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Surveillance of Space 2

Questions and Answers from Industry Day Meetings

1. Q. What is the main focus of the Surveillance of Space 2 mission?

A. Resident space object (RSO) catalogue maintenance will continue to be the default mission. However, Canada must respond to the evolving situation in space. The observation of specific targets and their characterization will also become areas of focus.

2. Q. Which performance characteristics are most important (Capacity, Sensitivity, Maneuverability, Accuracy)?

A. This is not known at this time as more analysis needs to be done. Respondents are encouraged to describe in their RFI responses their ability to meet or exceed all HLMRs and the trade-offs between them. Respondents are also encouraged to submit any outstanding or further questions through PSPC Contact.

3. Q. What is Canada trying to achieve strategically with this mission? How important is this service to Canada?

A. This project will support several initiatives identified in the Canadian Defence Policy, Strong Secure, Engaged (SSE), and enable the protection and defence of Canadian interests in space. The system will also contribute to the Space Surveillance Network (SSN) and fulfill Canada's commitments under the Combined Space Operations (CSpO) Memorandum of Understanding. The current contribution, provided by Sapphire, has built a reputation as a leader in SSA ventures and granted Canada unique access to the complete US space catalogue.

4. Q. In terms of Sapphire what is working well and what could be improved upon?

A. The business model and the way we operate by having a contractor operate the system that we own is working well. This is a model that we are interested in pursuing. During options analysis it is possible that we may not pursue that model. We are currently happy with Sapphire operations.

5. Q. Is there a desire to maintain your own catalogue?

A. This is currently outside of the SofS 2 project scope. We do not plan on having a Canadian satellite catalogue. Down the road that may be a possibility but not at this time.

6. Q. In regards to the project as a whole, are you looking for large technological advances or looking at off the shelf?

A. If an option is proposed, it will be considered. This will be an operational mission. The appetite for technological risk is low and we will be looking for mature technology. If the technology is mature and it is a product that exists and can be easily converted, we are open to it. The project schedule is tight and we are looking at ways to accelerate the process.

7. Q. Where does the requirement for visual magnitude 18 come from? What signal to noise ratio (S/N) is assumed? In what operational mode does it apply? For example stare mode with image stacking post processing.

A. The Sensitivity HLMR is actually to detect 30 cm spherical object at 40,000 km. This requirement relates to a population of uncatalogued objects in geostationary orbit. DRDC

conducted an internal study and calculated an equivalent brightness using a diffuse sphere model. The target visual magnitude is derived from this study. If you can only meet a requirement, such as sensitivity, in certain modes, state this in your RFI response. This will allow us to further determine/refine our specific requirements. Any further detailed technical questions and requirement clarifications of this nature encouraged to be submitted in writing through PSPC Contact.

8. Q. How much pointing time is allowed to achieve the Accuracy target of 0.5 arc-seconds?

A. If certain conditions or procedures are required to meet a requirement, state this in your RFI response. This will allow us to further determine/refine our specific requirements. Any further detailed technical questions and requirement clarifications of this nature encouraged to be submitted in writing through PSPC Contact.

9. Q. What is the sensitivity of the SBSS?

A. As it is the US Government's system, we cannot discuss.

10. Q. Are you looking at general mapping?

A. Resident space object (RSO) catalogue maintenance will continue to be the default mission. However, Canada must respond to the evolving situation in space. The observation of specific targets and their characterization will also become areas of focus.

11. Q. What will be SofS 2's orbital region of interest?

A. The HLMRs were developed with the current SSN capabilities in mind. Low earth orbit (LEO) has sufficient coverage from other existing sensors. The SSN would benefit from additional coverage and capacity in the deep space region (beyond 5000 km).

12. Q. Is there a particular part of space that Canada is responsible for?

A. No, there is no one part of space that Canada is responsible for. Sapphire is currently tasked with looking anywhere in deep space so we need to have global coverage. For this project, RSO catalogue maintenance is not going to be our only mission. We will continue to want global coverage. Response time is another key requirement. We're shifting to more ISR-type tasking. If we detect an interesting event we want to be able to look at it, keep track of it and get the information within a maximum 4 hours response time. If your proposed solution can offer global coverage and a rapid response time, then the details provided in the RFI response will help DND refine our performance targets to best meet our needs.

13. Q. When you refer to deep space, are you referring to the GEO belt, HEO belt or both?

A. We are casting a wide net. We are looking at beyond an altitude of 5000 km. We want to be able to cover the GEO belt to observe the assets of interest in that orbit, however, the Sapphire system has also frequently received taskings for objects in highly elliptical orbits (HEO). A system that is capable of viewing the variety of deep space targets is desirable.

