria are met and a Canadian ISS integrator can take over.

Canada can, and should assert itself. We have a capable industrial base. We have proven that we can support, modify and life extend complex military aircraft. We will need to do this again in the future.

The policy question that Government must ultimately answer is “do we need to have a domestic capability to service, support, modify and life extend military aircraft”. In other words, should Canada have an industrial policy to support specific sectors of Canadian industry? We assert the answer must be yes, and that this policy should require procurement officials to mandate certain elements of workshare in Canada and to develop incentives and mandatory requirements that drive OEMs towards the business model that makes the most sense for Canada in the long term.

2 INTRODUCTION

2.1 Background

In 2011, the Government of Canada announced its intention to conduct a comprehensive review of federal policies and programs related to the aerospace/space industry. By February 2012, an arm's length Review led by the Honourable David L. Emerson and supported by a three-member Advisory Council was launched.

The federal government is a major customer for the aerospace and space sector and as such its approach to procuring its requirements bears directly upon this industry in Canada. The focus of this study is the procurement of in-service support, or "ISS".

Over the past decade, there has been an evolution in the approach to procuring ISS within the Canadian Forces. From the traditional Life Cycle Support methodology, we have moved to an Optimized Weapon System Management (OWSM) approach, with one contract per major ISS activity such as propulsion, avionics and airframe. Finally we have adopted the Single Point of Accountability (SPA) contracting methodology.

In 2008, DND produced the In-Service Support Contracting Framework (ISSCF) which fundamentally altered how long term support contracts would be structured and how support risks would be mitigated. The SPA, model derived from the ISSCF, anticipates long term contractual arrangements with Original Equipment Manufacturers (OEMs) of aircraft platforms for the ISS of all aircraft systems and sub-systems, with subcontracts back into Canadian industry.

Since 2006, the Government of Canada has undertaken several major defence procurements including the procurement of the C-17 Strategic Airlift aircraft, C-130J Hercules aircraft, and CH-47 Chinook helicopters. As part of these procurements the SPA approach to contracting in-service support has raised concerns within the domestic ISS Canadian industry regarding work shares and long term ISS industry viability.

The Aerospace Review Secretariat has struck a number of committees; including one focussed on ISS, and has engaged a number of independent parallel reviews and reports. This report provides a parallel review of the issues surrounding military aircraft ISS in Canada.

2.2 Scope

This report is focussed on military aircraft in-service support (ISS). The authors were tasked to: "Examine the advantages and disadvantages of two approaches for the procurement of ISS; namely Optimized Weapon System Support (OWSS) and Single Point of Accountability (SPA) from the perspective of both the Canadian ISS sector and the Department of National Defence. Factors to be considered should include, but not be limited to: cost, reliability, sovereignty, economic benefits to Canada and the fostering of strategic capabilities in the sector."

The report explores the history of ISS leading to the current Single Point of Accountability (SPA) and performance based ISS contracting model. We briefly review the ISS approach employed on a number of representative legacy platforms, the status of ISS programs on recently purchased fleets and opportunities for Canadian Industry with regard to ISS on future fleets.

The report reviews a number of global forces that have an impact on the international trade in military aircraft and attempts to provide a summary of the perspectives on ISS of the various parties, including: the Canadian Government, DND, aircraft Original Equipment Manufacturers (OEMs) and the Canadian aerospace industrial base.

Costs, risks and access to data are reviewed. This is followed by a summary, recommendations and default options for ISS.

2.3 Methodology

The bulk of this report is based on interviews with industry leaders and a variety of current and past DND and government personnel. The authors have attempted to engage a broad spectrum of industry and government leaders in an effort to produce a balanced, objective and evidence based set of findings.

As this topic has been reviewed in the past, often in the broader context of military procurement practices and reforms, the report has incorporated some key findings from previous work. Additionally, we have extensively quoted the DND "In-service Support Contracting Framework" [(1)] as it is central to, and high relevant to this topic.

2.4 Report Structure

This report is structured as follows:

3. In-Service Support – A Definition

   The report opens with a description of the scope of activities normally associated with the term "In-Service Support". This provides a common baseline for subsequent discussions and recommendations.

4. The Evolution of Canadian Military Aviation Support Concepts

   Review of: Life Cycle Support, Optimized Weapon System Support (OWSS) and Management (OWSM), ISSCF and DOAD 3022, Single Point of Accountability (SPA), Performance Based Support. This section briefly describes each approach / concept, provides key statements from the ISSCF and shows how SPA evolved.

5. The Support of Legacy Platforms in Canada

   This section provides descriptions of a variety of legacy fleet ISS programs. The four fleets described; CC-130H Hercules, CP-140 Aurora, CF-18 Hornet and CH-124 Sea King. All remain in active service.

6. Recent Canadian Military Aerospace ISS Programs

   This section describes the ISS approach taken on a variety of recent programs, including; CH-149 Cormorant which is often cited as the driving force behind SPA, CH-148 Cyclone which is the most complex program from the point of performance based logistics, CC-177 Globemaster which is an excellent example of small fleet support, CC-130J Hercules which is cited as a substantial step backwards in Canadian content, CH-147F Chinook which is benefiting from a largely foreign implemented Canadianization program, and small UAVs which represent a different ISS model.

7. Canadian Military Aerospace ISS Opportunities

   Despite the rapid pace of RCAF recapitalization, there remain a number of key programs to compete and award in the near future. They represent a broad spectrum of fleet types and will attract varied ISS program approaches.

8. Global Trends and Forces

   The aerospace ISS market is subject to global forces. This section briefly explores the financial and market forces that directly impact on the Canadian air force ISS business space.

9. Perspectives on ISS

   Despite a consensus on many levels, there are divergent perspectives on ISS. This section provides an overview of the nominal perspectives from the Government, DND, Canadian Industry and foreign OEMs.

10. Costs and Economic Benefits

    This section explores the relative costs and benefits to the Canadian economy of direct ISS workshares, IRB offsets, longer term service life extensions and modification programs and spin off products and services.

11. Access to Data

    Value added in-service support of foreign built platforms is highly dependent on the availability of data. Without data, ISS is impossible, but this topic is one of degrees. Data comes in many forms, from basic maintenance instructions and ILS data packages to source code, finite element models and computational fluid dynamics models.

12. Recommendations and Conclusions

    This section describes a recommended default position for RCAF fleet ISS and then makes recommendations for some current and future platforms.

3 IN-SERVICE SUPPORT AND INTEGRATED LOGISTICS SUPPORT – A DEFINITION

The defence aerospace industry is very fond of acronyms, and this topic is particularly loaded with impenetrable jargon. A few key terms that are used extensively in this report are worth noting:

- In-service support = "ISS"
- Integrated Logistics Support = "ILS"
- Logistics Support Analysis = "LSA"
- Optimized Weapon System Support = "OWSS"
- Optimized Weapon System Management = "OWSM"
- Single Point of Accountability = "SPA"
- In-Service Support Contract = "ISSC"
- Original Equipment Manufacturer = "OEM"
- Performance Based Logistics = "PBL"

3.1 Integrated logistics Support (ILS)

Integrated logistics support (ILS) is an integrated and iterative process for developing materiel and a support strategy that optimizes functional support, leverages existing resources, and guides the system engineering process to lower life cycle cost and decreases the logistics footprint (demand for logistics), making the system easier to support.

In general, ILS plans and directs the identification/definition and development of logistics support and system requirements for military systems, with the goal of creating systems that last longer and require less support, thereby reducing costs and increasing return on investments.

ILS therefore, addresses these aspects of supportability not only during acquisition, but also throughout the operational life cycle of the system. The impact of ILS is often measured in terms of metrics such as reliability, availability, maintainability and testability (RAMT), and sometimes System Safety (RAMS).

At a very high level, ILS includes the development of, or customization of the following:

- Life Cycle Cost analysis,
- Manpower and personnel planning and management,
- Obsolescence Management – what is the plan for supporting technologies embedded in the fleet for 20+ years, given the very rapid changes in those technologies and products,
- Facilities planning,
- Repair and Overhaul (R&O) planning,
- Disposal planning,
- Development of a whole life training program and associated training materials and systems,
- Provision of technical documentation and manuals,
- Logistic Support Analysis (LSA) – an analytical approach to determining support needs,
- Development of a supply chain for essential spares and services,
- Identification of special tools and test equipment,
- Definition of packaging, handling, storage and transportation requirements which can be very complex and expensive for aerospace systems and their constituent subassemblies and parts,
- Environmental Health and Safety planning and management,
- Development of computer facilities for the timely exchange of data, which can include drawings, documents, training materials, configuration data, parts lists, MRP data, manuals, etc. Frequently this is called an Electronic Interface Environment (EIE),
- Reliability engineering, Maintainability engineering and Maintenance (preventive, predictive and corrective) Planning,
- Manpower and personnel planning,
- and more.

The complexity and scope of ILS programs varies from fleet to fleet and between nations. ILS should start at the early stages of design and development and continues throughout the life of the product, with a peak of activity during the acquisition and production phase.

Relative to the capital cost of a fleet of aircraft, and the long term cost of 20+ years of actual fleet support, ILS is relatively inexpensive. ILS is, however, high end "white collar" work, highly technical in nature and requires access to both large amounts of data and staff with specialized skills.

3.2 In Service Support (ISS)

In Service Support (ISS) typically refers to the post-acquisition support of an established fleet. Where ILS is the analysis, planning and set-up for support, ISS is the execution of (provision of) support over the entire life of the fleet.

Typically, separate contracts are let for Acquisition (which includes ILS) and for ISS. These may both be let to a single contractor, who is usually the OEM, or may be tendered separately.

An ISS plan is developed that defines program processes and how they fit together with the acquisition contract to form a fully integrated management system for the overall program. This is critical, as the two must act as one contiguous program without interruption, and the ISS program is directly influenced by the ILS activities and outcomes.

The ISS program is intended to provide long-term support of the fleet, often for 20 years or more, which presents costing, pricing and contract challenges given the number of unknowns involved. As 20 years of ISS often costs more than the initial fleet acquisition, the stakes are high for all parties.

The logistical support system for the fleet must be designed to sustain a high level of operational availability and reliability in harmony with the planned fleet mission profiles and expected usage. However, the support system must also be capable of dealing with change and a wide range of levels of utilization and op-tempo ranging from pre-deployment training thru to high intensity and unpredictable combat deployments.

3.3 ILS and ISS Revenue Profiles

Of critical importance to the topic of RCAF fleet ISS, is the profile, or timing, of costs and revenues. Figure 1 shows a notional revenue profile (not necessarily to scale).

It can be seen that there is a bump at the beginning of a program associated with the initial ILS activities and fleet deployment.

Between Initial Operational Capability (IOC, or early fleet deployment) and Final Operational Capability (FOC, which occurs on completion of deliveries and operational readiness activities), there is usually an interim support program that gets the fleet up and running and supports early training and operations.

ISS Contractor revenues are lowest early in the program, as the fleet is young, heavy depot level maintenance has not started, and failures/issues should be minimal. There is certainly a need to support issues as they arise and there is the need to collect and analyse data that provide clues as to the future reliability of the fleet.

Revenues climb as the fleet ages, culminating in high levels of, sometimes intensive, support and often some form of life extension and/or modification program.

There are cases for mid-life reset programs that update the platforms, refresh technologies, address known fleet-wide issues and return the fleet to "like new" condition. This activity can often provide a net positive return on investment thru reduced out-year support costs.

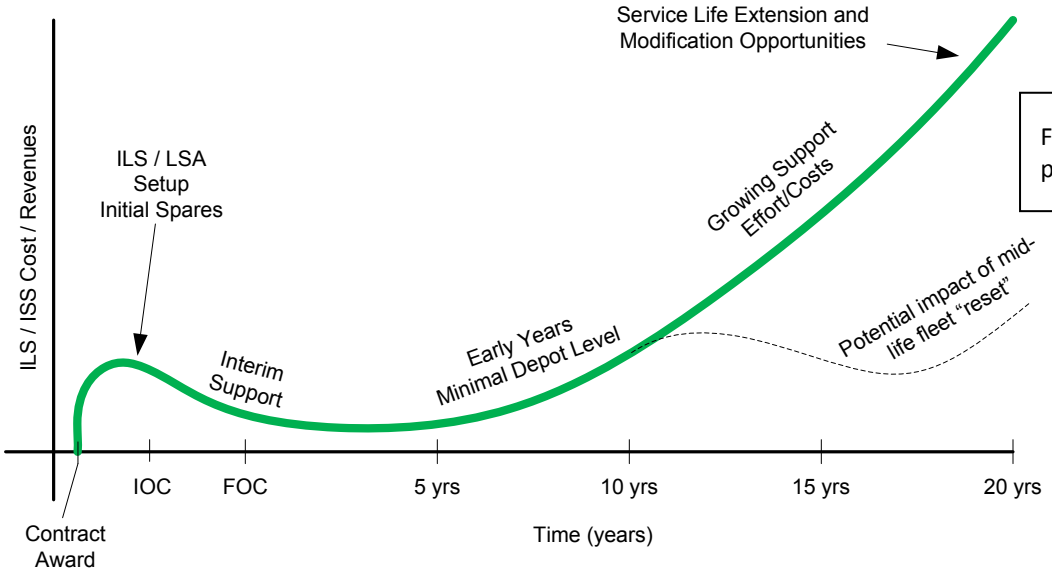


Figure 1 – Notional Support Cost Profile

4 THE EVOLUTION OF CANADIAN MILITARY AVIATION SUPPORT CONCEPTS

"DND's ISS contracting approach has evolved significantly over recent years; from being its own prime contractor in acquiring and managing its ISS needs from a network of Canadian firms, to relying on a designated lead integrator for a major system, to now contracting directly with the OEM to manage the ISS contract over the anticipated service life of the equipment." [(1)]

This evolution in thinking has been driven, primarily, by the issues of risk, resources and programmatic complexity at DND and PWGSC. In the current SPA model, DND manages a single contract with the OEM. DND is no longer in the middle of multiple contractors and no longer the de facto ISS prime contractor. Risk related to ISS has been pushed over to the OEM, who has total responsibility and is incented, or punished, via performance based contracting.

