Australian Government

DEFENCE INDUSTRY & INNOVATION

Response to Request for Proposal (RFP)

Defence Innovation Hub

Reference: P20-00001 – Sound navigation and ranging system for submarine detection

TABLE OF CONTENTS

PART 1 – RFP QUESTION FORM

A. PROPOSAL AND RESPONDENT DETAILS

INNOVATION TITLE: Sound Navigation and Ranging System for Submarine Detection

CAPABILITY STREAM: Maritime and Anti-Submarine Warfare

COMPANY NAME: Sonic Urchin Pty Ltd

INNOVATION HUB PHASE: Phase 2 – Technology Demonstration

INNOVATION CATEGORY: Goods & Services

INNOVATION SUMMARY: Sonic Urchin Pty Ltd is proposing to develop a sound navigation and ranging (SONAR) system for submarine detection. When mature, the innovation will provide a significant tactical advantage by increasing the range and accuracy of submarine detection. The current phase will aim to demonstrate the feasibility via water tank testing.

A.1 YOUR ORGANISATION AND TEAM

Please advise of any changes to the respondent and project partners details provided in Sections A, B and C of your initial submission to the Defence Innovation Hub.

All details provided in Sections A, B and C of our CFS submission remain unchanged.

B. ORGANISATIONAL CAPABILITY

In Part B, Defence will evaluate the extent to which your organisation is capable of, and has the capacity to, successfully progress the proposed innovation now and into the future.

To inform the evaluation, Defence will consider your responses to the questions below, as well as the relevant information that you provide in the Project Execution Plan (PEP). As part of this evaluation, we will consider:

(i) *the extent of your project management capability, and appropriateness of any proposed or existing governance arrangements;*

(ii) *financial and corporate viability; and*

(iii) *previous performance in delivering similar projects or services.*

You may attach any relevant diagrams, specifications, images, etc. to your RFP response if you believe it will assist in the evaluation process.

B.1 YOUR ORGANISATION AND TEAM

Please describe your organisation, key skill sets and overall readiness to deliver your proposal, including any other entities you are partnering with including subcontractors. As part of your response, outline the key reasons why you believe your organisation is set up to make your innovation a success.

Sonic Urchin Pty Ltd was established in 1920 in South Australia. Over the past 12 years, Sonic Urchin has worked with the Royal Australian Navy (RAN) to develop several high-fidelity underwater listening devices for submarine detection. Currently, we have over 40 permanent employees and an annual turnover of over $10m. Details of our core team are further provided in Section B.3.

Our key skills and experience are:

- Defence engineering experience;
- Subject matter experts in developing submarine detection devices; and
- Mechanical, electronic and systems engineering design.

The above are part of the key reasons why we are set up to make the innovation a success. In addition, we have:

- Staff with ex-military background who understand the RAN operational needs and requirements;
- Successful completion of a Phase 1 project;

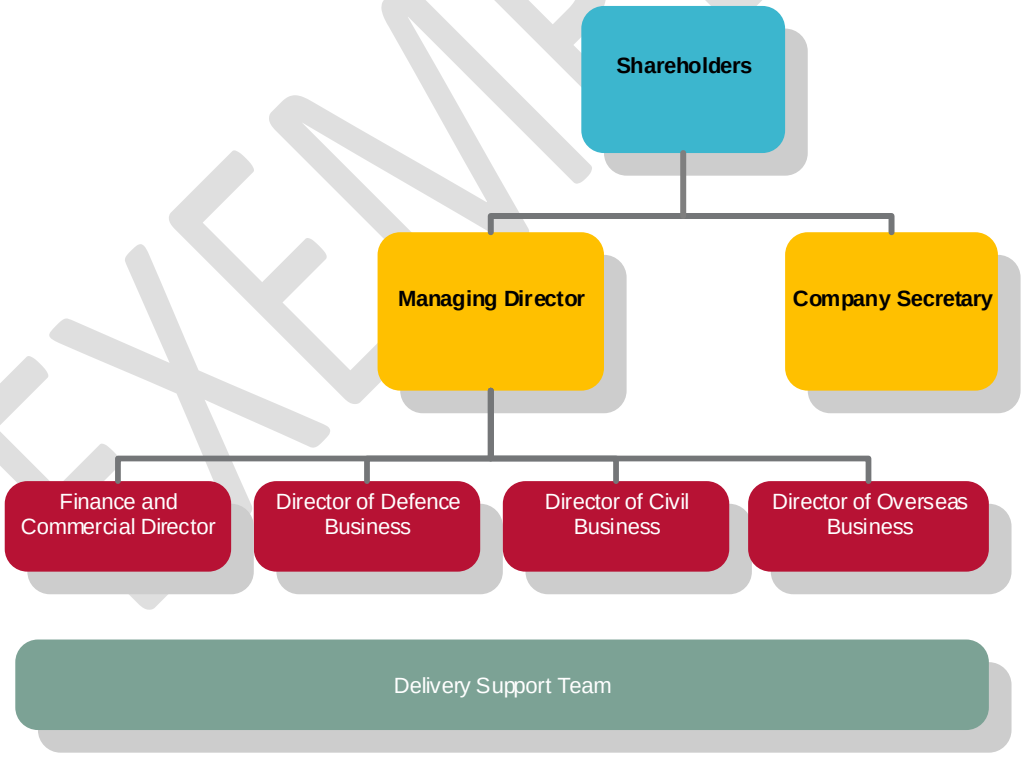
- Established working relationship with Defence, and in particular with the DST Group;
- An accredited quality management system to ISO 9001:2015 that will ensure the quality of our deliverables.