14. Q. Are there specified timeliness/revisit times?

A. There are no specified requirements in RFI as to timeliness or coverage. We want to gain an understanding of the art of the possible from industry. We did not clearly define these in order to not disregard options we might otherwise not be aware of. We will combine what is provided in the RFI responses with our own options analysis.

15. Q. In regards to the latency or response time of system, is near real time a requirement?

A. No, near real time is not a requirement. However, it is a target.

16. Q. Defence/military satellites have certain requirements that commercial ones don't, which are cost drivers. Is that something that is being factored into the resiliency for this satellite over what you would normally see on a commercial satellite?

A. The complete system must be operated and supported for a minimum of 10 years. Whether the required resiliency is built into the space craft or the system remains to be determined. We are going to use the responses from Industry to determine that. If you look at the approach taken with Sapphire, the small satellite design philosophy used mostly COTS components and we designed redundancy within the system. We cannot provide a definite response, but based on past experience and the funding ranges of the project, it may not be practical or economical to try to design a conventional satellite with MILSPEC parts with sufficient reliability and environmental hardening to last the entire mission life.

17. Q. Resiliency and protections for defence projects drive up costs as opposed to commercial. It that build into your cost estimate?

A. The costs associated with achieving all HLMRs are requested to be included in the RFI response and broken down to the extent possible.

18. Q. Is the project team still determining the ability to maneuver the satellite? Are you looking at numerous small satellites or more lifetime out of the satellite? Both are design drivers that can impact cost.

A. Maneuverability is still under consideration as an HLMR. The project team has not specified the design life of the spacecraft or individual components of the system. As long as the system as a whole provides the required capability for a minimum of ten years, the requirements will have been met. By leaving the requirements less specific, we are leaving the trade space wide in order to get a variety of possible solutions. The high level mandatory requirements give you an indication of what we're interested in. We are shifting our focus from catalogue maintenance towards more traditional intelligence, surveillance, and reconnaissance (ISR) role. We will still be doing catalogue maintenance by default but we don't want to be limited to that.

19. Q. It appears that maneuverability is a requirement. Is that the case?

A. There are two high level mandatory requirements under review. Within the next few months, a decision will be made. If your option is able to include maneuverability for space based components, please include that along with the indicative costing information in your response.

20. Q. Would you consider a hosted payload model?

A. If you provide us with that as part of your response, and it satisfies our HLMRs it will be considered. As well, information regarding indicative, non-binding costs would be helpful.

21. Q. Are you open to options in terms of ownership?

A. The Control HLMR stipulates the need for national operational control over planning, monitoring, operation, and management of the capability in support of CAF operations. Achieving requirement this would be difficult to demonstrate without DND ownership of the SofS 2 core system. There is, however, room for inclusion of data services. For instance, you could have a nationally owned system that you then supplement with data services.

22. Q. Would the actual operations be done by DND, staff, civilian staff or the vendor's staff? Any limitations?

A. At this time, we cannot provide a definite answer. The current Sapphire model works very well. If that's a model you want to propose we are open to it but we are very much open to other suggestions.

23. Q. Regarding the HLMRs, do you expect them to grow or change through the RFI and evolution of the process?

A. It is not likely that there will be additional HLMRs. Based upon the responses we receive to the RFI, they may be modified and the two under consideration may be approved. We expect to develop more detailed mission-level requirements upon the review of the responses.

24. Q. You mentioned a desire to achieve a capability that lasts for 10 years. Explain the background on why 10 years vs. 5, 12, 20 etc.? Is the minimum goal 10 years?

A. We don't want to find ourselves in a similar situation that we are in today where we are at the end of the life of the current capability without a solution. By specifying a longer time period than the first project, we are giving ourselves enough time to implement Surveillance of Space 3 seamlessly. For the purposes of the RFI, the minimum is 10 years which has been directed by chain of command.

25. Q. The RFI appears to be focused on the procurement of sensors. Are other capabilities such as data integration or sophisticated planning outside of the project scope?

A. The scope of the project is to deliver an SSA system. As part of an integrated system, a sensor operations facility is anticipated to be required. Software algorithms used to plan and schedule observations, potentially optimizing across multiple sensors and types of sensors, are considered to be part and parcel of the system and therefore within the scope of the project. Data processing will be part of that as well.

26. Q. The RFI mentioned a few different kinds of sensors but mainly optical sensors. Are you open to other kinds of sensors to fill the need?

A. Yes. The main focus on optical sensors is in part due to heritage. The project conducted its internal optional analysis and a formal report was published in 2014 in which it was determined that the cost of the radar system would be too high. However, if you have ideas for other sensors that could allow us to satisfy requirements within funding ranges, we are open to looking at all possible solutions.