"The rationale for this current approach is one of risk. OEM assumes full responsibility to deliver the contracted mission requirements and is required to involve some Canadian-based sub-contractors in the performance of the ISS activity." [(1)]

4.1 Life Cycle Support

"Traditionally, the Materiel Group contracted for repairable item support, spares support, and engineering services in discrete packages – albeit, on occasion, to the same contractor. DND usually arranged transportation to and from the repair venue, provided all spares, technical data and special test equipment, and - where necessary - provided engineering and configuration management support. " [(1)]

In the past, DND would have a Weapon System Manager (WSM, pronounced "wizzim") who was responsible for the integration of multiple support contracts and who, as a result, took overall responsibility for the airworthiness of the platform. DND, via PWGSC, would contract with multiple suppliers, selecting each to execute a specific support function. This model remains in effect on a few legacy platforms.

As noted in the ISSCF[(1)], there were a number of shortcomings associate with this approach, including;

- "The practice of tendering many small contracts promoted a fragmented defence industrial base,
- A piece-meal contracting approach left little motivation for industry innovation or incentive for improved performance,
- There was reduced accountability as there is a lack of product/output focus at the platform level and the process to deliver the end product is spread across several organizations,
- It was difficult to identify the root cause of problems when there is poor performance or contract deadlines and deliverables were not met,
- This traditional approach was relatively resource-intensive for DND and PWGSC, and
- This proved to be operationally ineffective, often resulting in poor equipment availability." [(1)]

4.2 Optimized Weapon System Support (OWSS) and Management (OWSM)

In an effort to simplify project management, reduce costs, identify a focussed single point of contact and responsibility for support and performance, and to manage the risk portfolio, the OWSS/OWSM approach was developed for air, land and sea platforms.

"Under the OWSM contracting approach, ideally a single contractor entity would share weapon system Total System Performance Requirement (TSPR) support responsibility with DND. DND would retain responsibility for a small number of predominately "managing" functions and would work with the contractor in an Integrated Product Team (IPT) approach to weapon system management."[(1)]

Thus, this model consolidated multiple support providers under the umbrella of a single contractor, though not necessarily under the OEM.

Two additional factors came into play; DND faced a tight budget and a constrained workforce which demanded a change in role and focus, and a more global movement on how you measure performance. Thus performance based ISS came into being.

The ISSCF notes that, while presenting a number of challenges, "OWSM represents a significant, positive evolution toward a focus on outcomes, operational capability, and performance-based contracting."[(1)]

4.3 ISSCF and DOAD 3022

The "ISSCF" is the DND "In Service Support Contracting Framework", and is broadly quoted thought this report. The ISSCF is a fairly comprehensive document. It reviews the approaches to ISS in the past and the fundamental issues and risks that DND has grappled with over time. It provides ISS program guidance for all three environments across "Deployable", "Critical Role" and "Non Critical Role" platforms. The ISSCF sets out clear guiding principles and identifies risks and approaches to risk mitigation.

In response to the main concerns expressed by Canadian Industry with regard to Canadian ISS work and access to data, we note that the ISSCF presents relevant guidance in article 27 [(1)], which is reproduced here, with our emphasis added.

DOAD 3022-0 [(3)] and 3022-1, both issued in August of 2010, formalize the guidance contained in the ISSCF, including the desire to retain key capabilities within DND and expectations with regard to the procurement of intellectual property.

4.4 Single Point of Accountability (SPA)

Single Point of Accountability (SPA) and the desire for performance based and incentivised long term contracts flow out of the "policy statement" in DOAD 3022-0 [(3)];

"The DND and the CF are committed to supporting national objectives, obtaining optimum value for money and providing ISS at a level that meets or exceeds operational requirements, by ensuring that an ISS contract (ISSC) for each CF platform is:

- established with the platform supplier concurrently with the establishment of the platform acquisition contract;
- long-term, performance-based and incentivized; and
- structured and managed to ensure clear and irrefutable contractor accountability for contracted results." [(3)]

While SPA confers a range of benefits to DND and the Crown, it also presents a number of risks to the Canadian Industrial base and is a mixed blessing for OEMs. This report explores the various perspectives on SPA, OWSS/OWSM and the ISSCF.

ISSCF Article 27

If the GOC is to be a smart buyer and owner, able to take independent action as well as ensure that Canadian companies perform critical defence activities, access to Technical Data (TD) and Intellectual Property (IP) rights become important considerations.

a. Canadian ISS Work. ISS contracts will normally be awarded to the platform suppliers (i.e. OEMs), which may often be foreign-based companies. By virtue of the contract's Industrial Regional Benefit (IRB) requirements, much of the ISS work will be sub-contracted to Canadian firms. IRB requirements, however, do not typically identify specific tasks that must be performed in Canada. As a result, *there is a risk that Canadian firms will be relegated to work of low intellectual value - work that will neither preserve critical defence capabilities nor support the sustainment and growth of Canadian industry. Accordingly, in addition to IRB requirements, the GOC should require specific work be performed in Canada (e.g., 50 percent of engineering hours shall be performed in Canada).*

b. Technical Data. *The GOC must secure all rights to the technical data (TD) that are required to support the equipment throughout its life.* This includes the right to access the TD, especially if they are not maintained in a DND system. It further includes the Intellectual Property (IP) rights residing in technical documents, such as the right to make copies (copyright) and the right to disclose trade secrets. *This is especially important when the ISSC is with a contractor other than the OEM.* When the ISSC is with a contractor other than the OEM, the GOC should normally procure the TD to reduce the ISS contractor's dependency on the OEM and thereby increase the contractor's accountability for performance.

c. Intellectual Property. GOC policy is that normally the Contractor takes ownership of the Foreground IP (IP created under the contract), but there are exceptions to this policy. Several of the exceptions may apply in the case of ISSCs. Thus, when allowable under the TB policy, the GOC will take ownership of the Foreground IP of critical defence industry capabilities. Similarly*, the GOC will also take ownership of Foreground IP when the ISSC is with the contractor other than the OEM to reduce the ISS contractor's dependency on the OEM and thereby increase the contractor's accountability for performance.* In all cases, the GOC will obtain a license to all the Background IP that is necessary to exercise the GOC's rights to the Foreground IP. *In all but exceptional circumstances, the GOC will grant licenses to Canadian industry to commercially exploit the IP it owns.*

4.5 Performance Based logistics Support

Performance based logistics (PBL) support involves rewarding or penalizing the contractor on the basis of measurable fleet performance parameters. The intent is to contract for outcomes, relieving DND of the need to levy proscriptive requirements and involve a large program management team.

Metrics are devised to objectively measure outcomes. For example, a key metric is often "availability". This can be measured as the number of aircraft that are functional to a certain level (some non flight safety or mission related deflects being acceptable) and available to fly missions at any point in time or within a set timeframe from the time that they are initially tasked. The demanded availability may also vary with time of day or day of the week. If the support contractor fails to provide an adequate level of service, resulting in availability constraints, penalties are levied. Similarly, incentives can be provided for exceptional performance. Often coupled with availability is "reliability". Having an aircraft available that subsequently proves to be unreliable and thus unable to perform a set mission, is of limited benefit to DND.

This metric environment can quickly become very complex, and with complexity comes risk to all parties plus management overhead. Additionally, it is difficult to impose performance metrics on a group of independent contractors, as responsibility for meeting performance objectives is difficult to assess in a multi-party arrangement. Accordingly, the simplest arrangement for PBL contracting is one where there is a single point of accountability (SPA) – a single commercial entity with full responsibility and accountability for the performance metric(s) that are being assessed.

DOAD 3022 calls for performance based in-service support, and this approach is increasingly common with our allies.

A very recent, though untested, example of PBL in Canada is the CH-148 Cyclone Maritime Helicopter Program. This PBL arrangement is extremely complex, featuring over 30 formulae with over 100 independent variables. Arguably, this is too complex to manage efficiently and presents a great deal of risk to both DND and the Sikorsky team.

In this case, the OEM, Sikorsky Aircraft Corp was awarded both the acquisition and support contracts, and subsequently subcontracted substantial elements of the program to General Dynamics Canada and L3 MAS, among others. Sikorsky signed up for a 20 year, firm fixed price, performance based ISS contract. Time will tell how well this works out for each party and if the number of formulae, and complexity of the MHP PBL calculus, will need to be adjusted.

The NOCTUA mid-size UAV lease in Afghanistan was predicated on a fairly straight forward PBL concept. Unfortunately, the proposed PBL based lease contract terms in the RFP were sufficiently onerous as to eliminate all but one competitor in the end. While all indications are that the program was generally successful, it did highlight the sensitivity on the part of industry to PBL arrangements that potentially push excessive risk onto the contractor – all stick and no carrot.

Properly implemented, PBL should be a good risk reward methodology. Improperly implemented, it can result in an overly complex contract full of land mines or can result in a commercially non-viable contract.

In conjunction with SPA, PBL offloads risk from DND, simplifies management and should result in more predictable rates of availability and reliability. From the OEM's perspective, they are taking on substantial risk, and need absolute control to manage the downside. From the point of view of Canadian ISS subcontractors, PBL can result in the foreign OEM holding on to work that has traditionally been done in Canada. Furthermore, there is concern that downside risks can be unfairly loaded into the hands of the Canadian subcontractor if the prime contract (OEM) terms and conditions are not available for review in the public domain.

In conclusion, while PBL is likely here to stay and confers many advantages, particularly to the end customer (DND / PWGSC) the devil is in the details. There is no rule that PBL contracts must be placed directly with the OEM, though this is the least complex path from the point of view of the Crown. A willingness on the part of Industry to engage in PBL arrangements is important as is a willingness on the part of the Crown to ensure that the metrics and contractual terms are fair and balanced and that the metrics and formulae can be effectively modeled to allow industry to price their participation with a reasonable degree of accuracy.

5 THE SUPPORT OF LEGACY PLATFORMS IN CANADA

Legacy platforms in Canada are supported under a range of support models.

The four fleets described below are managed and supported at a very deep level by Canadian industry, and have formed a business foundation for a number of companies. In these cases, given the existence of detailed and intimate relationships, the Canadian contractors have evolved skills, created value added employment, developed processes, leveraged other business including exports, and have proven their capacity and ability to provide sophisticated support, and ability to turn around Urgent Operational Requirements professionally and quickly.

For the sake of brevity, we have not addressed the CC-115 Buffalo, CC-138 Twin Otter, CT-114 Tutor (Snowbirds), CC-150 Polaris (Airbus), CH-146 Griffon and CC-144 Challenger, and other small fleets and training aircraft in this report. It is interesting, however, to note the diversity of these fleets in terms of age, support model, numbers of aircraft, etc. There would be no argument that ISS for the extended Royal Canadian Air Force is a highly complex environment.

5.1 CC-130H Hercules

Canada operates a mix of 32 E and H model C-130 Hercules aircraft in transport, air-to-air refuelling and search and rescue (SAR) roles. Purchased as far back as 1960, this fleet is showing its age. Although some of the H model aircraft are still mid-life, the overall fleet is old and requires intensive support and maintenance. The situation with this fleet has been exacerbated by high rates of use in support of the conflict in Afghanistan.

Cascade Aerospace of Abbotsford British Columbia won a competitive tender in 2005 to provide extensive support to the fleet and has perfected a C-130 OWSM program.

Cascade is a Transport Canada-Approved Maintenance Organization (AMO), and provides comprehensive nose-to-tail maintenance services for a range of aircraft platforms, including the Hercules fleet. These services in include:

- Light and heavy maintenance checks (A through D level / intermediate and depot level)
- Major structural inspection and repair
- Corrosion Prevention Control Programs
- Supplemental Structures Inspection Programs
- Bridge maintenance and maintenance planning
- Component repair and overhaul

In November of 2010, PWGSC exercised an option for an additional five years on a long-term contract with Cascade Aerospace Inc., taking it to 2016

Cascade is the prime OWSM contractor and subcontracts to its “Herc Solutions partners; Marshall Aerospace Canada, Derco Aerospace, and Standard Aero.

Cascade is reported to have doubled the operational availability of Canada’s C-130 fleet.

Cascade’s support services include complete fleet management, engineering, Integrated Logistics Support (ILS), aircraft modifications and heavy maintenance.

This program invoices a great deal of engineering and program management and is dependent on access to detailed engineering data on the aircraft.

Cascade Aerospace is a Lockheed Martin-authorized C-130 Service Center (one of only 13 in the world) and has a 20 year contract with Lockheed Martin to assist in providing In Service Support (ISS) services for Canada’s new C-130J fleet (Ref Section 6.4).

Dwayne Lucas, Cascade's Senior VP of Business Development, has noted that "The Canadian OWSM model is an excellent tool that can be readily adapted to any customer. We are focused on tailored solutions. Additionally, we are working with Export Development Canada (EDC) and the Canadian Commercial Corporation (CCC) to facilitate a comprehensive Canadian and customer-centric solution for our international customers."

Cascade is also partnered with CAE Inc. for the delivery of C-130 training solutions to Canada and other C-130 operators, including operations and maintenance trainers for C-130J aircraft.

Cascade's CC-130 OWSM program complements their large commercial fleet support capability. This civilian/military revenue mix, often complemented by a domestic/export mix, is critical to Canadian aerospace corporations, as it dampens the inherent volatility of a single string business. CAE is another excellent example of this.

The CC-130 OWSM program employs approximately 90 engineers, out of 120 total white collar employees, over and above shop floor staff.

The recently purchased CC-130J fleet was selected to replace these older aircraft. The fate of the lower life H model aircraft is unclear, but it seems likely that they will continue to be operated in their current roles for some time, slowly being replaced with FWSAR and other fleets.

5.2 CP-140 Aurora

Canada's CP-140 Aurora fleet is over 25 years old, and is currently going thru the later stages of a multi-phase upgrade program called the Aurora Incremental Modernisation Program (AIMP). At some point these aircraft will be retired, but that point appears to be a long way off. In the absence of a replacement (dubbed CMA), Canada has elected to extend the life and capabilities of a portion of the current fleet.

Canada's $1.67 billion AIMP project began in 1998, and is an amalgamation of 23 individual projects grouped into 4 consecutive block upgrades.

Built on the venerable P3 platform, Canada's has 18 CP-140 Aurora aircraft. 11 aircraft are proceeding through the final stages of the AIMP program. This phase involves a complete wing replacement, including the center box, and the installation of a state-of-the-art mission system and associated sensors.