In addition to Sonic Urchin, ZZZ Pty Ltd will be engaged through a Service Contract to manufacture a scaled model of a submarine for water tank testing. ZZZ Pty Ltd is an established company with extensive experience in scaled model production. Our service contract has been drafted to clearly define the scope, timescale and requirements to ensure quality and timely delivery, and can be provided for Defence review if required.

B.2 GOVERNANCE ARRANGEMENTS

What are the corporate governance structures and arrangements of your entity? How are these managed at an operational level?

At Sonic Urchin, we operate with a flat governance structure to encourage communication and to maximise the flexible management of our resources. This governance structure is illustrated in the organisational chart below:



For each project, a Project Manager will be selected from the Delivery Support Team, alongside engineering team members. The Project Manager is responsible for all deliverables and will be the direct point of contact for our clients. For this project, the Project Manager will report directly to the Director of Defence Business.

B.3 PROJECT TEAM

Please provide relevant details of the proposed project team, including a summary of their experience and their intended role on the project. If you do not have personnel allocated to any particular role(s) at this point in time, please provide the position description(s) for the role(s).

Our proposed core project team members are summarised in the table below.

Name	Role	Skills and experience	Responsibilities
Francis Smith	Project Manager	• RAN Officer for 10 years • PRINCE2 Qualified • Project Manager for Minor projects worth $2m each • Project Manager for our Phase 1 development	• Project Oversight • Direct Point of Contact with Defence and subcontractor • Review of deliverable compliance to QMS • Risk management • Commercial matters • Project deliverables
Dr Jane Lighthill	Technology Lead	• PhD in Acoustics • 14 years of industrial experience • Lead developer of our 'Eel' electronic listening device • Lead developer of our Phase 1 work	• Lead the design and development of the SONAR technology • Lead review meetings with Defence • Approval of technical deliverables
Mark Lam	Mechanical Design Lead	• BEng (Hons) in mechanical Engineering • 15-year experience in mechanical engineering design, including our 'Airtube Matrix'	• Lead the mechanical design of the 'pinger' • Development of the water tank test and evaluation plan
Steve Jones	Electronic Design Lead	• BEng (Hons) in electronics • 8-year experience in electronic design • Specialist in piezoelectric transducers	• Lead the design of the piezoelectric hydrophone • Lead development of signal decoding
Ann Lewis	Systems Lead	• 20-years' experience in systems engineering • Led the integration of our 'Eel' device with the YYY platform	• CONOPS development • Lead the development of Functional Performance Specification

		• Led the requirements capture study in our Phase 1 development	• Technology roadmap and maturation plan development

In addition to the above, Sonic Urchin has a pool of over 40 engineers that can support the development of the SONAR system.