27. Q. Are you looking for a ground-based or space-based system?

A. The trade space is wide open. We are looking to procure a system that will allow us to meet the HLMRs. The system has to be operated for a minimum of 10 years. In terms of resiliency a single space based platform will not likely be the optimal solution, but will be considered if proposed. The most likely option will be a suite of sensors -- how many and what types we don't know. We are looking forward to receiving the responses to see what they feel will be the appropriate response.

28. Q. Will this project be Classified?

A. The operational security classification of the system could be raised to the Secret level. The data itself, the taskings, the information flowing through the system etc. could be classified up to Secret level. The project itself is not anticipated to be Classified.

29. Q. You mentioned the system might go up to the Secret security level. If so, do the ground based sensors need to be in Canada, the commonwealth or does it matter? Assuming we have access to commonwealth territories, would that be a possibility?

A. At this time, there are no restrictions on the location of the ground based sensors. In your response, you can offer your thoughts on this. Having them located outside of Canada would increase the programmatic complexity of the project. However, we are open to hearing all ideas and possibilities as long as they satisfy our HLMRs.

30. Q. If this program were to operate in a Secret environment, will that also impact the satellite architecture? Do we need to have some protection measures on how data is handled on the spacecraft bus itself? Would we be allowed to conduct the development of the program at an unclassified level?

A. The operational security classification of the complete system will be Secret if the proposed security HLMR is approved. It will be important to later demonstrate that the architecture can operate at the Secret level. From the development stand point, the project itself will not be classified. Canadian Security Establishment (CSE) is the lead security agency and national authority for COMSEC. Operation at the Secret level would require CSE-approved high assurance cryptographic products (HACP) to secure communications links. How this COMSEC equipment is integrated into the satellite architecture is your choice, but whoever is going to deal with the COMSEC equipment will require a CSE COMSEC Account. The facilities where work is done and processed applied will need to satisfy the CSE Approval For Use (AFU) requirements. Use of foreign Cryptographic products may also be subject to additional constraints imposed the National Communications Security Authority (NCSA) of the Cryptographic Producing Nation, including export controls (eg. International Traffic in Arms Regulations [ITAR]).

31. Q. What is Canada's willingness to implement this as a bilateral with the British MoD?

A. Expanding collaborative efforts with allies is one of our priorities. We've been focused on collaboration with the United States, however, CSpO is a multinational Memorandum of Understanding (MOU) that also includes the UK, Australia, and New Zealand. The possibility of a new bilateral agreements would be of interest. Details on this approach would be appreciated to be presented as an option in written responses.

32. Q. We have a colleague that works at ESA level on their SSA. The ministerial in 2019 is coming and there is a push for a larger budget. Would it be relevant to include some ideas? Are you talking to ESA at this time?

A. One of the ideas of engaging Industry is to learn about similar work companies undertaken for other government agencies such as the European Space Agency (ESA), the Department of Defense (DoD), etc. We would like to make use of that work. Any information would be valuable to provide in your RFI response.

33. Q. Could there be greater international collaboration if there is more money in 2019 or is this project limited to supporting and working with the SSN?

A. We would not close the door to collaboration but cannot confirm to what extent we may be able to collaborate. Our international partners in this effort are the United States, UK, Australia, and New Zealand. If it possible to leverage a program that we have with one of these partners, that could be presented as an option for in your submission and would be considered.

34. Q. Does DND anticipate parallel studies?

35. Q. Will there be the opportunity to have funded system studies where the vendors would be able to provide their solutions before the RFP is issued?

A. We do not anticipate parallel or funded system studies for this project at this time. However, the procurement approach remains to be fully defined.

36. Q. Will there be opportunities to do contracted phase studies (phase 0 or A) in parallel with the DND definition phase or will contractors be expected to that on their own?

A. We do not anticipate having preliminary phase studies for this project at this time. We are going to be looking at our procurement strategy once we get responses from Industry. If it is believed that the project would benefit from this approach, it may be included as an option in the RFI response with supporting justification.

37. Q. You mentioned that there are gap mitigation discussions taking place. Is there is a second project planned at this time to address this?

A. Not at this time.

38. Q. One option has already been dropped. Why?

A. Internal option analysis already conducted has produced the list of option identified in the RFI. If you have alternative solutions, you are welcome to present the capability trade-offs, risks, and non-binding indicative cost estimates in you RFI response for consideration.

39. Q. Is the main hurdle WRT a capability gap-filler spacecraft due to budgetary cycles?

A. If you have questions regarding the capability gap and/or wish to provide input, please direct correspondence to Alan Chan, PSPC Contact. These will be considered independently of SofS 2 and the RFI and receive a separate DND response. Meanwhile, options to minimize the capability gap in the course of fielding a final operational capability for SofS 2 may be included your RFI response.