The mission system at the heart of the renewed Aurora fleet is built on the same core as the new MHP helicopter mission system. This system enables the aircraft to collect and present integrated tactical situational awareness data gathered by the new radar, electro-optics, electronic support measures, acoustics and magnetic anomaly detector systems. It delivers information to on-board operators through an easily configured and managed digital map display. Integrated with surveillance systems, it enables surface and sub-surface maritime, overland and littoral surveillance operations.

The combination of new comms, new radar, mission system and other sensors and airframe life extension has created a truly world class capability.

It is not unusual for Canada to stretch out the life of a military aircraft fleet, but this program is exceptional in its scope. AIMP is a highly intrusive and complex modernization program.

IMP Aerospace (which is coincidently an interesting anagram for AIMP) in Halifax Nova Scotia is responsible for the modification of the bulk of the fleet and for the

Aurora Service Life Extension Program (ASLEP). Central to extending the life of the aircraft is the replacement of the wings.

The Aerospace Division of IMP is a Lockheed Authorized P-3 Service Center and is approved by Transport Canada as a Design Approval Organization (DAO). IMP has access to detailed engineering data that enables this level of support. IMP has leveraged this into a wing replacement program for Norway and fully expects to see more P3 heavy maintenance and life extension work as the world-wide fleet continues to age.

Support for the CP-140 is divided into 3 contracts

- Pratt & Whitney for the engines.
- IMP is the OWSM for the aircraft and subsystems
- L3-ESS (Electronics Systems Services) is OWSM for avionics and Mission System.

General Dynamics Canada, who supplied the mission system and the systems engineering / integration engineering, supports L3 ESS and 14 Wing with a software support crew. L3-Westcam provided the EO/IR ball and MDA in BC provided the new multi-modal radar. This is a truly pan-Canadian team.

The three prime support organizations report to a Weapons System Manager (WSM) in DND. Today this might be called "old school", but it works. ISS for the newly modified and upgraded fleet has not started. Interim support is underway.

5.3 CF-18 Hornet

In 1980, the F/A-18 was selected as the winner of the New Fighter Aircraft competition, and a production order was awarded. The Canadian Forces began receiving the CF-18 in 1982 with delivery of just over 100 by 1988.

In 2001, the Incremental Modernization Project (IMP) was initiated. The project was broken into two phases over a period of eight years and was designed to improve air-to-air and air-to-ground combat capabilities, upgrade sensors and the defensive suite, and replace the data links and communications systems on board the CF-18 from the old F/A-18A and F/A-18B standard to the current F/A-18C and D standard.

Boeing (merged with McDonnell Douglas), the primary contractor, and L-3 Communications, the primary subcontractor, was issued a two contracts for the modernization project starting in 2002. A total of 80 CF-18s, consisting of 62 single-seat and 18 dual-seat models were selected from the fleet for the upgrade program.

Today, L3 MAS in Mirabel Quebec provides extensive support for the airframe and avionics. In conjunction with their partner CAE, they have incorporated a range of upgrades.

L3 has undertaken highly intrusive inspections and repairs of the fuselage and wings. They have manufactured replacement parts and have provided software management and upgrades.

L3 do pretty much everything except engines and avionics from a depot perspective. This work is enabled by a data package that was purchase with the aircraft. As a result, L3 is now quite independent of the OEM.

Canada historically operates its aircraft quite differently from the US and other first tier nations. We use them hard, and keep them a long time. Accordingly we invest in long term support strategies aimed at early detection of issues and overall life extension.

Our fleet of CF-18's could have been dead in 2003, had we not been proactive. For example, Canada did a full scale fatigue test in conjunction with the Australians, providing insights into problem areas which resulted in discrete modifications and, in some cases, the complete removal and replacement of the center barrel – not unlike the old magician's trick of cutting a woman in half.

This had a big impact on L3's export business and is likely to continue to provide a source of export revenues. Of note, there are a large number of tired F-18's in the World, including in the US. With continued delays on the JSF program, there is almost certainly a market for the skills, techniques and engineering designs that L3-MAS has developed on the CF-18 program. Imagine that, Canadians providing critical support and life extension expertise to the US and the World. It is probably fair to say that Canada has led the world in understanding the F-18 costs and fleet management issues.

5.4 CH-124 Sea King

The CH-124 Sea King Aircraft have been very much in the public eye over the past few years. Originally purchased in 1963, these venerable aircraft continue to do hazardous duty from the back of our frigates day in and day out.

The first of 41 helicopters were delivered in 1963 carrying the designation CHSS-2 Sea King. The airframe components were made by Sikorsky in Connecticut but most CHSS-2s were assembled in Longueuil, Quebec (Montreal) by United Aircraft of Canada (now Pratt & Whitney Canada), a subsidiary of Sikorsky's parent company.

According to the RCAF web site; "Domestically, Sea Kings contribute to search and rescue (SAR) operations, disaster relief, counter-narcotic operations, and fisheries and pollution patrols.

The helicopter also plays a vital role in international peacekeeping operations. It has been heavily committed to the international campaign against terrorism. Since being deployed to the Persian Gulf in 2001, CH-124s have conducted hundreds of missions to transport troops and locate suspicious vessels. Indeed, the Sea King remains one of the busiest aircraft in Canada's Air Force."

As a Sikorsky licensed CH124 (H-3/S-61) aircraft facility, IMP continues to provide all levels of support to various fleets of aircraft around the world, including the Canadian Sea King fleet. Other customers have included the USN (United States Navy) and the Egyptian Air Force.

As part of the effort to extend the service life and expand the role of the CH124 Sea King there are several modification and improvement programs in work. These include:

- Improved troop carrying capability
- Upgraded avionics
- Installation of an improved self defence suite (SDS)
- Machine gun mount and guard installation
- Improved instrument video monitoring
- Conversion of at least one ASW aircraft to Waterbird configuration to allow for pilot training in ditching procedures

Given their advanced age, operational availability is constrained and parts availability is an issue.

That we continue to have airworthy platforms is a testament to work performed by IMP in close cooperation with DND.

Through detailed knowledge of the airframe and systems, IMP has managed to keep the Sea King airworthy far longer than planned. They have engaged in corrosion detection and repair, overall service life extension and the rapid design, development and integration of changes on an urgent operational basis. Incredibly, by the time that they retire, we will have operated Sea Kings with effect for 50 years – this is something few nations are able to do.

5.5 Summary – Legacy Fleets

Common themes on four very different legacy platforms are:

- Access to data has enabled high levels of support,
- Canada frequently has the need to extend the useful life of a variety of platforms,
- Life extension programs are critical to Canada's fleets,
- Canadian businesses have the skills and capacity to take on intensive support programs and highly intrusive and engineering intensive update, upgrade and service life extension programs,
- OWSM models work, even when the single point of accountability is not the OEM,
- High value-added work in Canada leads to export opportunities to the net benefit of the Canadian economy and to DND through overhead and R&D absorption, and
- Urgent modifications, demanded in times of war, are easily provided by domestic suppliers, who have the interests of Canada and, by extension, DND front and center.

6 RECENT CANADIAN MILITARY AEROSPACE ISS PROGRAMS

"Over the past few years (from about 2005 through 2010), the Canadian government procured several types of aircraft to meet current threat situations, namely the C-177, C-130J and the CH-47.

For reasons of operational expedience, these were individually procured through negotiated sole-source processes by securing contracts with offshore OEMs under a Single Point of Accountability (SPA) framework. This framework has become associated, in the government's aerospace procurement policy, with procurement from the airframe OEM as the Prime Contractor.

In the short term, this enabled the government to rapidly procure aircraft fleets to close critical immediate capability gaps but creating other – long term – supportability capability gaps that may well prove to be of much greater strategic concern over the aircraft's expected operational lifetime." [(2)]

This section briefly looks at a number of recent fleet purchases, starting with the CH-149 Cormorant. There are a very wide range of aircraft types represented here, from the very large CC-177 (C-17) to very small UAVs and the hot topic of the sole sourced Chinooks and C-130Js.

6.1 CH-149 Cormorant

The CH-149 Cormorant is the Canadian Forces designation for the AgustaWestland AW101 (formerly EH101).

Developed as a joint venture between Westland Aircraft in the UK and Agusta in Italy (now merged as AgustaWestland), the EH101 is a medium-lift helicopter for military applications but also marketed for civil use.

The CH-149 fleet was purchased in 2000 and is tasked with Search and Rescue. A total of 15 aircraft were purchased. One aircraft was lost in an accident and the balance of the fleet are based at Gander, Greenwood and Comox.

In August 2010, the fleet of 14 CH-149 Cormorants passed 40,000 operational hours. It is reported that fleet had a higher flying rate than any other AW101 fleet and Cormorant 901, then stationed at Canadian Forces Base Comox with 442 Squadron, had the highest number of airframe hours on any of the AW101s anywhere in the world. This all sounds very Canadian.

According to the Wikipedia posting on the CH-149: "In the early years of service, the EH101 and its variants experienced tail rotor hub cracking issues. A British Merlin crashed on March 30, 2004 due to tail rotor hub cracking.

The CH-149 Cormorant has been grounded/limited flight status multiple times with these cracks being one of the causes; all 15 aircraft in Canadian inventory showed cracks of varying degrees shortly after entry into service in 2004. Subsequent re-engineering by AgustaWestland resulted in newer hubs in 2005. Out of the 6 aircraft which had the new hubs installed, 3 showed cracking one month later.

AgustaWestland has since eliminated this issue with the development of a new Articulated Tail Rotor (ATR) with elastometric bearings for the EH101/AW101, which is based on the proven ATR used on the AW139 medium-twin helicopter. The ATR is now standard issue on new AW101s and is offered for retrofit on existing fleets."

The Cormorant is frequently cited as the program and platform that caused a substantial change in thinking in PWGSC and DND with regard to accountability and performance based logistics for the RCAF fleets of the future.

"The GOC chose to compete the ISSC [In-Service Support Contract] in Canada separately from the aircraft acquisition. This approach created an undesirable situation wherein the GOC is caught between the Original Equipment Manufacturer (OEM) and ISS contractor in dealing with any performance shortfalls, making it difficult to identify the cause or to deliver solutions."[(7)]

Apparently Canada bought the aircraft, and separately contracted the ISS program to Canadian Industry, but did not buy technical data, drawings and spares. Only portions of the TDP were obtained and no IP relating to

design was procured. There is speculation that this was compounded by the tail rotor problems and a worldwide shortage of spares, but the facts of the matter have proven difficult to unearth for this report.

It is notable that In June 2011, several US VH-71s, which are also based upon the AW101, were purchased by Canada to be used as spare parts for the CH-149 fleet. This seems to corroborate the notion of an overly constricted supply chain.

Despite the issues that surround supply, a comprehensive support program is in place in Canada via IMP in Halifax.

IMP Aerospace is the Canadian prime contractor for In-Service Support (ISS) for the CH149 helicopters. Since August 2000, the Aerospace Division of IMP has been delivering this service, which includes highly trained personnel at the Cormorant Support Centre in Halifax and at the four main operating bases at Comox, Trenton, Greenwood, and Gander.

CH149 ISS includes the following services for the Cormorant fleet for first, second and third-line activities:

- Program Management
- Airworthiness
- Maintenance
- Engineering
- Logistical Support
- Technical Training

This Program provides a unique "turn-key" ISS arrangement for DND and SAR operations, with Canada's Air Force maintaining responsibility for Program oversight and the provision of aircrew.

As a DND Accredited Maintenance Organization (AMO), IMP Cormorant technicians conduct aircraft servicing and all levels of preventative and corrective maintenance, including responsibility for component and support equipment servicing and all aircraft modifications. Technicians at the bases are on-call for SAR operations around the clock.

As a DND Accredited Technical Organization (ATO), IMP engineers and technical specialists ensure the Cormorant fleet is fully airworthy in accordance with DND policy. Activities within the ATO include the provision of engineering support and services, airworthiness, logistics support, risk assessment and mitigation, data and configuration management, and design of aircraft repairs and modifications.

Cormorant ISS Material personnel at IMP manage all aspects of Cormorant inventory, component repair and overhaul services, warehousing, and disposal requirements.

6.2 CH-148 Cyclone (MHP)

The CH-148 Cyclone is the long awaited replacement for the venerable Sea King helicopters. From an ISS perspective, this program is notable for its 20 year firm fixed priced performance based ISS contract and for the application of the Single Point of Accountability model through the prime contractor, Sikorsky Aircraft.

The ISSCF[(1)] states that; "The MHP firm-fixed price, 20-year contract approach transfers much more risk to industry than the risk sharing approach of the CSH. This is not necessarily a bad thing; however, it is probable that the Contractor has considered the risk in developing his bid price and the GOC is paying an unknown 'risk premium' for this form of insurance. Nevertheless, the price resulted from a competitive source selection, which should result in the GOC paying fair market price. Achieving the same result in a sole source situation could prove very challenging."

On MHP, the ISS is distributed, but there is a Single Point of Accountability thru the OEM and most of the engineering is done by Sikorsky.

Canadian subcontractors for ISS are L3 and General Dynamics Canada;

- L3: Management services to Sikorsky – mostly associated with the air platform. Provide and sustain the Integrated Information Environment and measurement tools to report on the performance based availability program. Responsible for ILS, LSA, etc.
- GDC = Mission kit, support and training. This resulted in a large facility in Halifax with numerous engineering positions and sophisticated labs.

The work in Canada includes the Maritime Helicopter Training Centre, with two Operational Mission Simulators. Other elements of in-service support include the Integrated Vehicle Health Monitoring System, spares and software support.

The original position on this program was that the aircraft did not require a DLIR (Depot Level Inspection and Repair) cycle; that the structure was to last for the life of aircraft with no deep level inspection and repair. Given this plan for no major inspections, the ISS footprint in Canada is small. This would have resulted in a lower bid price and reduced budget pressure in DND.

Thus, data rights and/or access were not procured for the airframe.

DND does 1st and 2nd line and can do 3rd line (engines, gearboxes, etc.) although these are not part of DND's responsibility. DND needs the ability to do a wide range of support actions and repairs as these aircraft will often be deployed on a frigate at sea. Thus they, somewhat uniquely, need to be highly autonomous.