B.4 KEY PERSONNEL

Does your proposed innovation project require any key personnel? If so, please list the key personnel and provide the following:

- **an overview of the role/work they are to perform**
- **indicate whether or not these key personnel have already committed to your project**
- **describe the nature of employment of these key personnel (e.g. full time employee, contractor)**
- **describe how the organisation plans to manage the risk of key personnel no longer being available to support the project.**

All five core team members in Section B.3 are key personnel and are full-time employees of Sonic Urchin. Their roles and responsibilities are given in the table in Section B.3.

A key risk to the project is the unavailability of any of the key personnel. To mitigate this risk, the proposed schedule has been reviewed by all five key personnel to ensure not only that the effort scheduled is reasonable, but also to establish an understanding of their required involvement. In the unlikely event that one of the key personnel will become unavailable, Sonic Urchin has established resource management and business continuity plans which will further mitigate the risk. Our weekly resource management meetings identify and anticipate risks on staff resource across the company, and allocate remedial actions as required. We have numerous staff that have the relevant skills and experience, and a register of suitable subcontractors with enabling agreements that can be activated within short notice if any of our key personnel become unavailable.

B.5 DEMONSTRATED EXPERIENCE

Please outline any relevant recent experience in product development, Intellectual Property management, and commercialising or developing innovative technology that exists within your business (including personnel). If you do not have relevant experience, please outline a high level approach to how you intend to execute these functions.

Sonic Urchin and its staff have extensive experience in product development that is relevant to this project. Some examples are:

Airtube Matrix

Airtubes have long been a device used to detect submarines, although their use is often limited due to the noise of sea traffic. Sonic Urchin has developed a system of tube arrays in a cylindrical layout, that alongside a mechanical sound manipulator allows sound detection to be focussed in any selected direction, thus, minimising the noise interference. This was successfully developed and integrated for the SEA1234 Project.

The Eel Listening Array

Similar to the 'Airtube Matrix', the 'Eel' is a line array of neutrally buoyant piezoelectric hydrophones. Signals from individual sensors are summed after passing through lead-lag electronic compensators. This allows the threat to be 'scanned' at different angles with enhanced fidelity. The device was successfully demonstrated and is currently being evaluated for integration into the SEA1234 Project.

SONAR DIH Phase 1 Development

The proposed technology has already benefited from a $200k fund from the Defence Innovation Hub, over a six-month project which successfully defined Defence needs and requirements. The project established the feasibility of the concept based on literature research and theoretical analysis.

B.6 TOP 3 RISKS

What are the top three (3) risks facing your innovation project? What mitigation strategies do you have in place or propose to address each of these risks?

Our top three risks are:

1. Size, Weight and Power (SWaP) feasibility – our literature survey has identified a successful detection of an iceberg at 500Hz echo-sounding. Our intention is to significantly increase this frequency for optimal submarine detection. An unknown is whether the mechanical actuator can produce a strong enough signal to create an echo for detection, especially given seawater absorption of wave energy increases with frequency. To mitigate this, our Phase 1 research included a feasibility evaluation based on established acoustic theory and data, which has demonstrated that SWaP requirements are achievable for a useful echo strength to be established over a two mile detection range. The proposed testing will further confirm this calculation.

2. Availability of water tank test rig – we propose to carry out tests and demonstrations at the DST Group water tank testing facility in Adelaide. There is a risk that the test rig will become unavailable, thus, affect the project schedule. To mitigate this risk, we have already discussed with DST Group the possibility of using this facility and will liaise with them early in the program to agree a suitable schedule and resource requirements for use.
3. Supply of transducers – for this phase of development, we intend to purchase piezoelectric transducers from an American manufacturer, as the operation of its device at high frequencies is already proven. The manufacture of the submarine model will also be outsourced to ZZZ Pty Ltd. There is a risk in the delay of supplier deliverables. To mitigate this, Sonic Urchin has already contacted the companies to obtain quotes and timeframes for delivery of equipment. We have also prioritised the procurement of these items in the development schedule.

B.7 FINANCIAL VIABILITY

When submitting your RFP response, please attach a financial statement for the previous three financial years for your business. If not available, please explain why and demonstrate what assurances you have in place to ensure your organisation will remain financially viable for the duration of the program.

Financial statements for the previous three financial years have been provided.

B.8 PATENTS

State whether there are any patents relevant to the innovation which are either pending or approved? Please also include details of patents which the innovation is dependent on.