40. Q. As a potential gap filler, would a service model be considered?

A. We will consider all solutions. The content would need to meet the allied need (Five Eyes). This would apply to the gap filler solution only.

41. Q. If we have a solution to fill the gap between the current capability and the new project, is there a possibility to provide funding during that gap period? When will funding be available for a gap filler capability?

A. For the gap mitigation, there is no project for funding at this time. If you have questions regarding the capability gap and/or wish to provide input, please direct correspondence to Alan Chan, PSPC Contact. These will be considered independently of SofS 2 and the RFI and receive a separate DND response. Meanwhile, options to minimize the capability gap in the course of fielding a final operational capability for SofS 2 may be included your RFI response.

42. Q. What type of costing information should be included in the RFI response?

A. We are interested in both the technical aspects of the solution and the financial aspects. It is critical to the project team to have the indicative, non-binding cost estimates included with the RFI responses. Full life-cycle costs of the solution are requested and asked to be decomposed to the extent possible. Annex G of the RFI offers a sample structure and references for further guidance.

43. Q. Can we provide multiple solutions or should we focus on only one?

A. In the RFI responses you can provide multiple options. Respondents are encouraged to include the advantages, disadvantages, and risks and indicative, non-binding cost estimates for each option.

44. Q. Is there a way to participate in the project without being a satellite builder or without providing a complete solution?

A. Any company is invited to provide a response. If you feel you can provide a solution or part of a solution, please describe how your technology can contribute. If you can address only a part of the problem, we'd be very interested in that. You can participate directly with your own RFI response or alternatively you can network with other companies that may be involved and offer them your technology. If making a response, you could include information on how your solution would fit into a possible partnership arrangement. Indicative, non-binding cost estimates would also be much appreciated.

45. Q. If we cannot offer a complete solution should we still provide a response to the RFI? If so, is it possible to be considered in the specifications requirement of the final solution? Are there alternative options available?

A. Respondents are encouraged to submit a response to the RFI even if they cannot provide a complete solution. Whether you feel you can offer a solution or part of a solution, please provide how your technology can contribute. We want to know about applicable technologies on the market, including indicative component costs. This knowledge will assist the project in validating the HLMRs and establishing of performance targets. Respondents are asked to provide

details on technology maturity and the degree to which technological risks are mitigated. It's possible that you may want to consider a partnership with a systems integrator.

46. Q. If a solution proposed is confidential, it will not be released as part of the RFI summary release, correct?

A. We are not going to release any information that is provided to us within the RFI responses. Any information provided by respondents will be treated as confidential proprietary information.

47. Q. If we submit formal questions will there be a process by which you will publish questions and answers to the RFI?

A. Yes, we will post the questions and answers on an ongoing basis. Questions can be directed to Alan Chan, PSPC Contact.

48. Q. In our response, should we include information on past work that we have completed?

A. You can include information on past work in your response. The project intends to minimize risk by leveraging existing technology with an established Technology Readiness Level (TRL) where possible.

49. Q. We are considering linking up with a systems integrator. Are there any issues with this?

A. There are no issues with you partnering with a systems integrator. Your strategy is your own.

50. Q. Our response plans to be less technical in nature and more descriptive in how we plan on approaching the project. Will this be accepted?

A. It is up to you determine how you structure your response. The focus should be to inform the project team of your company's capabilities and products how these could satisfy our HLMRs.

51. Q. Would you accept the submission of white papers?

A. You are encouraged to include all necessary information necessary for the project team to review your proposal.

52. Q. Does the response have to be comprehensive or will incremental responses be accepted?

A. Comprehensive responses are ideal in order to allow the team to validate the HLMRs. However, you may provide an initial response and subsequently provide us with updates based on, for example, new information or new work having been completed. The sooner we get responses, the sooner we can get the project moving. Providing indicative, non-binding costing information is also appreciated.

53. Q. Will there be an opportunity to have a technical briefing at a later date?

A. If we have questions to your response that may be something we do. If we choose to, it will be done in a fair manner and that opportunity will be open to other interested parties.

54. Q. What does the National Security Exception (NSE) imply?

A. The NSE is an internal government exception which is in place due to the nature of the project. As a result of the NSE, Trade Agreements will not apply to this project. The Industrial and Regional Benefits Policy is applicable to procurements when there is an exemption from trade agreements.