DND presented a very complex set of PBL algorithms in the RFP – approximately 35 different formulae and 100+ independent variables. The bidders were required to bid compliant to this (a feature of Canadian procurements), and the perception was that this presented a significant risk to Industry.

This approach has not been tested yet, as the first formal delivery of a Cyclone has yet to occur, and proof of the approach will really not be available for many years. There are indications, however, that the highly complex PBL arrangement will be simplified, as it is unwieldy both for the industrial team and for the Crown.

A number of things jump out right away;

- Reviewing the history of older platforms, and looking at the military aircraft environment as a whole, it is hard to imagine that this platform will not require depot level maintenance. If history is any guide, it is reasonable to expect that we will fly this aircraft for a long time, and likely beyond the OEM's or DND's original expectations.
- No matter how well designed and built this platform is, it will operate in an aggressive environment with constant exposure to salt spray and salt fog. If corrosion does not set in, it will be a miracle, particularly if the fleet life is stretched out.
- The mission system is built around a complex set of COTS processors and technologies. The program has intentionally built the capability to continuously support, maintain and upgrade the mission suite. One would expect that this will eventually result in some level of airframe modifications and could conceivably involve changes to the senor suite during the extended life of the fleet.
- Finally, Canada should be concerned that this platform is unique to Canada and that follow on sales are slow to non-existent. It is encouraging that Germany has shown an interest in the CH-148 Cyclone to replace the German Navy's ageing fleet of Lynx and Sea King maritime helicopters; however that project is currently on the back burner.

Reviewing the above in the context of the decisions to not purchase access to airframe data and to not build the capability to conduct depot level repairs and upgrades, it seems likely that the ISS approach will eventually need to be renegotiated.

6.3 CC-177 Globemaster

On 5 July 2006, the Canadian government issued a notice that it intended to negotiate directly with Boeing to procure four airlifters for the then "Canadian Forces Air Command". On 1 February 2007, Canada awarded a contract for four C-17s with delivery beginning in August 2007. The first Canadian C-17 was turned over to Canada on 8 August, 2007 and the final aircraft was delivered in April of 2008.

The C-17 is officially designated CC-177 Globemaster III in Canada and the fleet are assigned to 429 Squadron based at CFB Trenton.

In addition to the RCAF, the C-17 is operated by the U.S. Air Force, United Kingdom, Australia, Qatar, United Arab Emirates and NATO Heavy Airlift Wing. Additionally, India has ordered C-17s. As of March 2012, 241 of these aircraft have been built. Thus Canada's fleet represents less than 2% of the total worldwide fleet of aircraft. This fact, and the very small fleet size of 4 unmodified aircraft, became key considerations for the selection of an in service support program model.

A conscious decision was taken to contract for acquisition, ISS and long term support via an FMS sale with the USAF. Canada bought into the Globemaster Sustainment Partnership. Boeing has a substantial contract with the USAF, and Canada became a member at a pro-rata share. The net cost is significantly lower than for a domestic support network for 4 aircraft. Accordingly, there is very limited ISS work in Canada. The aircraft are based in Trenton, and all 1st and 2nd line maintenance is performed by "blue suiters". Deep maintenance, one aircraft at a time for 5 months, is performed in the US at the same facilities as the USAF aircraft. As a result, Canada gets the best possible service at a guaranteed rate. That said, the ISS budget estimate for this fleet is $1.6B over 20 years, a point that we will address again later in this report.

Defense Industry Daily reported on 17 November 2008 in an article entitled "Canada Joining the Anglosphere C-17 Club with CC-177";

"The final requirement under the "Canada First" defence procurement policy is a commitment to Canadian industrial benefits equivalent to 100% of the contract's order value through a C-17 Industrial Benefits (IB) program coordinated by Industry Canada. In practice, the government generally counts a number of investments that a winning bidder has already made,(*) in order to make this sort of requirement practical and allow it to buy equipment at all. C-17 manufacturer Boeing is already a major presence the Canadian economy, with more than 1,400 highly-skilled employees in Quebec, British Columbia and Manitoba generating approximately $1 billion in annual business. Canada has a large aerospace industry that exports 80% of its $22 billion annual production value. Given its convenient location, and Canada's long-standing ITAR export controls exemption, it is also Boeing's 3rd-largest international supplier base." (9)

There has been some grumbling within industry in Canada that this procurement provides little net benefit to the Canadian aerospace industry. As noted above, Boeing would counter that that they do a significant amount of business in Canada, including substantial participation of Canadian industry in high volume commercial aircraft programs. Viewed dispassionately, it appears that Canada did the right thing in this case. An indigenous support capability for such a small fleet of complex platforms seems like a fundamentally uneconomical arrangement. Further, these aircraft are unlikely to be uniquely modified for Canada, and the entire world wide fleet is likely to be pressed into long term service.

So far, our small fleet has seen noble service in Afghanistan and in support of humanitarian missions.

(*) The authors note that IRB policy calls for both incrementality and causality.

6.4 CC-130J Hercules

The legacy Hercules fleet is described in Section 5.1, above. As noted, there is an indigenous capability to support the older model Hercules fleet at Cascade, who operate the "Herc Solutions" OWSM program.

Seventeen CC-130Js were procured on a sole source basis and the OEM, Lockheed Martin, was contracted as the Single Point of Accountability for the entire program, including acquisition and 20 years of ISS.

Relative to the work that Cascade is responsible for on the older fleet, there is very little engineering or program management work on the CC-130J. This work is almost completely in the hands of Lockheed in the United States. There is no ASIP (Aircraft Structural Integrity Program) which would collect data for life analysis and assessments, nor any constant LSA, build up and development of LSA, Supply chain management, R&O management, etc. There is no tracking of contracts, delivery behaviours and statistics, assessments of performance, analysis of consumable rate and usage, etc.

Accordingly, Cascade has a handful of engineers and program managers on the "J" program relative to the staff of 120 engineering and program management staff on the legacy Herc's. Repairs for the new fleet will be approved by Lockheed, despite the fact that Cascade holds an ATO for the old fleet.

In the sidebar to the right is a paraphrased account of the ISS contact as reported on http://cc-130j.ca, dated March 22nd, 2010. The article goes on to say;

"We assembled a team to support Canada's CC 130J fleet that rivals any such team in the world through a rigorous and competitive process. … This team — as well as the expertise and capabilities in Canada to fulfill our industrial benefits obligation — stands as a testament to the quality of Canada's high- technology industrial base."

Of note is the fact that Lockheed plans to satisfy the requirements for Canadian content thru the IRB program, largely, to their credit, with subcontracts for value added aerospace products and services.

This program, and the Chinook program that follows, are central to the debate about the viability and need for a depot level aircraft support capability in Canada and the relative value of IRBs and targeted in-service support workshares over the long term.

A significant question for the CC-130J is whether or not the value and content of depot level work in Canada can or will be increased over time as the aircraft age.

Lockheed Martin Announces Canada CC-130J In-Service Support Team and $1.5 Billion Industrial Regional Benefits

http://cc-130j.ca, Monday, March 22nd, 2010

The initial in-service support (ISS) contract period is for six-and-a-half years from contract award in December 2009 to June 30, 2016.

[Core contracts announced included:]

- Cascade Aerospace (Abbotsford, British Columbia) will provide third-line maintenance on the CC-130J fleet including technical support, engineering support services, aircraft structural integrity, corrosion prevention and control, incorporation of aircraft modifications and other services through a $27 million contract.
- IMP Aerospace (Enfield, Nova Scotia) will provide warehousing services, including all spares and support and test equipment item management, receipt of supplies, order fulfillment, defective goods processing and packaging/shipping activities through a $16 million contract.
- CAE (Montreal, Quebec) will provide maintenance simulators and training devices, courseware and services through a contract value to be announced.
- Standard Aero (Winnipeg, Manitoba) will support and service for the CC-130J's Rolls Royce AE2100 engines. Contract value to be announced.
- HAAS Group (Oshawa, Ontario) will provide all hazardous materials services through a $2 million contract.

Several other Canadian companies, which are still involved in contract negotiations, will be announced at a later date.

Lockheed Martin also announced more than $1.5 billion in approved industrial benefits projects with Canadian companies associated with the country's purchase of and subsequent maintenance and support of 17 C-130J Super Hercules aircraft over the next six-and-a-half years. This amount will increase over the life of the program to $2.3 billion in industrial benefits to Canada as required by the contract.

Of this $1.5 billion, Lockheed Martin thus far has approved projects with companies throughout Ontario valued at more than $307 million.

6.5 CH-147F Chinook

The Canadian H-47 Chinook, designated CH-147F by the Canadian Forces, provides advanced features that include a newly designed, modernized airframe with a long-range fuel system, upgraded electrical system, and enhanced fully integrated Common Avionics Architecture System cockpit and Digital Automatic Flight Control System. The aircraft also has improved survivability features, including a Directional Infrared Countermeasures system, internal ballistic protection, and crashworthy, armoured pilot and co-pilot seats.

The Canadian government awarded Boeing a sole source contract for 15 Medium-to-Heavy-Lift Helicopters and in-service support in June 2009. Aircraft deliveries are scheduled to begin in 2013 and conclude in 2014.

The Boeing bid was for the acquisition program and an estimate for 20 years of ISS. The contract that was let in 2009 included an obligation to demonstrate airworthiness and initial acceptance within 36 months, which was achieved.

The first 5 years of ISS kicks in with the final delivery of 15 Helicopters. There is one contract for the entire scope of work, however the 20 year ISS contract is a Rough Order of Magnitude (ROM) estimate which is firmed up every 5 years for a further 5 year period.

The report authors understand that it is "likely" that Canada will take on more ISS work as the fleet evolves, with work and data migrating from Philadelphia to Canadian partners with Boeing.

Of note, there is no depot level maintenance in the current scope of work. In due course that requirement will need to addressed. That piece of work could go to a Canadian Boeing partner, but there is no specific mandate on the OEM to make this happen

In the event that engineering, associated data access, program management, modifications, life extension move into Canada, an opportunity will arise for the Canadian contractor to provide, through Boeing, services on other fleets.

The fundamental concerns are;

- There is no certainty that this work will migrate north as there is no imperative, that we are aware of, in the contract to sustain various key capabilities in Canada.
- There is no Canadian DLIR capable entity involved in the fleet LSA or management at this time.
- Canadian direct workshares to date are minimal. For example: L3-MAS, who have significant capabilities (see the F-18 in Section 5.3, above) have been contracted to provide language translation for aircrew technical publications products, as well as data conversion, language translation and development of S1000D Issue 4.0.1-Compliant Interactive Electronic Technical Publications for CH-147F maintainers. To be sure, this is good work, but it only represents a very small fraction of the total capability that is present and available at L3.
- As with the CC-130J, Boeing is falling back on Canada's Industrial & Regional Benefits (IRB) policy. There are IRBs potentially valued at U.S. $2 billion for Canada over a 20-year period.

The similarities in the Lockheed CC-130J contract and the Boeing CH-147F contract are striking: Sole source, SPA through the OEM, limited ISS workshare in Canada, a heavy reliance on the IRB program and the *possibility* of work in the future with no real involvement in the fleet support today.

6.6 Small UAVs

Canada has started to employ Unmanned Aerial Vehicles (UAVs) in theater, and in exercises and R&D programs. These are also referred to as Unmanned Vehicle Systems (UVS).

Canada has purchased smaller UAVs and leased a mid size UAV system for support in Afghanistan. Some of the small UAVs are now also deployed off of our frigates. There are plans to purchase (lease?) a fleet of larger UAVs in the future through project JUSTAS, but this program has been repeatedly delayed.

In 2009, the federal government awarded Boeing/Insitu, a $30 million contract to provide the gas powered Scan Eagle UAVs for the Canadian Forces (see photo below).

ING Engineering, headquartered in Ottawa, and with facilities and personnel across Canada, was selected to run the CF's UAV operations in Afghanistan.

As Insitu's Canadian partner, ING Engineering deploys field service representatives with extensive military backgrounds to provide support.

In Afghanistan, ING kept the drones in tip-top shape and trained soldiers on how to use them. In a unique twist, ING also launched and recovered the aircraft. ING's seven-member team in Afghanistan flew more than 30,000 hours with the Canadian Forces. These aircraft can fly for nearly 20 hours straight and have a range of 100 km. Nominally, three aircraft were launched every day and two each night.

This is more than conventional ISS or depot level maintenance. This is the provision of a high level of in theatre turn key support that extends to delivering aircraft daily in the air and retrieving them in the air. Such is the world of UAVs. ING describes themselves as a charter airline that flies payloads instead of people.

A separate smaller contract was awarded to Prioria Robotics Inc., a Florida-based company for smaller, man portable, hand launched UAVs, shown below;

These aircraft, named Maveric, were supported in theatre by ING, using the established Scan Eagle infrastructure and depot in Kandahar.

ING employed really specialized high density knowledge that could not easily exist in the CF and be sustainable because soldiers move around, have careers and many other priorities. Thus ING could be very focused, well trained, experienced and efficient. The Scan Eagle contract was performance based, with the contractor paid by the hour, with a threshold of minimum guaranteed hours per day.

For both contracts, the OEM was the Prime and SPA. ING staff was trained and executed launch and recovery plus 1st and 2nd line support. The OEM was the depot and technical authority. Damaged items, including airframes, were simply boxed up and shipped as line replaceable units back to the OEM for evaluation and repair or replacement. The key to availability and sustainability was to have sufficient spares of everything in theatre, immediately at hand. Given the small size of these platforms, this is entirely feasible. Further, the low cost of major airframe items males them more of a disposable item, necessitating less of a depot level footprint.

Modifications were not contemplated, though payload swap-outs were common. In the end of the day these small UAVs are an aviation activity - not toys or model airplanes – so they are handled just like their larger manned brethren from an airworthiness perspective.

The Scan Eagles continue to be employed extensively in Canada at various bases, and they have been deployed operationally on some of Canada's frigates.

For the Navy, once again, ING is a sub to Boeing / Insitu. In these cases, however, there are Canadian Eyes only restrictions that eliminate any OEM staff from the mix. Small teams of ING employees (typically 3 people) are deployed and carry out essentially the same functions as they did in Afghanistan for the Army.

Adoption of this solution was hard. There was a "level of surrender" that was not comfortable for the Navy. However, the performance to date has been impressive and the ING teams feature a high density of knowledge that is the perfect complement to the deployments.