Through the development of the Eel listening array, four international patents have been approved, and will be used as background IP for the current proposal. This background IP is described in Annexure C of this RFP submission.

C. INNOVATION SUITABILITY

In Part C, Defence will evaluate the extent to which the proposed innovation could further the effectiveness of a Defence capability, enterprise or technology challenge.

To inform the evaluation, Defence will consider your responses to the questions below, as well as the relevant information that you provide in the PEP. As part of this evaluation, we will consider:

(i) *the extent to which your submission clearly articulates and explains the proposed innovation; and*

(ii) *the extent to which your proposed innovation is unique, and would provide a new or enhanced capability, or improves Defence's effectiveness and efficiency through innovation.*

You may attach any relevant diagrams, specifications, images, etc. to your RFP response if you believe it will assist in the evaluationprocess.

C.1 INNOVATION SUMMARY

Provide a summary of the proposed innovation / technology. This section should expand upon the information provided during the Call for Submission (CFS) stage. If it exists, provide additional detail on the high level summary of your proposed innovation / technology and specify if any changes exist since the CFS submission.

Sonic Urchin Pty Ltd is proposing to design and develop a sound navigation and ranging (SONAR) system for submarine detection. The proposed phase of work will advance the innovation from TRL 3 to TRL 5 via water tank testing.

The detection of submerged objects using conventional methods is difficult due to the large attenuation of light and radio waves in water. Sound, on the other hand, is well known to be able to propagate a long distance in water and is widely used as a means of ship and submarine detection. Nevertheless, current devices, such as air tubes and hydrophones, are 'passive', i.e. they are reliant on noise generated by the submarine itself. This passive method acts to limit the range and accuracy of detection.

The proposed SONAR system uses an active 'ping', in which case the echo sound pressure wave can be made much stronger than submarine self-noise. The signal content is also known a priori to enable more accurate classification, thus, reducing false alarms. Together these will provide significant tactical advantages for Defence.

The system will employ piezoelectric transducers as both underwater sounders and listeners. It is also proposed that our existing Eel listening array, modified to register the sounder signal (rather than the current configuration to detect submarine self-noise), will be used such that the bearing of the target submarine can also be deduced.

C.2 INNOVATION USEFULNESS

Describe in detail how your proposed innovation when mature is intended to be used by Defence and with which, if any, Defence platforms and major systems it is intended to interface with.

You should describe the nature of any interfaces that would be required with Defence systems, what would be exchanged across the system (e.g. information, physical material, etc).

When mature, it is anticipated that the innovation will be integrated into the Future Destroyer SEA1234 Program. Most likely it will be hull-mounted at the bottom of the ship, within a hydrodynamically efficient enclosure.

The innovation may also be interfaced with the destroyer's Combat Management System to enable direct 'sense and respond' torpedo launch.

C.3 INNOVATION BENEFITS

Provide a detailed summary of what key benefits Defence will receive in adopting your innovation. How will your innovation make Defence more efficient, effective or productive? What other benefits will Defence receive from adopting your innovation?

Currently, the employed submarine detection devices, such as the 'Eel' and the 'air tubes' are 'passive' and have significant limitations due to background noise interference. The information they provide is also highly limited. The intended innovation will provide the following benefits:

1. Significantly enhance the reliability of detection – this will be achieved through the ability to manipulate the signal waveform (to maximise the echo strength) and have it known a priori (to focus detection parameters);
2. Extend the detection range – the use of active signals will significantly enhance the detection range, from the current hundreds of meters range to several kilometres; and
3. Provide additional critical information – other than range and bearing, the echo signal will also reveal additional critical information that is not possible with current technologies. As an example, Doppler shift of the original signal will likely provide information on target speed and heading.

In addition to tactical advantages, it will advance Australian Defence's skills and capability in anti-submarine warfare technologies. Successful development will bring about a unique technology that is of high sovereign worth, both in the hardware design and in algorithm detection.

C.4 INNOVATION DEMONSTRATION

If the Hub needs to understand your innovation in greater detail to inform the evaluation of your proposal, what activities if any can you offer to assist this. Examples may include site visits, inspections, concept demonstrations, or prototype demonstrations.

Our Phase 1 findings have been presented to Defence with positive feedback. We welcome Defence visits to our site where we can demonstrate the Eel listening array, which will form a significant component of our proposed system.