55. Q. Is there going to be a requirement for a certain level of Canadian content or Canadian ownership?

A. This project is subject to the Industrial and Technological Benefits (ITB) Policy. Canada is seeking input on economic leveraging opportunities as part of the Request for Information process. A determination has not yet been made at this time regarding specific requirements such as direct Canadian content. We will continue to engage industry on the development of Value Proposition as the project moves forward. It is also early in the process to say where Canadian ownership is required. Upon receiving feedback, we will be able to provide more specific information. However, attention should be paid to the Protection and Control HLMRs to ensure that any solution presented is able to meet them.

56. Q. How is this project being synchronized with the IDEaS program?

A. Right now the project and the Innovation for Defence Excellence and Security (IDEaS) program are completely separate entities. IDEaS could, however, serve as a means of reducing risks with respect to concepts technologies. The DRDC staff supporting SofS 2 are actively involved in the IDEaS program and the project director is monitoring for potential opportunities.

57. Q. Is it confirmed that ITB's will apply to this particular project?

A. Yes, the ITB Policy applies to this project.

58. Q. Is section on ISED/ITB in the RFI deliberately been left broad?

A. We are seeking industry's input on economic leveraging opportunities related to SofS2 as part of the options analysis phase. As the project moves forward, we will continue to engage industry as we develop the Value Proposition for SofS2 in more detail.

59. Q. Please provide clarification on the ITB policy

A. Under the ITB policy, companies awarded defence procurement contracts are required to undertake business activity in Canada equal to the contract value. How this may be divided between direct and indirect commitments remains to be defined. SofS2 falls within the Key Industrial Capability area of Space Systems, and for SofS2 we expect to leverage this procurement fully within Space Systems. Within the Value Proposition, which is weighted and rated, the specific weighting and rating of elements will be considered in areas that support the objectives of the ITB Policy, such as R&D, supplier developing including small and medium business, and exports. The Value Proposition will form part of the bid selection scoring, alongside the technical and financial components of the bid evaluation.

60. Q. For this project, what will the sensor operations facility do? Is this a manned facility? Are the contractors doing operations, data processing, quality checks etc.?

A. Under the current concept of operations (CONOPS), the military operators at the Sensor System Operations Centre (SSOC) in North Bay receive the observation taskings or requests from the CSpOC. The list is finalized, including the addition of any Canada-specific tasks. That

list is sent to the Sensor Operations Facility (SOF) where a scheduling algorithm optimizes the sequence and generates space craft commands for uplink to the space craft. This is done with very little user interaction. The sensor operations facility all receives and processes data into the required format for return to the SSOC. In-service support (ISS) and operations of the SOF is provided by the contractor.

61. Q. Is an autonomous tasking system a requirement?

A. There are no requirements but that is the vision. It's unlikely to remove the human user element entirely but we are open to hearing options as outlined in the responses.

62. Q. How do you envision the ground based sensors fitting in your overall architecture? Is the data coming in going to be shared or sold or do you see the data being only Canadian owned?

A. The architecture of the SofS 2 solution has not yet been selected. Both ground and space based sensors, or a combination thereof, remain under consideration. Regardless of the sensor type, the Control HLMR states that Canada must be able to maintain national operational control over planning, monitoring, operation, and management of the capability in support of CAF operations. The capability delivered is also intended to be a unique contribution to the allied SSN. With a commercial (service based) solution, these requirements could be challenging to meet. If the Protection HLMR were amended to allow Secret level operations, it would necessitate that all data be exclusively owned by DND. We are not closing the door completely to a commercial solution. There may be a role for commercial data to play in addressing the capability gap.

63. Q. Would a solution having an operations center outside of Canada be considered or will there be a requirement that it be operated within Canada only?

A. The Control HLMR states that Canada must be able to maintain national operational control over planning, monitoring, operation, and management of the capability in support of CAF operations. Having the sensors operations facility in Canada may be the preferred solution but we want to hear all options you may propose. In the event the Protection HLMR is modified to specify a requirement to operate up the Secret level, it may prove difficulty to operate the system outside of Canada.

64. Q. In terms of a control station access point, is it limited to Canada only or Five Eyes only?

A. We will consider all options that satisfy our HLMRs. If you are wondering what nations will be most likely to be acceptable, Canada's traditional allies will be seriously considered.

65. Q. The current project schedule is fairly back-loaded. There seems to be a long lead-up to the Implementation Phase. Why?

A. We are looking at options. If companies are able to deliver and earlier IOC, please submit that in your RFI response.

66. Q. Is the schedule related to the availability of the funding?

A. No. As we are in options analysis, the schedule is related to project planning.

67. Q. Is there flexibility in the schedule to have the capabilities completed sooner?

A. We plan to work within the current schedule. We have a number of internal processes that we must follow but are looking at ways to speed things up. Suggestions on how the implementation phase timeline could be sped up should be included in the response.