Looking to the future, not surprisingly ING wants to bring the whole thing across the border. While remaining coordinated with the OEM, they have the ability to be Prime and integrate new payloads, especially sensitive ones. This fits with Canadian Eyes Only ops. This notion of a Canadian prime and an OEM subcontractor, will come up again later in this report. Further, the model for large UAVs bears many similarities to the positive experiences Canada has had on the smaller aircraft.

The experience with Scan Eagle and Maveric has leveraged ING to a position of corporate stability and density that enable them to employ a fairly large staff, with approximately 30% engineers. This is to the net benefit of Canada and the economy. It was a gamble on a new model that paid off, both for DND and for a new Canadian industry.

6.7 Summary

We have seen a number of models applied to new fleets and new capabilities. The problems of multiple contractors on the Cormorant were not repeated on subsequent fleet acquisitions. Everything from CC-177 to man portable UAVs have been purchased with the OEM as the single point of accountability.

The CH-147F Chinook and CC-130J Hercules remain programs of great concern to the in-service support industrial base. Purchased as sole source procurements, the role for Canadian industry has shifted away from long term support and engineering to a large number of component supply transactions under the IRB umbrella.

This shift is most apparent on the CC-130J, as it can easily be compared and contrasted with the CC-130E/H OWSM contract. In this case, unless there is a significant change in workshares over time, Canada's ability to independently support our C-130 fleet will diminish. One of the fundamental questions that we will ask at the end of this report is "does Canada need to have a domestic ISS and depot level support capability?".

The outcome on the Chinook and 130J is likely a case of "unintended consequences" rather than a determined effort to choke off an industry / capability. Clearly SPA was overstated in these cases. The ISSCF (described in Section 4.3) is both balanced and nuanced. Yet the Chinook and C130J were both directed sole source contracts with no mandate for Canadian ISS workshares and thus Canada has little leverage to pull this work over the border. These acquisitions were driven by Afghanistan, urgent renewal, limited options, etc. In and of themselves, they don't appear to be bad decisions, but the selected ISS framework has created a large lost opportunity.

As noted in the introduction to this section, "In the short term, this enabled the government to rapidly procure aircraft fleets to close critical immediate capability gaps but creating other – long term – supportability capability gaps that may well prove to be of much greater strategic concern over the aircraft's expected operational lifetime." [(2)]

7 CANADIAN MILITARY AEROSPACE ISS OPPORTUNITIES

The Government of Canada has made substantial progress in the area of RCAF fleet recapitalization recently, meeting many of the objectives set out in the Canada First Defence Strategy (CFDS) [5].

A number of key aircraft fleet acquisition programs remain on the horizon, with some of them likely to mature in the near future.

Four key programs are listed below. It is notable that these are a very diverse set of platforms, each likely requiring a tailored approach to ISS. They include;

- JUSTAS, a complex multi-role weaponized UAV,
- JSF, a supersonic stealthy air superiority fighter,
- FWSAR, a rugged search and rescue platform, and
- CMA, a long range, highly integrated manned ISR platform with sophisticated anti-submarine warfare capabilities.

Furthermore, "The challenge ahead is to find ways to meet DND's single point of accountability imperative while maintaining some degree of assurance that Canadian industry will continue to create and maintain the capability of meeting future unique national requirements, including technology enhancement, in the operations and maintenance of Canadian owned and operated systems." [7]

7.1 Revenue Outlook

There is a looming revenue shortfall in the airframe ISS business in Canada. Even if substantial ISS contracts are let for Canadian industry, directly or via OEMs, there is a dip in revenues coming, and this is illustrated below.

The scale on this diagram is notional. The vertical axis is Canadian industry ISS revenues and the horizontal axis is time – notionally 20 years.

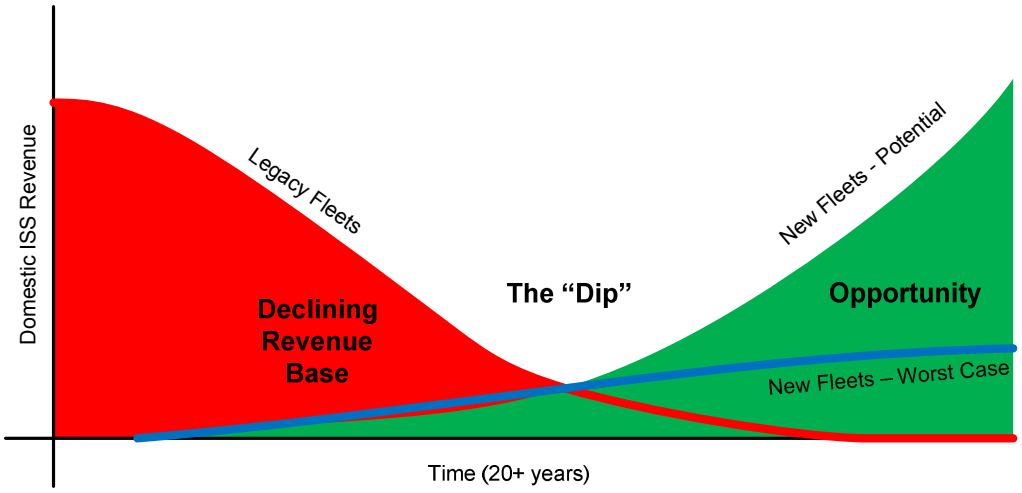
As noted above in Section 5 above, there is intensive support work on the CC-130 E/H, CC-115 Buffalo, CH-124 Sea King, CP-140 Aurora and CF-18, among others, right now. As these fleet are retired and replaced with newer platforms, this depot level effort will decline.

Although new fleets present ILS and interim support and start up revenue opportunities, some of this work is already committed to off-shore OEMs and the rest is a relatively small bucket of work. Real revenue generation on these platforms will not occur until later in their lives

For example, the CC-130J fleet will not have not sufficient hours for any heavy checks until 2014/15. Chinooks and upgraded CP-140's will enter service in 2013/2014. The CH-148 MHP Cyclones will start to be deployed in 2013 as well.

There is no question that DNDs fleet support costs will dip and industry revenues will dip as well. The question is, to what degree will Canadian Industry revenues recover? There is a large opportunity here, but the future may bring a smaller airframe and depot level industrial capacity in Canada. The major ISS players have strategies for sustainment, some based on leveraging skills and experience developed on older platforms in the export markets, some by diversification.

How we select long term support models for future programs will influence the recovery as well as the viability of this capability.



7.2 Fixed Wing SAR

Despite being on-again, off-again, the Fixed Wing Search and Rescue procurement will eventually happen.

There has been extensive consultation with industry over possible models for this capability. Everything from the conventional DND fleet model to a public-private partnership with a substantial private contribution has been considered. It seems unlikely, however, that Canada will go the way of a private service delivery model. It is more likely that DND will own and fly the aircraft. In either case, there is a real opportunity to modify the aircraft in Canada and provide whole life support in Canada. This is a highly competitive procurement – a perfect environment for demanding certain behaviours from OEMs.

There is the opportunity for a Canadian ISS subcontractor to the OEM with full transfer of IP and Tech Data packages sufficient to enable all levels of support and modification. This is a hotly contested program, for aircraft that will be modified at the outset and that will likely enjoy continuous upgrades throughout their lives. These aircraft will lead hard lives flying aggressive mission profiles.

Among the ISS options are;

- A Canadian company bids as prime, with the OEM as a subcontractor and with access to data.
- An OEM bids as prime and supports the aircraft through production and then the roles flip with the ISS provider taking the Prime role and the OEM providing services and spares.

Either model lends itself to a performance based contract. If the Crown believes that domestic support is a priority, it can be mandated or encouraged through an appropriate set of requirements and bidding incentives.

7.3 CMA

With the CP-140 AIMP program starting to deliver aircraft, we are probably a long way off from purchasing an Aurora replacement.

Either Canada will purchase a fully integrated platform, such as the P8, or elect to integrate a mission system and sensor / comms suite onto an existing platform. It is also possible that CMA will become a system of systems, with layers of capability being provided by disparate platforms.

In any event, Canadian industry has demonstrated, via the MHP and Aurora AIMP programs, and via a range of export programs, that system integration is a well-honed skill and that complex ISR platforms are well within the reach of our industrial base. In the event that a made-in-Canada solution is selected, the underlying aircraft must be supplied with sufficient data to enable modification and thru life support and upgrades.

In the event that Canada elects to purchase a fully integrated platform, it is incumbent upon the Crown to negotiate an arrangement whereby Canada can fully maintain the platform, at least to the point of modifying the mission system and sensor / comms suite. This platform will operate for a number of decades, during which the underlying technologies will likely go thru a number of generations of change.

7.4 Joint Strike Fighter

Despite an enviable volume of work for niche Canadian tier III suppliers in the JSF low rate initial production program, there is no real certainty of follow on work during the high rate production program. There are real concerns in the industrial base regarding competition for workshare in a highly competitive environment with numerous nations vying for subcontracts.

The sheer complexity of the on board systems, and the reluctance of the US Government to share source code, largely locks Canadian industry out of a substantial role in JSF long term upgrade programs and it is unlikely that these aircraft will deviate significantly from a baseline configuration over their lives.

In terms of airframe support, these are complex systems, though the underlying structure is fairly conventional and can be expected to misbehave in the same way that legacy fighter aircraft have behaved. We can expect cracks and delaminations and corrosion etc. It is the nature of the beast.

Canada is one of nine countries in the F-35 JSF program, contemplating only 65 aircraft in a production run that will exceed 3,000.

Canada has been a participant in the F-35 JSF program since 1997. This early involvement has been providing Canadian industry with the opportunity to become a part of the F-35 JSF supply chain.

In 2006, Industry Canada signed Memoranda of Understanding — containing industrial participation plans — with each of the prime contractors (Lockheed Martin and Pratt & Whitney). These agreements ensure that Canadian companies can compete for work on the JSF program, including the airframe, systems, engines and associated services. Opportunities include providing a wide

range of manufacturing and services in areas such as major structural assemblies, electronic systems, advanced composites, high speed machining, simulation and training, tooling, sustainment, and landing gear maintenance.

To date, 70 Canadian companies have secured over $435 million USD in contracts on F35 development and initial production (up from $370 million USD in June 2011).

As the program enters full-rate production, opportunities for Canadian industry could increase. The multiplying effect of a long service life and a large number of aircraft in the fleet is seductive. We could win a lot of work, but there are no guarantees. There is significant risk, given the number of international players and where the program is currently at, that Canada will not benefit from a high percentage of work, commensurate with our investment in the program.

In 2006, it was announced that "the UK will have the ability to successfully operate, upgrade, employ, and maintain the Joint Strike Fighter such that the UK retains operational sovereignty over the aircraft." In December 2006, an agreement was signed which met the UK's demands for further participation, i.e., access to software source code and operational sovereignty. The agreement allows "an unbroken British chain of command" for operation of the aircraft. This level of involvement almost certainly is a by-product of the high level of participation of the UK in the program from the outset.

There is certainly a case for saying that the shift from high level of involvement in support to roles in a massive supply chain has no net impact on the economy as a whole, but simply a shift of emphasis within the aerospace industrial base.

From the point of view of ISS, a northern JSF depot in Canada would be an excellent offset, though this will require significant political will to secure.

The discussion to date has been about suppliers to the production line. This is all good. The concern is that we haven't started talking about the sustainment program, which is a massive part. Typically, 60% to 70% of life cycle costs come from sustainment. There is real money here, but not the large multipliers that could come into play if we participate in global supply chains. Many in industry are pushing for Canada to be more aggressive in this domain.

7.5 JUSTAS

Larger UAVs frequently have all-composite structures and complex avionics. These aircraft generally feature modular mission suites, and a few can be armed.

Given their relatively small size, the complex composite layups in their structures and the difficulty associated with damage assessment and repair, the major airframe components become line replaceable units that are only cost effective to repair by returning to the OEM. This mitigates against domestic airframe maintenance, particularly when small fleets are purchased. Thus, domestic ISS becomes subsystem oriented.

It is inevitable that these aircraft will host a range of payloads over their lives, either due to obsolescence and technology upgrades or due to the rapid evolution of sensors and missions systems and the evolution of mission profiles and associated sensor, weapon and comms requirements.

Accordingly, there is a strong case to be made for domestic control of the payload on these platforms. This demands a domestic systems integration capability and associate infrastructure: software labs, System Integration Labs (SILs) and the like. With this domestic capability, the airworthiness of the structure becomes an OEM issue, while the mission worthiness of the system becomes a domestic issue.

There is substantial potential for noble engineering workshares on this class of platforms.

The end goal is sovereign control over the data gathering capabilities of the platform. You retain the ability to host Canadian Eyes Only payloads. You retain the ability to upgrade and enhance. You don't lose the ability to procure sensors and subsystems off-shore, but you need the ability to integrate these. Clearly you need to respect various interfaces (power, etc.) and must respect the airworthiness of the platform, but there is no reason why the industrial base that created MHP and Aurora AIMP could not take on this role.

7.6 Summary

There are substantial opportunities on future platforms. Some of these procurements will be competitive and are thus opportunities to demand certain behaviours, contract models and workshares. Some will require real political will if there is to be a substantive level of Canadian content in long term support.

8 DOMESTIC AND GLOBAL TRENDS AND FORCES

We do not live in a static world or markets;

"The economics of arms production and military procurements have changed. There has been a widespread consolidation of defence manufactures and an increasing number of multi-national technology development programs and a globalization of supply chains." [(7)]

It is impossible to look at the state of military aerospace In-service Support, and future options, in isolation. This line of business is intimately interrelated with a number of global and economic realities.

8.1 The Cyclical Nature of ISS

This is a cyclical business space and these are frequently cyclical issues. There are boom and bust cycles and these are aggravated by the cycle of capital procurements in DND.

We are, after all, a relatively small player, with small fleets. We compensate by being extremely good at what we do and by punching above our weight. Unfortunately however, or defence budget, Canadian sensibilities and politics seem to lock us into periods of low defence funding punctuated by bursts of defence procurement.

Thus the revenue generating opportunities and opportunities to bid on new work in the ISS space are aggravated by the timing of fleet replacement. We are in a period of replenishment, which would sound like a good thing, until you understand that new fleets don't attract much in service support work early in their lives.