C.5 INNOVATION UNIQUENESS

WHAT ARE THE UNIQUE FEATURES OF THIS INNOVATION THAT WOULD SET IT APART FROM POTENTIAL COMPETITORS?

Our innovation is unique because:

1. Our literature survey has not identified any military use of an active echo-sounding technology for submarine detection. The only similar application is iceberg detection which is based on the use of low frequency pulse at 500Hz. This would result in too large an acoustic wavelength (~3m) that is not effective for submarine detection. Hence, our objective to optimise the sounder waveform is a highly unique situation for submarine detection.
2. The technology will utilise the Eel listening array developed by Sonic Urchin, which is a unique technology with four international patent approvals.
3. All other competing devices are currently passive. The active SONAR will significantly enhance the range and accuracy of detection.

D. INNOVATION FEASIBILITY

In Part D, Defence will evaluate the extent to which the proposed innovation will be able to be developed and adopted with relevant defence systems, from a technology perspective.

To inform the evaluation, Defence will consider your responses to the questions below, as well as the relevant information that you provide in the PEP. As part of this evaluation, we will evaluate:

(i) *the current technology readiness level of the proposed innovation, and the relevance and credibility of any claims made by the Respondent relating to the feasibility of the proposed innovation;*

(ii) *the level of effort that is required to implement the proposed innovation into the relevant Defence system or platform; and*

(iii) *the extent to which the proposed innovation can be applied to a platform or system that is readily available for modification.*

You may attach any relevant diagrams, specifications, images, etc. to your RFP response if you believe it will assist in the evaluation process.

D.1 CURRENT MATURITY STATE

Describe the history of development of your proposed innovation to this point and the evidence of claimed Technical Readiness Level including describing any research and development, experimentation, verification and validation testing, integration and / or certification activities that have been undertaken and any objective evidence you have of what has been achieved.

In considering the current maturity state of your innovation, also consider the maturity of technical requirements, design maturity, supportability and system maturity for individual components where applicable.

Information you should consider here includes but is not limited to whether the basic principles underpinning the innovation have been proven, and whether the proposed application/s for the innovation have been proven.

The proposed technology has already benefited from a $200k fund by the Defence Innovation Hub, over a six-month project which successfully defined Defence needs and requirements. The project also established the feasibility of the concept based on literature research and theoretical analysis. Other outcomes from the project:

- Confirmed the need by and the advantage that Defence will gain from a reliable detection system which can also offer extended range and functionality;

- Established the requirements by Defence in terms of detection range, operational environment and detection threshold (as a function of ocean background noise).
- Supported the feasibility of the concept via:
    - Analytical calculations based on acoustic theory of sound scattering of a submerged cylinder. The echo strength was estimated based on the analytical calculation and the typical seawater absorption spectrum;
    - Deduced the power requirement of the actuator using results from the bullet point above, and simple 'piston' sound field to represent actuator; and
    - Carried out a literature survey, including the identification of a previous application in the US to successfully locate an iceberg at a two-mile distance using a similar echo-ranging device operated at 500Hz sound frequency.

Based on the above, the current maturity of the technology is estimated as Technical Readiness Level (TRL) 3.

D.2 PLANNED MATURITY PATH

Describe the planned path to continued maturity of the proposed innovation including describing any future research and development, experimentation, verification and validation testing, integration and/or certification activities that will be undertaken to achieve continued maturity of the innovation.

As part of your response, describe the technology risk profile (technological, developmental, production and market risks) to date and any residual technology risk in continuing to mature the innovation.

You should consider what further development is required before a proposed innovation could be utilised by Defence or integrated with a Defence system.

The work proposed for the current phase will provide physical evidence of the component capabilities and how they can work together to realise the innovation. This will involve the design, manufacture, test and analysis of a scaled system and water tank experiments. The work will take the innovation to TRL 5, and requires a funding of $800k over an 18-month duration, and will include four stages, which are:

Stage 1 – Design (3 months). This stage will include the following activities:

- Procurement of piezoelectric transducers for use as underwater sounders and receivers;

- Design of an interface system to convert electrical signals into desired inputs and outputs. At the heart of this system will be a tuned receiver circuit to selectively pick up signals at or around the transmission frequency;
- Design of a scaled 'generic' (unclassified) submarine model, with particular focus on replicating the features that may enhance the sound echo. We intend to engage the DST Group for guidance and advice on this topic; and
- Develop a plan for water tank tests including the specification of test requirements. We propose that the Defence test facility at AAA will be used. Defence assistance in securing the use of the facility and technicians will be required.