68. Q. During the presentation session, there was mention of a potential opportunity to advance the program. How real would that possibility be if the capabilities in Canada or in Industry were able to provide solutions in a shorter period of time? Would that be of interest to project team of Surveillance of Space 2?

Yes. We expect to arrive at project implementation in 2023 and shortly thereafter the contract would be signed. The assumption is that it would take about 36 months to deploy from contract signature to the initial operating capability. That is based on a timeline to build a traditional small satellite. If you are able to offer options to deliver a capability within 12-18 months of contract award, for example, please include that in your RFI response for consideration. Information would be appreciated on how the inclusion of an early capability affects the overall architecture, to what degree HLMRs be met by the early capability, and any capability trade-offs or additional costs that would result. These details will help inform DND's analysis.

69. Q. In the RFI there is a great deal of detailed information. Given that the contracting date in 2023/2024 the information will likely change drastically between now and then. How should we approach this?

A. The information requested in the RFI is what the project team feels it needs to be able to come up with a proper cost estimate and full analysis the various solutions. The more detail you can provide, the easier this process will be for the project team. Your response is yours to make. Provide the level of details that you think is appropriate and if we require more info, we will respond to you with questions.

70. Q. Is the budget fixed in stone? How ridged is the budget in terms of potential solutions?

A. The dollar value quoted during the mass brief is not a budget but a funding range. The Defence Capabilities Blueprint published this funding range to give a very rough order of magnitude for preliminary planning purposes. We do not have an approved budget at this time. This is one of the purposes of the Options Analysis Phase: to assist the project team to cost out the capability and then proceed to Treasury Board for expenditure authority approval.

71. Q. Prior to the issuance of the formal RFP would there be any update to the funding range?

A. As we get responses from Industry we will get a better idea of what is possible both technically and financially. By narrowing down the technological solutions we will be able to refine the estimated costs of the system. However, DND will not necessarily publish an updated budget. When the RFP is released, it will be up to Industry to cost their solution and provide a bid that will be evaluated based on predetermined criteria, including a financial evaluation.

72. Q. Are launch costs included within the funding range?

A. We are asking for a capability. If a response says "our response includes X number of satellites in orbit and a few ground based sensors and the cost is X amount", the assumption is

that the satellites have been placed into orbit. When preparing the RFI response, costs are requested to be decomposed to the extent possible.

73. Q. Will there be a mechanism in which Canada would consider providing a separate contract or co-funding or doing some sort of separate arrangement for launch? For example, you have the solution, less the launch, and the launch is handled separately because Canada may have negotiated separately and agreement with a launch provider outside of the RFP process. Do you envision something like that happening?

A. If the response includes a satellite in space it is assumed the cost of delivering that capability is included in the cost. When preparing the RFI response, costs are requested to be decomposed to the extent possible.

74. Q. Would a shared launch with other sensors or other satellites be considered?

A. We cannot provide a definite answer. It is in the trade space. Sapphire was launched on a shared launch. If physical security and other requirements are met then there is no reason why such a solution would be discarded.

75. Q. Would a non-US launch be acceptable as part of the solution?

A. We cannot provide a definite answer. If that is what you propose, and it satisfies our HLMRs, it will be considered. Nothing at this time that would preclude the use of launchers outside of the US.

76. Q. In terms of the financial model, do you see this as being a single contract award based on the final RFP or will there be a stage where you take it to the CDR and then a there's a contract for CDR and then you submit another bid for the actual implementation?

A. As we are still in the Options Analysis Phase, this is still to be determined.

77. Q. Is there an intention to award a project management services contract to support project delivery on the management side?

A. We currently have access to a supply arrangement to provide Project Management Support Services (PMSS) and Engineering Support Services to Director General Information Management Project Delivery (DGIMPD). When the current contracts expire they may be re-competed. There are no plans to establish unique contracts for this project.

78. Q. Will this RFI determine the RFP or will there be several more RFI's coming in the future?

A. There is only one RFI and it will lead up to the RFP. There will be more consultation and more one-on-one meetings with Industry. We hope to cast a wide net and from the responses, learn what Industry can provide. From there we will refine the requirements and then further engage Industry.

79. Q. There is going to be an RFI phase and then a voluntary draft RFP followed by a final RFP, is that correct?

A. Yes, that is correct.

80. Q. It is our interpretation based upon your presentation that there would not be an RFP contract for definition phase. Are you planning on doing an in-house definition phase and only do an RFP to Industry for an implementation phase?

A. Our strategy remains to be determined. Engaging Industry during the project definition phase is an option that is currently on the table. Currently, the Project plan is to do this internally. However this may change. As part of the analysis for the RFI responses, as a team we are going to determine what the best strategy is going forward. Once we determine this, we will communicate that to everyone.