It is interesting to note that Canada finds itself somewhat out of step with much of the western world, having tackled budget deficits and national debt early on. We have also changed military posture significantly thru our role in Afghanistan, and we find ourselves both needing to recapitalize and able to do so.

There are also cycles within a fleet. There is a burst of activity during the acquisition period for ILS and initial support, followed by a period of limited activity unless there is a fundamental latent issue with the fleet or an initial supply chain issue. Higher levels of support and engineering activity tend to occur later in the life of the aircraft, often culminating in a life extension of modification / reset program, as described in Section 3.3.

8.2 Debt and solvency pressures in Europe and the United European and US Economies

Debt and solvency pressures in Europe and the United States are changing the face of aerospace and defence industrial bases.

While Europe is struggling to come to grips with a debt and liquidity crisis, the United States is largely ignoring its massive accumulate debt as the 2012 Presidential election plays out. Eventually unpleasant medicine will be required, and it will involve reductions in US and European defence spending.

As defence spending declines, established OEMs will search for means to bolster falling revenues and to protect existing markets and intellectual property. In the context of shrinking revenue bases and inevitably heightened domestic and international competitive pressures, it is likely to become increasingly difficult to secure rights to data and IP sufficient for domestic ISS. Additionally, we are seeing an appetite in major OEMs for the long term stable revenues and related change revenue that accrue from retaining ISS business. Additionally ISS business, particularly into export markets, provides reliable and relatively high margins.

It can be argued however, that the flip side of this environment is the probability of heightened competition between OEMs and nations for major acquisition programs. Canada may be in a strong position to negotiate deals that are favourable to DND, the treasury and Canadian industry, if OEMs start to get hungry. This notion was explored in the preceding section.

8.3 Shifting OEM Revenue Focus

We are already seeing this shift in behaviour by large OEMs. Where once, long term support was something to be traded in support of national IRB programs, it is now often seen as a valuable steady stream of long term revenue and access to upgrade and change related revenues.

The application of Single Point of Accountability in this shifting marketplace must be balanced by expectations for the provision of data and execution of subcontracts in Canada that preserve and support our national aerospace industrial base.

Reliance solely on either the IRB program (such as with CC-130J and CH-147F) or opportunities to compete in a crowded market (such as with JSF), may not fully develop our industrial capability to the extent possible, and may result in a short sighted outcome that will be regretted once these new fleets age.

8.4 Long Term Canadian Defence Spending

While the Canadian economy appears to be robust, and we have a substantial national natural resource base to fall back on, our economy is ultimately tied into the large global economy. As a relatively small player, we are at risk. With DND most of the way through a massive Air Force recapitalization program, the potential for another downturn in spending is high. There are certainly implications for the Canadian defence and aerospace industrial base. While we are at this peak of capital procurements, we need to be quite specific to target key national priority technologies, products and services to ensure that they are adequately supported into the future. As US defence spending contracts, we can expect to see US domestic pressure to "buy American" even if this not an overt or public policy. Accordingly, Canadian industries will likely suffer unless they are well supported domestically and/or they have developed truly competitive global reach. If, as has been the case in the past, Canada's defence spending follows the US trend, and we see a reduction in capital procurements in the coming decade, value added ISS work may become vitally important.

8.5 Global Markets and Supply Chains

Globalization cuts both ways. It opens up opportunities and thrusts us into a crowded and competitive marketplace. Those who are prepared to compete, with high levels of efficiency, established world class products and services, and with the support of the Canadian Government thru agencies like the CCC, will likely thrive.

The three largest players in the Canadian defence ISS market; Cascade, IMP and L3, have all developed exportable products and services. It is reasonable to expect that they will all do fairly well as they fight for market share with these offerings. If we believe that retention of their inherent capabilities is of the national interest, then there is a case for continuing to support them through domestic programs.

8.6 System Complexity and Integration

Aircraft are becoming increasingly complex and highly integrated and structures are becoming more sophisticated and complex.

While this confers advantages in terms of operational effectiveness, agility and lethality, it also makes these systems much more complex to support, and by extension it becomes more expensive and difficult to export that support for small fleets.

A prime example of this is JSF. With a highly integrated avionics suite, right up to and including the pilot's helmet, and more lines of code than have ever flown before, this is one seriously complex system of systems.

The JSF structure is fairly straight forward inside, but there are large composite elements, such as wing skins, and sophisticated surface treatments to enhance stealth. This is not a simple structure to support.

Avionics subsystem maintenance and support for a small fleet becomes increasingly expensive to the point of not making economic sense.

Damage assessment and repair of new structures requires complex equipment and substantial infrastructure, again not cost effective for a small fleet.

For some platforms, we will need to be selective when we identify suitable domestic ISS workshares, as was noted in the discussion on the JUSTAS UAV program in Section 7.5.

9 PERSPECTIVES ON ISS

Not surprisingly, it was difficult to find consensus on this topic. Within the Canadian Aerospace and Defence community, military aircraft ISS is a sensitive issue, and there are divergent opinions with regard to the current state of affairs, the validity of the current model, the impact on industry and the balance that must be struck to satisfy frequently opposing objectives.

"SPA" is frequently directly associated with "Sole Source", off shore ISS and limited value added Canadian offsets. We believe that this is inaccurate and unfair, but it is a strongly held belief in some communities.

Each community has a unique perspective on this entire line of business and the issue of ISSCF and SPA. Even within otherwise homogenous communities, there are divergent voices, and we sense some real fear about the future. The following sections attempt to summarize the nominal positions taken by the various protagonists and identify the key drivers or issues at play in each community.

9.1 Government Perspectives

9.1.1 History

During and after World War Two, Canadian governments built and supported a strong aerospace sector in Canada. ADM Materiel in DND was RCAF Materiel Command, and PWGSC was the Department of Defence Production; both of whom were mandated to ensure Canadian industry could build and support aircraft to the extent possible. The RCAF was not allowed to provide depot level maintenance; this was reserved for Canadian Aerospace industries to help maintain a solid Canadian industrial base. From C.D. Howe until very recently, Canadian government policy was to support a strong Canadian ISS capability in Canada. As noted earlier. this long standing policy began to change due to the end of the Cold War (less need for this industrial base), the budget cuts of the 1990's (deficit control), and structural changes in the global aerospace sector (consolidation, increased complexity, and OEMs moving into the ISS sector). These events have eroded sixty years of previous Canadian policy which results in serious pressures in the ISS sector.

9.1.2 Jobs

The Government of Canada released the Canada First Defence Strategy (CFDS) in 2008, providing a blueprint for a recapitalized and revitalized Canadian Forces.[(5)] Excerpts from the section six, entitled "Positioning Canadian Industry for Success" are reprinted below;

"Combined with the improved framework for competition and trade provided through Advantage Canada, the Canada First Defence Strategy will help position Canadian companies for success in the global marketplace. Its infusion of long-term, stable funding will allow industry to plan ahead, make better use of investments in capital and technology, and become more effective players in the supply chains of the world's primary defence equipment manufacturers. In short, this Strategy will help Canadian companies build global excellence and leverage Canada's competitive advantage." [(5)]

"The Canada First Defence Strategy will set the stage for a renewed relationship with Canadian defence industry and research and development organizations across the country." [(5)]

"With the Government's significant investment in the Canadian Forces, Canadians will profit from the development of high-tech, high-value sustainable jobs in all regions – directly through the development of military capabilities and indirectly through technological spinoffs and commercial applications. This will put Canadians to work protecting Canadians. "[(5)]

There is clearly a desire to show that Canadian tax payer's money is being used to the net benefit of Canada and to show that high value jobs accrue from major DND capital acquisitions.

However, job creation is never an objective at the outset in terms of procurement strategy per se. DND and PWGSC generally leave the concern to Industry Canada and their implementation of the IRB policy. However, IRB Policy comes at employment through the indirect avenue of Canadian Content Value, which is generally not targeted at specific technologies, sectors or categories of employment. There does not appear to be any "strategic" approach to the objective of ensuring that specific Canadian industrial capabilities are sustainable in the long term.

Under budget pressures, DND is struggling to provide a defence capability, not Canadian industrial capability. If a foreign OEM can provide cheaper support, so be it. Without a clear and overarching government policy, DND will continue to value defence utility over supporting Canadian ISS providers.

9.1.3 Defence Recapitalization

There is clearly a fundamental desire to rebuild, update aging fleets and get the best possible equipment into the hands of the military as soon as possible. No doubt this gets politicized, but the intent is also clearly honest, even if it occasionally produces less than desirable or unintended outcomes.

9.1.4 Budget Stability

Capital renewal is complex and requires stable long term funding. The desire to lock down current and out year costs and to put a box around the total cost of ownership of these expensive assets is palatable. Nobody wants surprises, particularly Government ministers.

Budget stability primarily impacts the selection and the launch of a project. Once underway, budget stability seems less significant as DND demonstrates enormous talent in cash management.

9.1.5 Sovereignty

There is a fundamental political need to both enhance Canada's ability to protect our sovereignty, and to be seen to assert our sovereignty in all areas, including our coastlines and the North.

One key issue is tied to the shrinking of ice in the north. As navigation thru the northern passageways becomes easier, traffic will increase and challenges will inevitably follow. We must protect our territory, the northern environment, our northern citizens and the resources therein. This has implications for military mission planning and capital acquisitions.

However, sovereignty appears to be a topic that is obliquely addressed within defence. Even the Defence mandate is not one of Sovereignty. The significance of a Canadian Defence Industrial Base seems to ebb and flow. Not since the post war years has it been a significant feature in discussions.

9.2 DND Perspectives

9.2.1 Reliability and Availability

The need to have aircraft that are available and reliable is fundamental. DND must have mission capable assets at all times and cannot tolerate situations that limit effectiveness. To that end, it is very important for DND and PWGSC to be in a position to clearly identify who is responsible for inadequate reliability or availability. Similarly, they both need leverage to ensure that they get attention and performance. Thus SPA and PBL were created to address these fundamental needs.

9.2.2 Interoperability

Increasingly, Canada's military is called upon to operate in complex environments and in very close cooperation with coalition forces.

Interoperability occurs at a number of levels but does not necessarily require that the partners operate identical aircraft. Common data and communications links are essential. Common supply chains are a bonus.

9.2.3 Cost Management

As sensitive as DND is to cost management today, it is likely that this will become an even stronger focus in the future. Recent events, such as the last minute cancellation of the MSVS SMP logistics vehicle competition, suggest that budget tightening is already having an influence.

If there is a sense that "buy Canadian" is expensive and SPA + OEM executed ISS is cost effective by virtue of economies of scale, there will be active and passive resistance to the "expensive" solution.

9.2.4 Retention of DND Capabilities

DND needs the ability to quickly respond and react with agility. DND requires the ability to provide first and second line support to all aircraft fleets. DND must be able to support fleets in theatre, often in the absence of civilian personnel.

There is a need to retain of key corporate skills in DND, in part to maintain a smart buyer capability.

"A smart buyer capability is defined as possessing the in-house expertise to assess value for money and effectively challenge industry when dealing with technical, logistics or programmatic issues during all phases of the equipment's lifecycle." (1)

"… the GOC must retain sufficient internal expertise and oversight to effectively manage ISSCs, reduce mission risks to an acceptable level and account for political, social, economic and legal considerations. This expertise requires that the GOC retain the smart buyer and provision of operational advice responsibilities. Additionally, the GOC will be the regulator for air- /seaworthiness and establish regulations and policies that must be adhered to by both the GOC and its ISS contractors. These roles serve to protect the public interest and ensure probity. " (1)

9.2.5 Human Resource Management

There is a persistent shortage of staff within DND. The normal rotations and career evolution that a soldier undergoes exacerbates this issue. Budget cuts don't help.

Creative support solutions are likely to become increasingly attractive to DND. This is already happening in the small to mid-size UAV world, as described in Section 6.6, above. The JUSTAS and FWSAR programs are clear candidates for innovative public/private partnerships.

9.3 Domestic Industry Perspectives

From the perspective of Canadian Industry, there are a number of fundamentals:

- Domestic ISS is not a nice to have, it is a strategic imperative.
- It is imperative that we acquire access rights to technical data - not necessarily ownership.
- Support of the industry throughout the cycles of capital acquisition and "rust out" is critical to the viability of this capability.
- Canadian industry has the capacity, skills and experience to do first rate work for DND.
- Canada must not eviscerate our domestic ISS capacities in return for access to global supply chains via the IRB program – balance is critical.
- We have developed high value added jobs for engineering and program managers via support of number of platforms. We need to retain these highly skilled positions.
- Access to IP and technical data can be achieved, and it need not be expensive. Make access to / provision of data a rated requirement or require the OEM to partner for specific work with Canadian companies.
- There is a dip in work/revenues coming. We can survive this, but need to know that there is a bright future.
- Canada should have the inherent capability to make independent decisions regarding its Air Force fleets.
- The notion that we will "Never modify or adapt" new platforms is not a reasonable position to take. We will life extend, and we will modify.
- Don't fall for slick salesmen. We don't know what support will cost for new platforms. In spite of what OEMs say, these aircraft will all need depot level inspection and repair.
- We need a defence – industrial strategy. If necessary we should pick winners and losers. Put our resources in those places that provide long term return on investment and that support overall national objectives and strategies.
- Stability is critical – to stable revenues, staff retention, the ability to invest in R&D, the ability to take big bets on export markets.

"Historically, junior defence Small or Medium Enterprise (SME) companies have looked upon defence procurement and ISS programs as a springboard to the latest generation of technology and opportunities to improve their global competitiveness.

Past ISS programs have provided opportunities for technology transfer, participation in configuration control and engineering change development and generally have resulted in improved positioning of Canadian contractors for high value follow-on work. They have often been the sources of innovation that has allowed the CF to maintain the capability of its aging fleets well beyond the operational life of similar equipment in allied militaries.

Industry representatives have suggested that incentive to innovate will decline should OEM prime contractors for major defence ISS programs fail to engage Canadian industry and especially SMEs in technology transfer and engineering change development and instead relegate their role to one of installation and "touch labour"." [(7)]

9.3.1 The Role of Canadian System Integrators

The role of systems integrator sometimes gets lost in this discussion, as ISS tends to focus on logistics, R&O, supply chains, LSA etc. A critical part of ISS is modifications, updates, technology insertions, obsolescence management, etc. Given the rapid change in technologies and relatively long life of complex platforms, an ability to do system integration engineering activities is critical for some platforms.