Stage 2 – Integration and testing (six months). This stage will include the following activities:

- Construction of the combined sounder/receiver transducer system will be conducted;
- Manufacture of the scaled submarine model will be carried out by our industry partner ZZZ Pty Ltd, with whom we have an established working relationship;
- Implementation of the post-processing algorithm as identified during the previous work to efficiently evaluate the time delay and amplitude of the 'echoes'; and
- Carry out commissioning tests of the transducer system and the model submarine according to the functional (e.g. sound pressure sensitivity) and non-functional (e.g. watertight) requirements.

Stage 3 – Water tank tests (3 months). This stage will include the following activities:

- Carry out underwater measurement of 'background' echoes due to sound reflection from tank wall boundaries at the desired transducer locations;
- Data of the 'active echoes' from the model submarine will be collected, for an envelope of parameters to include submarine depth, SONAR system depth and location, and signal frequency; and
- During this stage, post-processing of data will be carried out to isolate the submarine echoes from those of the background. It is anticipated that the large tank size will facilitate this (i.e. the background echoes will be of distinguishably larger time delay and lower amplitudes).

Stage 4 – Analysis and reporting (six months). This stage will include the following activities:

- Based on the measured echo strength, the 'transmission losses' will be evaluated as a function of the envelope of parameters mentioned;
- The 'scalability' of the setup will be examined, with the objectives to quantify (on paper) the feasibility of a full-scale system and its effect on the measured data; and

The projected detection range of a full-scale system will be estimated. This will be based on the measured transmission losses, acoustic wave propagation theory and the 'detection threshold' as set out by our previous work. The results will be used as a key performance measure to support further funding.

Upon successful completion of the proposed program, the next phase will involve the production of a full-scale prototype system. Testing will be conducted to demonstrate the detection of actual underwater vessels. It is proposed that the testing will aim at locating a known submarine wreckage, such as the HMS J7, which has recently been scuttled off Port Phillip. This will allow the capability of the system to be validated without compromising Defence resources or security. This phase of the program will expect to last 18 months and at a cost of $1m and will bring the innovation to TRL 6.

The final phase of the innovation development will incorporate the prototype system in an existing V-Class destroyer. It is proposed that sea trials will be carried out to locate an E-Class submarine under a set of defined tracks and manoeuvres. As this phase of the program, we will rely heavily on Defence collaboration, it is currently estimated that it will last up to two years, depending on the availability of vessels, and require funding of up to $2m.

The phased approach will ensure the technological risks are minimised. As the development will advance from laboratory through relevant operational environments, a key residual risk is in the influence of background environments, which is highly variable and will affect the performance. This includes ocean background noise, sound reflection from the seabed and sea surface, and the change in sound speed due to temperature and salinity (which will 'bend' the acoustic rays). Nevertheless, as the physics of these effects are well established, we are confident that the target echo will be distinguishable via the application of appropriate algorithms. This is especially true as an active device, SONAR offers significantly more control (i.e. waveform, frequency, amplitude, etc.) for Defence than the existing means of passive detection that also suffer from the variation in background environment.

D.3 IMPLEMENTATION EFFORT

Describe the overall effort that you believe will be required by both the innovator and Defence to implement the innovation into the relevant platform or system? What do you believe will be the critical success factors?

As part of your response, provide an estimate of the effort required for the end user(s) to be sufficiently trained to utilise and benefit from your innovation. Justify, as best as you can, your estimate and list any assumptions that may influence the sustainability (both positive and negative) of the innovation i.e. pre-requisite knowledge, transport and storage requirements, current national security/safety policy and legislation etc.

It is anticipated that it will take five years to mature the innovation before capability integration. While during this proposed phase, the reliance on Defence is relatively low due to the use of an unclassified scaled submarine model. Defence involvement will be critical to the success in future phases, as the provision of Defence platforms and resource for sea trials will become necessary.