81. Q. The RFI is open until January 2020. That is a long time to not have direct access to DND to have discussions. Will there be re-engagement opportunities between DND and Industry?

A. The RFI allows us to have a formal process in place in which we can engage Industry on an ongoing basis. The responses that will be provided will allow the project team to review and validate the requirements. It is likely that the team will reach out with questions or requests for clarification. These follow ups will be done in a way that will ensure fairness among all interested parties.

82. Q. The RFI lists a submission date of October 23, 2018. Is this a hard deadline?

A. No. The objective of the RFI is to engage Industry and get input on what type of capability SofS2 should be. We've defined HLMRs which translates into a very wide trade space and we're now asking Industry to propose options on how we can satisfy these mandatory requirements.

Responses may be submitted within coming weeks and months. We suggest you take the time necessary to prepare the response that you feel will be helpful to us. Once we receive the responses and begin our analysis we may reach out to you for questions or clarifications. The RFI is open until January 2020 in order to allow the project team to continuously engage with Industry and it is our hope to conduct further one on one meetings.

83. Q. Are we able to get an email list of the attendees from Industry Day?

A. However, you may submit a request to Alan Chan, PSPC Contact, detailing what companies you want to speak with and he will respond to you.

Acronyms and Glossary of Terms

The following are definitions that relate to the SofS 2 project, and the DND organization that supports it.

Term	Description
ADM(IM)	Assistant Deputy Minister (Information Management).
ADM(Mat)	Assistant Deputy Minister (Materiel).
ADM(Pol)	Assistant Deputy Minister (Policy).
CANSpOC	Canadian Space Operations Centre. The CANSpOC provides a wide range of services to the Commander Canadian Joint Operations Command (CJOC), including missile warning, notification of space launches, satellite conjunction analysis (through its partnership with the US Joint Space Operations Center), and other space-related intelligence operations.
BC, BCA	Business Case, Business Case Analysis.
CAF	Canadian Armed Forces.
CCR	Commissioning Complete Review. Normally signifies IOC.
CC&T	Command, Control and Telemetry. Command and Control are uplinks to the satellite for its operations. Telemetry is downlinked data on the status of the satellite.
CO	Contracts Officer. Normally provided to the project by PSPC.
CONOPS	Concept of Operations.
CORA	Centre for Operational Research and Analysis.
CSE	Communications Security Establishment.
CSpO	Combined Space Operations. The US STRATCOM-led organization tasked with acquiring and Sharing SSA intelligence. Member nations include Australia, Canada, New Zealand, the UK and the US. A major element of the “Five-Eyes” military alliance comprising the same member nations.
CSSS	Canadian Space Surveillance System. The existing CSSS comprises the Sapphire system (the satellite and its ground segment) and the SSOC. The SSOC is owned by Canada, and operated by the RCAF. The Sapphire system is owned by Canada and loaned to MacDonald Dettwiler and Associates (MDA) for operations and in-service support. The CSSS will include the future Sapphire 2 system.
DAP	Data Acquisition Period. Typically a 24-hour period starting at GMT 00.00.
Data	For a GBO or an SBO, this is the product of the observation process. It is provided to the SOF (or SPSF in the case of Sapphire) for analysis and formatting. Once completed, it is sent to CSpOC via the SSOC.

Term	Description
DCB	Defence Capability Board.
DGCSI	Director General Capability and Structure Integration.
DGIMO	Director General Information Management Operations.
DGIMPD	Director General Information Management Project Delivery.
DIM Secur	Director Information Management Security
DND	Department of National Defence.
DPDCS	Directorate Research and Development Communications and Space
DPS	Defence Procurement Strategy
FOC	Full Operational Capability. The system has been certified as a contributing sensor to the SSN.
FOR	Field of Regard. The total area of sky that a telescope can view, by moving its Field of View (FOV).
FOV	Field of View. The total area of sky that a telescope can view without moving its pointing direction.
GBO	Ground Based Optical. A ground-based optical telescope and its ancillary equipment, with the capability to track RSOs and report their orbital parameters to the CSSS.
GEO	Geosynchronous Orbit. About 35,786 km altitude. The satellite's orbit position is synchronized with the earth's rotation, such that it remains over a particular point on the earth's surface. Commonly used for communications satellites.
Ground Station	An RF antenna and its ancillary equipment. A ground station passes on uplink commands from the SOF to the SBO, and relays downlink telemetry and data to the SOF. The ground to space link is RF, and the SOF to ground station is a secure internet connection.
HLMRs	High-Level Mandatory Requirements.
IOC	Initial Operational Capability. The system has been deployed, commissioned and is ready to begin preliminary operations.
IRMC	Investment and Resource Management Committee,
IPCP	Investment Plan Change Proposal.
IRPDA	Independent Review Panel for Defence Acquisition.
ITB	Industrial and Technological Benefits.
ILS	Integrated Logistics Support.
ISS	In Service Support. Typically comprising maintenance, repair, engineering support and Integrated Logistics Support (ILS).