"Today, two defence aircraft platforms are supported by systems which are designed, developed and integrated by Canadian industry; the modernized CP140 Aurora, and the new CH148 Cyclone maritime helicopter. Both are state of the art in terms of their capability." [(2)]

"As recent defence aircraft procurement programs have been acquired through offshore OEMs, the opportunity to participate with these OEMs to undertake system integration has not been identified, either due to the lack of such a demand in the case of the C130J and the C17,

or the lack of an identified strategy in the case of the CH47 Chinook." [(2)]

Recent defence aircraft procurement programs acquired through offshore OEMs have provided less opportunity to undertake system integration in Canada. The C130J and the C17 had no need, and the CH47 Chinook had no Canadian strategy to do so. OEMs see defence system integration as a core business competency, and therefore "absent Canadian government policy intervention, have no incentive to engage Canadian industry in that role." [(2)]

The lack of Canadian policy to support integration in Canada constrains Canadian industrial capability. Lack of trust in Canadian industry thus results in a more limited ability for independent action and further limits the Canadian government from being an informed buyer

9.4 OEM Perspectives

Canada is a tough place to do business for foreign military suppliers. We write complex and usually highly proscriptive specifications. We demand 100% compliance. We run demanding competitions. We require 100% offsets. RFPs are generally complex and bids can be massive as a result. With the additional of PBL, we have shifted risk to the OEM. In addition, we want proven technology and existing platforms. We don't want to be first.

For the OEM, it all boils down to margins.

Typically, R&O margins > ILS margins > Capital Goods margins. Furthermore, export margins > domestic margins. Winning export R&O and upgrade work is hugely positive to the bottom line. Winning long term support contracts is thus very lucrative, particularly when the contract is based on a ROM price subject to regular conversion to short term firm fixed contracts.

With an established long term relationship in hand, changes and upgrades become gravy, even if they involve a lot of due diligence due to their sole source nature.

Of course, this applies equally to Canadian suppliers and foreign OEMs. Fewer but larger foreign OEMs facing fewer sales, are now aggressively moving into the long term support (ISS) sector. Higher margins and steady revenues are attractive. For example, Sikorsky own HSI (Helicopter Support Industries), now called Sikorsky Aircraft Services. The Boeing Support Services group is a large revenue generator, and consolidated C-17 maintenance is another low risk example.

Large OEMs are constantly developing their supply chains. Boeing has become an aircraft integrator in addition to being an aircraft manufacturer. Whole fuselage sections of commercial aircraft are now regularly shipped half way around the world to be mated at a Boeing or Airbus facility. Folding foreign suppliers into this model is relatively easy today, but it would have been a distraction that added cost and risk a couple of decades ago.

9.4.1 OEM Interview Question Response Summaries

This report was produced by interviewing a wide range of players in the broader military aerospace community. The following are summaries of statements that seemed to be fairly consistent across the OEM stakeholders;

OEMs will remind that people tend to forget all of the other elements in the sustainment bucket. Engines, avionics, R&O in general terms, the procurement of spares and supply chain area all part of ISS. Much of this is beyond the core competencies of a number of domestic companies who advocate a higher level of domestic support and R&O.

When one moves further from the traditional model to the future model, what you consider as being enhanced and threatened can be very different. Some component builders may not be impacted at all, as the contract simply comes from somewhere else. In fact with global supply chains they may benefit from some of these shifts. With airframe support, however, there is a different story.

Long serving legacy platforms require a lot of depot level work, and their replacements will need much less of this kind of work initially. In fact, the customer is demanding low life cycle cost platforms and has expectations of high reliability and low ISS costs, especially early in the life of any fleet. In this environment, R&O firms naturally come to pessimistic conclusions. At a minimum, those firms seeking depot level work will suffer until these weapons systems age and require attention.

When Canada accepted SPA, they were seeking a customer high end goal to control their destiny in a different way, and to be assured of a certain level of availability.

The old model involved the management of dozens of contracts by DND. Now the OEM owns the supply chain. DND does not buy the spares, DND buys a guaranteed availability. All of those smaller contracts are gone and Canadian businesses must now contract with the OEM .

If the OEM owns the spares and the performance guarantees, the OEM must be in charge of ISS. Canadian suppliers can participate in global supply chains.

OEMs are certainly keeping a higher share of the work in the front end, but this could evolve over time towards more involvement of Canadian industry.

Acquisition and support contracts must address technical data. Provision must be made to ensure Canadian firms working as suppliers or team members gain access to the relevant data. Data will come with restrictions and limitations, and will not generally be sold to partners.

Canada has one of the toughest IRB programs anywhere. Boeing and others claim to have delivered and over delivered against their obligations. IRBs are based on CCV (Canadian Content Value) that requires the OEM to find offsets worth as much as two times the project contract value. This is a good benefit, but not all offsets are of equal quality to Canadian industry.

SPA is a dual edge thing. There are opportunities and constraints. From the OEMs perspective, if the contractor engages with the provider, it can open more doors than it closes.

While owning technical data is often very useful, there is no need to buy it in most cases. OEMs are now more protective of increasingly complex IP. Access is what Canada needs, and the SPA concept enables easier sharing of data within a strong team. SPA can in fact help create an integrated team.

9.4.2 Protection of Intellectual Property

There is no question that a key concern of the highly consolidated aerospace industry is the retention and control of intellectual property. The OEM SPA approach simplifies this control significantly.

9.4.3 Long Term Revenue Generation

As noted in Section 8, domestic defence budgets are tightening, particularly in the US. Additionally there has been a shift towards integration of aircraft and a reliance on global supply chains. In this environment, ISS work, with long term stable revenues and decent margins looks very attractive, while global supply as the norm becomes a simple way to provide offsets.

ISS provides steady revenue, but also, and importantly, it provides daily contact with customers, leading to upgrade and life extension opportunities

10 COSTS AND ECONOMIC BENEFITS

10.1 Economic Benefit to Canada

Worked conducted outside of Canada provides valuable goods and services, but returns nothing to the national treasury.

Work carried on inside Canada provides substantial returns. In excess of 50% of labour costs are returned in various corporate, consumption and income taxes. The bulk of the remaining income circulates within the economy.

The net economic benefit to Canada of work performed in Canada can be substantial.

In addition to the economic benefits of direct work, there are longer term benefits relating to innovation, support to corporate G&A and overheads, the potential for revenue diversity (such as achieved at Cascade Aerospace), etc.

As ISS is highly labour intensive, employing a large percentage of high value white collar workers, there is a case to be made for valuing the economic impact when assessing domestic vs. foreign supply.

Either one or both of IRB programs and rated bid requirements should account for the relative value of domestic vs. foreign labour.

10.2 IRB Offsets

IRBs are currently largely focused on transactions rather than strategic national technologies.

Despite its value and attempt to extract low risk and high value offsets, the IRB program is not born of an industry overview or strategy. IRBs seek a dollar for a dollar. This program should evolve to be more targeted, less focussed on counting transactions and merely adding up CCV.

Most interviewees understood that the most recent set of IRB policy changes tries to move the program forward and that the quality of the transactions will continue to improve.

However, there still does not appear to be an overarching view of what industrial capacity Canada needs within any of the three principal parties involved in procurement.

".. the current IRB programs emphasize the transactional nature of the benefit and do not routinely provide additional recognition of technology transfer or enhanced-value industrial activities undertaken by the ISS Contractor or Original Equipment Manufacturer (OEM). In the current program there are few incentives to entice an OEM to engage Canadian industry in general and SMEs in particular in higher value technology-transfer or IP development activities." [(7)]

"DND should collaborate more closely with IC and Public Works and Government Services Canada (PWGSC) at the outset of an acquisition activity to examine the ISS requirements, to create contractual opportunities for technology transfer to Canadian industry and to define IRB recognition for those activities consistent with their value within an overall Defence Industrial Strategy." [(7)]

Some would say that less government regulation over the industry will allow market forces to pick the strong over the weak. This only takes us part way; we need to reinforce those industries that are important to Canada. Through various selective trade agreements and the promotion of strategic business and access to specific markets, Canada and other countries support certain industries. With a relatively small economy in a very large and growing global market place, focussed strategies become essential.

One solution is to target offsets, rather than "fritter them away across a spectrum of opportunities with no sustaining activity and critical mass" as one respondent noted.

There is a case for adding points in the competitive selection / best value rating schemes in RFPs for offsets that satisfy specific strategic imperatives. This is not the same as IRB multipliers, but rather an incentive to target offsets.

11 ACCESS TO DATA

A great deal of the discussion and passion that surround the topic of RCAF fleet ISS, is tied to the issue of "data". Without the necessary data, long term depot level ISS is impossible, but this topic is one of degrees.

Data comes in many forms, from basic maintenance instructions and ILS data packages to source code, finite element models and computation fluid dynamics models. Not all data is required in all cases and it may not be necessary for the Crown to own or even access data if there is an appropriate contractual relationship between the OEM and the Canadian ISS provider and suitable terms in the contract the ensure that targeted domestic work shares are enabled by access, with reasonable limitations, to relevant data.

When we talk about access to data, we need to answer a number of questions, and these answers will be different for each program / fleet:

- When do we need data?
- What data do we need?
- What will we do with this data?
- What IP and future use restrictions are we willing to accept?
- Do we need data that is freely available or held in escrow?
- What will it / should it cost, if anything?
- Can data be freely shared between an OEM and it's Canadian ISS partner, eliminating the need for the Crown to purchase it?
- What are our neighbours (eg: Australia and UK) acquiring on similar platforms – ie: is this data available?
- How will we protect data?
- In the absence of data, what have we relinquished in terms of operational flexibility and sovereignty, if anything?

The case for access to data from ISSCF is as follows;

"If the GOC is to be a smart buyer and owner, able to take independent action as well as ensure that Canadian companies perform critical defence activities, access to Technical Data (TD) and Intellectual Property (IP) rights become important considerations.

a. Canadian ISS Work. ISS contracts will normally be awarded to the platform suppliers (i.e. OEMs), which may often be foreign-based companies. By virtue of the contract's Industrial Regional Benefit (IRB) requirements, much of the ISS work will be sub-contracted to Canadian firms. IRB requirements, however, do not typically identify specific tasks that must be performed in Canada. As a result, there is a risk that Canadian firms will be relegated to work of low intellectual value - work that will neither preserve critical defence capabilities nor support the sustainment and growth of Canadian industry. Accordingly, in addition to IRB requirements, the GOC should require specific work be performed in Canada (e.g., 50 percent of engineering hours shall be performed in Canada).

b. Technical Data. The GOC must secure all rights to the technical data (TD) that are required to support the equipment throughout its life. This includes the right to access the TD, especially if they are not maintained in a DND system. It further includes the Intellectual Property (IP) rights residing in technical documents, such as the right to make copies (copyright) and the right to disclose trade secrets. This is especially important when the ISSC is with a contractor other than the OEM. When the ISSC is with a contractor other than the OEM, the GOC should normally procure the TD to reduce the ISS contractor's dependency on the OEM and thereby increase the contractor's accountability for performance.

c. Intellectual Property. GOC policy is that normally the Contractor takes ownership of the Foreground IP (IP created under the contract), but there are exceptions to this policy. Several of the exceptions may apply in the case of ISSCs. Thus, when allowable under the TB policy, the GOC will take ownership of the Foreground IP of critical defence industry capabilities. Similarly, the GOC will also take ownership of Foreground IP when the ISSC is with the contractor other than the OEM to reduce the ISS contractor's dependency on the OEM and thereby increase the contractor's accountability for performance. In all cases, the GOC will obtain a license to all the Background IP that is necessary to exercise the GOC's rights to the Foreground IP. In all but exceptional circumstances, the GOC will grant licenses to Canadian industry to commercially exploit the IP it owns." [(1)]

The ISSCF goes on to recommend;

"Canadian Defence Industry, Intellectual Property and Technical Data.

The GOC will:

a. identify ISS tasks that are to be performed by industry in Canada in order to preserve critical defence industry capabilities;
b. secure all rights, including access and IP rights, to the Technical Data it needs for the support of the equipment throughout its life including the potential necessity to re-compete or repatriate ISS work;
c. take ownership of the Foreground IP of critical defence industry capabilities when allowable under TB policies;
d. obtain a license to the necessary rights to the Background IP to enable the GOC to exercise the GOC's rights to the Foreground IP; and,
e. in all but exceptional circumstances, the GOC will grant licenses to Canadian industry to commercially exploit the IP owned by the GOC" [(1)]

Item e. will be a sticking point for OEMs in the case of background data. At a minimum, the Crown should obtain sufficient rights to enable fleet support, even at the expense of subsequent commercial exploitation and should retain the rights to all foreground data, although this data may be of limited value on a stand-alone basis.

There is evidence that data rights can be obtained. We understand that the UK has certain rights on the JSF program to enhance their sovereignty over their fleet and that the Australian Government has procured data for the support of their C-130J fleet.

In a truly competitive environment, access to data can be a mandatory requirement or can be a rated requirement that carries sufficient points as to make compliance a game changer for the compliant bidder. In this case, the Crown needs to weigh the relative value of data access against the rated values of other technical requirements, ie: you may end up buying a slightly less capable system, that meets all mandatories, while it provides exceptional data access. It becomes a trade-off.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Summary of Conclusions

The following is a brief summary of major conclusions, referenced back to the detailed sections of this report.

Section 3 – In Service Support and Integrated Logistics Support – A Definition

- Integrated Logistics Support ILS is nominally the process of setting up a support environment and infrastructure including the analyses necessary to quantify support requirements.
- ISS is the act of providing support throughout the life of the fleet.
- ILS runs for the entire life of the fleet, constantly course correcting the ISS activities.
- There is an initial burst of revenue during the acquisition program associated with ILS. Then revenues/costs fall off until the fleet starts to age. This curve creates a revenue hole for the ISS provider at the beginning of the fielding of a new fleet.