Term	Description
ITAR	International Traffic in Arms Regulations. The US regulations governing the transfer of sensitive defense equipment and information to foreign countries.
CSpOC	Combined Space Operations Center. The US organization that operates the SSN.
LCMM	Life Cycle Materiel Manager. Manages the system after acquisition is complete.
LEO	Low Earth Orbit. Up to 2000 km altitude. Commonly used by earth observation satellites (e.g., Radarsat series). Used by Sapphire.
LEOP	Launch and Early Operations.
MC	Memorandum to Cabinet.
MEO	Medium Earth Orbit. Normally above 5000 km and commonly used for GPS satellites.
MOU	Memorandum of Understanding.
MRD	Mission Requirements Document.
MRO	Months after Receipt of Order.
NORAD	North American Aerospace Defence Command.
PA	Project Approval.
PCRA	Project Complexity and Risk Assessment.
PD	Project Director.
PL	Project Leader.
PM	Project Manager.
PMB	Project Management Board.
PMO	Project Management Office.
PSLV	Polar Satellite Launch Vehicle. One of the two main Indian launch vehicles.
PSPC	Public Services and Procurement Canada. Responsible for contractual aspects of the project.
PWGSC	Public Works and Government Services Canada. Former name of PSPC.
RF	Radio Frequency.
RFI	Request for Information. Also Letter of Interest (LOI).
RFP	Request for Proposal.
RFQ	Request for Qualification.

Term	Description
RSO	Resident Space Object. Man-made objects in orbit around the Earth. Includes satellites, left-over objects from the launch and deployment process (e.g., spent boosters), and debris from collisions.
SBO	Space Based Optical. A space-based optical sensor (satellite) with the capability to track RSOs and report their orbital parameters to the SSOC.
SBSS	Space Based Space Surveillance. The Space Based Space Surveillance Block 10 satellite (SBSS) is US SBO dedicated to the SSN.
SCC	Satellite Control Centre. The control element of the Sapphire ground segment, which manages satellite operations via Command, Control and Telemetry (CC&T).
SCD	Strategic Context Document.
Sensor	For the Sapphire system, this refers to the Satellite (SBO), but could equally apply to a GBO.
SIM	System Simulator. An emulation of the sensor, used for training and debugging anomalies.
SLA	Support Level Agreement. A method for procuring services from other government departments.
SOF	Sensor Operations Facility. Manages satellite operations via Command, Control and Telemetry (CC&T) as well as RSO data acquisition and analysis. For Sapphire, this functionality is provided by the SCC and SPSF, which are two separate facilities.
SPSF	Sensor Processing and Scheduling Facility. The Sapphire ground segment element, which manages RSO data acquisition and analysis.
SofS	Surveillance of Space. The original Canadian space surveillance project.
SofS 2	Surveillance of Space 2. The follow-on Canadian space surveillance project.
SOI	Space Object Identification.
SOR	Statement of Requirement.
SPSF	Sensor Processing and Scheduling Facility.
SRB	Senior Review Board.
SSA	Space Situational Awareness. The ability to view, understand and predict the physical location of natural and manmade objects in orbit around the Earth.
SSN	Space Surveillance Network. A network of ground and space sensors, operated by CSpOC, and tasked with tracking and identifying RSOs and missile launches.

Term	Description
SSOC	Sensor System Operations Center. The Canadian operations centre that serves as the interface between the SSN and the Sapphire system (and the future Sapphire 2 system).
TAA	Technical Assistance Agreement. An agreed to “rule book” that governs how and what technical information will be discussed, presented, and/or conveyed by any means to a foreign national.
TBS	Treasury Board Secretariat.
TLE	Two-Line Element. A TLE set completely describes the orbital parameters of an RSO.
Track	Tracks will be a grouping of six observations divided into two sets of three called tracklets. Observations will be separated by a minimum of six seconds within a tracklet. There will be a minimum of 12 seconds between the last observation of the first tracklet and the first observation of the second tracklet. Maximum track length will be 1.5 minutes.
STRATCOM	Strategic Command (US).
VCDS	Vice Chief of Defence Staff.
VisMag, M_v	Visual Magnitude. The apparent brightness of an object in space, such as a star, or an RSO, as seen by the human eye. Each decrement of VisMag is a factor of 2.512, i.e., a larger number represents a dimmer object. For example, a VisMag 5 object is 2.512 times dimmer than a VisMag 4 object.