Section 4 - The Evolution of Canadian Military Aviation Support Concepts

- The evolution of the Single Point of Accountability model was driven by many factors, with DND and PWGSC risk a key driver.
- The OWSM model fits well within the context of a single point of contract.
- OWSM represents a significant, positive evolution toward a focus on outcomes, operational capability, and performance-based contracting.
- The ISSCF framework provides a nuanced and balanced view of how ISS should be performed. It absolutely supports the notion of a substantial level of Canadian content and access to data.
- SPA need not necessarily refer to the OEM nor refer to the same commercial entity throughout the life of a fleet.
- In conjunction with SPA, PBL offloads risk from DND, simplifies management and should result in more predictable rates of availability and reliability.

Section 5 - The Support of Legacy Platforms in Canada

- Access to data has enabled high levels of support.
- Canada frequently has the need to extend the useful life of a variety of platforms.
- Life extension programs are critical to Canada's fleets,
- Canadian businesses have the skills and capacity to take on intensive support programs and highly intrusive and engineering intensive update, upgrade and service life extension programs.
- OWSM models work, even when the single point of accountability is not the OEM.
- High value added work in Canada leads to export opportunities to the net benefit of the Canadian economy and to DND through overhead and R&D absorption.
- Urgent modifications, demanded in times of war, are easily provided by domestic suppliers, who have the interests of Canada and, by extension, DND front and center.

Section 6 - Recent Canadian Military Aerospace ISS Programs

- Everything from CC-177 to man portable UAVs have been purchased with the OEM as the single point of accountability.
- The CH-147F Chinook and CC-130J Hercules remain programs of great concern to the in-service support industrial base.
- As the CH-147F and CC-130J were purchased as sole source procurements, the role for Canadian industry has shifted away from long term support and engineering to a large number of component supply transactions under the IRB umbrella.
- There has been a substantial and measureable shift of high value white collar engineering and program management work out of Canada on the CC-130J program.
- One of the fundamental questions that we must ask is "does Canada need to have a domestic ISS and depot level support capability?".
- As the CH-147F and C130J were both directed sole source contracts, with no mandate for Canadian ISS

work shares, Canada has limited leverage to pull this work over the border.

- These acquisitions were driven by Afghanistan, urgent renewal, limited options, etc. In and of themselves, they don't appear to be bad decisions, but the selected ISS framework has created a large lost opportunity.

Section 7 - Canadian Military Aerospace ISS Opportunities

- "The challenge ahead is to find ways to meet DND's single point of accountability imperative while maintaining some degree of assurance that Canadian industry will continue to create and maintain the capability of meeting future unique national requirements, including technology enhancement, in the operations and maintenance of Canadian owned and operated systems." (7)
- There is a looming revenue shortfall in the airframe ISS business in Canada.
- How we select long term support models for future programs will influence the recovery as well as the viability of Canada's domestic ISS capability.
- There are substantial opportunities on future platforms. Some of these procurements will be competitive and are thus opportunities to demand certain behaviours, contract models and workshares. Some will require real political will if there is to be a substantive level of Canadian content in long term support.

Section 8 - Domestic and Global Trends and Forces

- This is a cyclical business space and these are frequently cyclical issues. There are boom and bust cycles and these are aggravated by the cycle of capital procurements in DND.
- Shifts, and likely declines, in defence spending in the US and Europe present both challenges and opportunities to Canada.
  - Exports will shrink.
  - Competition for sales will grow, giving Canada leverage.
  - There will be a heightened desire on the part of OEMs to retain relatively high margin ISS work.
- There is likely another down cycle in Canadian defence spending coming, particularly as it relates to the RCAF and ISS.
- The growing complexity of military aircraft makes domestic ISS harder to achieve and may require us to focus on specific areas that are of national importance.

Section 9 - Perspectives on ISS

- There is substantial divergence of desires and needs across the various stakeholders.
- OEM perspectives have shifted substantially, and this has occurred at the same time that Canada has gravitated towards the SPA model. The effect has been to reduce Canadian work shares in ISS.

Section 10 - Costs and Economic Benefits

- There are substantial net benefits to Canada of work performed in Canada in terms of tax revenues returned to the treasury and the circulation of wages throughout the economy.
- The current IRB program is too transaction based and not targeted towards achieving a sustainable defence industrial base.

Section 11 – Access to Data

- Canada does not necessarily have to "buy" data. Access is critical and can be obtained through partnerships between the OEM and Canadian ISS providers.
- Not all programs require the same levels of data.
- Without access to key data, independent long term domestic support, upgrades, repairs and life extensions are simply not possible.
- The ISSCF takes a fairly aggressive position on access to data.

12.2 Towards a Default Policy on ISS

Every procurement and platform will be different. This certainly applies to the area of In-Service Support. We believe that there is no such thing as a one-size-fits-all approach to ISS, particularly in such a diverse fleet, frequently made up of a limited number of aircraft per type.

Despite this diversity, we believe that there need to be ground rules and a default or baseline policy, clearly articulated, against which deviations can be taken.

This approach enables us to clarify what we generally want, and to clearly understand the extent to which we are proposing to diverge from that baseline on each contract.

We already have the basis for a default position on ISS in the ISSCF.

We have two recommended models for consideration:

12.2.1 Model 1: OEM = SPA

- The OEM is the Single Point of Accountability for the duration of the life of the fleet.
- The OEM provides ILS, LSA, initial cadre training, interim spares and full support thru the warranty period and until FOC (ie: final aircraft delivery), folding in the Canadian ISS lead (see next step) early in the program.
- OEM selects a Canadian ISS lead;
  - Option 1: Upon award, the OEM competes a comprehensive support program in Canada with mandated Canadian work shares, or,
  - Option 2: The OEM bids a team which includes a Canadian partner who will be their ISS lead and who has mandated work shares.
- In both options above, the Canadian partner must be fully engaged in ILS work as soon as possible, as this brings them into the fold and provides them with critical insights and knowledge that facilitate their later ISS role.
- IRBs requirements must be set up to target specific offset work, penalizing low value work and rewarding high value work that is in targeted areas.
- Technical data for Canada: 1) GOC acquires rights to data, sufficient to enable domestic support of the fleet, or 2) mandates free and clear data access between the OEM and their selected Canadian ISS partner, or 3) makes data availability a mix of mandatory and rated requirements that encourage the bidder (OEM) to provide the required access up front.
- The OEM remains the ultimate design authority, but Canadian Industry and DND would have the ability to manage, upgrade and repair their own platforms.

12.2.2 Model 2: SPA Swap

- The OEM is the Single Point of Accountability for the fleet acquisition program and the SPA is handed over to the Canadian ISS prime once all of the aircraft have been delivered and initial setup/training/interim spares, etc. has been delivered.
- The OEM provides ILS, LSA, initial cadre training, interim spares and full support through to the SPA swap point, folding in the Canadian ISS prime (see next step) early in the program.
- OEM selects a Canadian ISS Prime;
  - Option 1: Upon award, the OEM competes a comprehensive support program in Canada with mandated Canadian work shares, or,
  - Option 2: The OEM bids a team which includes a Canadian Partner who will be their ISS Prime and who has mandated work shares.
- In both options above, the Canadian ISS prime must be fully engaged in ILS work as soon as possible, as this brings them into the fold and provides them with critical insights and knowledge that facilitate their later ISS role.
- Canada mandates the ISS prime role and clearly articulates what workshares and level of independent support are required.
- Technical data for Canada: 1) GOC acquires rights to data, sufficient to enable domestic support of the fleet, or 2) mandates free and clear data access between the OEM and their selected Canadian ISS partner.
- The OEM remains the ultimate design authority, but Canadian Industry and DND would have the ability to manage, upgrade and repair their own platforms.

Note that neither of these models is a “shot-gun wedding”, where a Canadian ISS prime is selected by Canada and imposed on the OEM.

As noted above, these are default positions. The model that eventually was selected for the CC-177 fleet could

still be employed, but we should have a clear understanding that it was deviant and to what extent it deviated.

" … once the government takes ownership of a product or system then it is strategically important that the in-service support (ISS) be under Canadian control. It further acknowledges the requirement that such purchases must also bring with them sufficient intellectual property (IP) to allow the department to be a "smart owner/operator", and to have a "smart" Canadian ISS contractor. In addition, the government recognizes the economic impact of military spending on major crown projects and remains committed to ensuring that Canadians and Canadian suppliers benefit, by requiring OEM contract recipients to re-invest in Canada.

By virtue of the ISS contract's Industrial Regional Benefit (IRB) requirements, much of the ISS work will be subcontracted to Canadian firms. IRB requirements, however, do not typically identify specific tasks that must be performed in Canada.

As a result, there is a risk that Canadian firms will be relegated to work of low intellectual value – work that will neither preserve critical defence capabilities nor support the sustainment and growth of Canadian industry. Accordingly, in addition to IRB requirements, the GOC should require specific work to be performed in Canada (e.g., 50 percent of engineering hours shall be performed in Canada)." [(7)]

"In the ideal situation, ISS programs would provide the Government with opportunities to achieve three outcomes:

- Maintain up-to-date and interoperable platform capabilities in the most cost-effective manner;
- Preserve the ability to insert unique national capabilities; and,
- Use ISS program activities as a springboard to assure Canadian defence industries retain the ability to service generations of follow-on technology and compete globally." [(1)]

With regard to Model 2 above (which involves some kind of cross-over from an OEM as prime to FOC and contractual novation to make a Canadian ISS supplier / Integrator the ISS Prime) the Crown needs on-ramp approvals to ensure that set up criteria met and Canadian ISS integrator can take over. We will need honest cost-benefit business case / business models to validate these approaches.

12.3 Specific Platform Options and Recommendations

We recommend that the following approaches be considered for the long term support of recently purchased and future RCAF fleets;

12.3.1 CC-130J Hercules (Section 6.4, above)

The Government of Canada and Lockheed will revisit the ISS component of this fleet every 5 years. Canada should assert that it needs greater autonomy and control over the support of this fleet in its later years of life and negotiate 1) a larger role for Canadian industry today in LSA and engineering analyses, and 2) negotiate the sharing of sufficient data to enable Canadian industry to provide depot level support, repairs and upgrades later in the life of the aircraft in a manner that is similar to the level of support provided to the legacy Hercules E/H fleet.

12.3.2 CH-147F Chinook (Section6.5, above)

As with the CC-130J, the Government of Canada and Boeing will revisit the ISS component of this fleet every 5 years. Canada should assert that it needs greater autonomy and control over the support of this fleet in its later years of life and negotiate 1) a larger role for Canadian Industry today in LSA and engineering analyses, and 2) negotiate the sharing of sufficient data to enable Canadian industry to provide depot level support, repairs and upgrades later in the life of the aircraft.

12.3.3 JUSTAS (Section7.5, above)

We recommend "Model 2" above, with a twist. Canada should procure sufficient data to enable in-theatre repair and execution of UORs domestically.

We should plan for airframe repairs to be executed by the OEM unless it is economically feasible to do this in a Canadian facility. In effect, the major airframe components become line replaceable units that are returned to the OEM for evaluation, repair or replacement.

Procure sufficient data to enable a Canadian integrator to have complete and unfettered ability to manage the payloads, amending, upgrading and replacing them as necessary completely independently.

Create both a Canadian ISS lead and a Canadian Payload Integration lead.

12.3.4 CMA (Section 7.3, above)

As noted earlier in this report, in the event that Canada elects to purchase a fully integrated platform, it is incumbent upon the Crown to negotiate an arrangement whereby Canada can fully maintain the platform, at least to the point of modifying the mission system and sensor / communications suite. This platform will operate for a number of decades, during which the underlying technologies will likely go through a number of generations of change.

12.3.5 JSF (Section 7.4, above)

Although Canada has made a commitment to this aircraft, and it would appear that we are likely to sole source procure a fleet of F-35s, there are many in industry who believe that we still have room and opportunity to negotiate the long term support package.

From the point of view of ISS, a northern JSF depot in Canada would be a fantastic offset, though this will require significant political will to secure.

A balance between access to global supply chains and participation in long term support appears to be the appropriate approach for Canada. While out year support will look expensive, and there will be concern over the cost of establishing a domestic F-35 support capability, it seems highly likely that a platform of this level of sophistication will eventually require the scope and level of care that we current apply to the CF-18 fleet.

Furthermore, with a worldwide fleet in excess of 3000 aircraft, there is no doubt that export opportunities will emerge as Canadian industry innovates and develops life extension products.

Canada needs to be at least as aggressive in this area as other JSF partners, or we will give away ground to our long term detriment.

12.3.6 Fixed Wing SAR (Section 7.2, above)

This is a hotly contested program, for aircraft that will be modified at the outset and that will likely enjoy continuous upgrades throughout their lives.

We recommend ISS Model 2 for FWSAR if not an outright Canadian prime from the outset. The contract should be performance based.

Canada should demand that a complete data package be delivered, sufficient to enable both domestic modification of the aircraft for the SAR role and to enable unfettered long term support.

The policy question that Government must ultimately answer is “do we need to have a domestic capability to service, support, modify and life extend military aircraft”.

We assert the answer must be yes, and that this requires procurement officials to mandate certain elements of workshare in Canada and to develop incentives and mandatory requirements that drive OEMs towards the business model that makes the most sense for Canada in the long term.

13 ACKNOWLEDGEMENTS AND REFERENCES

13.1 Acknowledgements

COGINT Ltd. would like to recognize and thank the following individuals who offered their time, experience and insights to help produce this report and guide the authors towards their findings.

- Mark Aruja, Thales Canada
- Al Conrad et al, IMP
- Jack Currie, GD Canada
- Paul Evans, Carte Nav solutions
- LGen. Robert Fischer (ret'd), Former ADM(Mat)
- Peter Gartenburg, L3 Canada
- Ian Glenn, ING engineering
- Brian Love, Field Aviation
- Dwayne Lucas, Cascade Aerospace
- Eddie Morin, Boeing Canada
- Tim Page, CADSI
- LGen. Ken Pennie (ret'd), Former CAS, DGSP
- Keith Stoodley, Provincial Aerospace
- Janet Thorsteinson, CADSI
- Tom Wright, Former ADM Industry
- And the many others, not listed here, who provided guidance and data.

All errors are absolutely the author's responsibility.

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13 July 2012

13.2 References

The following reference material was instrumental in the development of an informed and balanced assessment of ISS options. These documents are available from multiple sources, including COGINT Ltd., and have been separately provided to the Secretariat for reference.

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