In addition, while it is possible to conduct the proposed phase of work unclassified, we anticipate that future work will involve classified information. Our facility is currently DISP accredited to handle up to OFFICIAL information. Defence advice on security requirements and sponsorship for accreditation will also be crucial to the development of SONAR. The same also applies to the security clearance of personnel.

Finally, given the intention to integrate into the V-Class destroyer for demonstration, and to interface with the Combat Management System for 'sense and response', software and hardware certifications will be required, and Defence guidance on these requirements will also be critical.

It is our intention that during the final phase, the prototype development will include an intuitive user-interface (i.e. a visual display of a circular coordinate, with flashing light indicating the range and angle of the target location), which will minimise the requirement for training operators of the SONAR capability.

On sustainment, given minimal moving parts, it is not anticipated that the requirement will be more stringent than other flooded components such as ship propellers, although, considerations such as watertight and corrosion protection will be required.

D.4 SAFETY

Describe your approach to the management of safety for this innovation and provide a high level explanation of how you intend to achieve Technical Regulatory compliance. Describe your approach to develop, deliver and manage a Systems Safety Program, commensurate with the safety risks inherent in the design, to meet the agreed safety objectives. If applicable, also provide details of the maturity of your system safety planning to date.

We will be using a Systems Engineering framework and we will be applying our experience in Defence technical regulatory frameworks and risk management, to develop a System Safety Program as part of the Technology Demonstration.

We will use our experience in Navy Seaworthiness, acquired through our partnership with Defence in the development of other underwater innovations, to develop a System Safety Plan.

D.5 WORKPLACE HEALTH AND SAFETY

Describe your approach to Workplace Health and Safety Legislative compliance in your organisation as it relates to the proposed path to continued maturity of the proposal.

Sonic Urchin operates a WH&S management system that is certified to ISO45001. Our Health & Safety Manual describes the responsibilities and systems that are used to implement Health & Safety Policy within our company and during the execution of projects and will be applied to this development. These documents can be provided on request.

E. INNOVATION TIMELINESS

In Part E, Defence will evaluate the anticipated timeframe that the proposed innovation would require to realise a positive impact on Defence capability.

To inform the evaluation, Defence will consider your responses to the questions below, as well as the relevant information that you provide in the PEP.

Defence will consider the extent to which the proposed timeline and duration of the proposed innovation aligns with timelines for any Defence capability requirements or related activities undertaken by Defence.

E.1 SCHEDULE REASONING

With respect to the planned Work Breakdown Structure (WBS) and/or schedule for the phase that you will provide in your PEP, please explain the key reasoning, assumptions and approach to planning activity durations and estimates that underpin your timeline.

The key reasoning for the proposed staged approach and WBS is to de-risk the development. Our reasoning, assumptions and approach to planning the activity durations and estimates that underpin our timeline are:

- During the initial three months, our 'Design' stage, the system design and test planning tasks will provide clarity for the whole project. During this stage, the procurement of the transducers and the scaled submarine model will also be initiated to mitigate any supplier delay. Our previous work to design a similar product took about 2.5 months so the extra half a month is to de-risk to procurement of the transducers;
- During the next six months of 'Integration and Testing', the system components will be integrated into the test unit. These include the piezoelectric sounders/receivers, the control electronics and the post-processing algorithms. Commissioning tests will be performed with the objective to confirm that the unit meets the functional and non-functional requirements as deduced from Phase 1 of this project. Our previous work to undertake similar work but with less components has taken four months, so we are allowing an extra two months to de-risk this task;
- During the next three months of 'Water Tank Tests', data will be collected in-situ at the Defence test site. Preliminary analysis will be carried out to confirm the data collected is both adequate and relevant. Our previous work to create under data collection has taken three months to complete; and

- During the final six months, detailed data analysis, in both frequency and time domain, will be carried out to better quantify the performance of the system, and to improve the detection algorithm. This information will then be used to estimate the performance of the system at full-scale, thus, allowing the benefit claims to be justified for funding of future phases. We have not undertaken something similar, so we have double our worst estimate by our technical staff. From our previous experience, when we have undertaken activities that we have not undertaken before they usually take double our worst estimate.

As mentioned, the schedule duration is based on similar activities previously undertaken for other innovation development as a top-down estimate, but we have undertaken a bottom-up verification. Sonic Urchin is therefore confident about the proposed WBS and schedule.

E.2 SCHEDULE DRIVERS AND RISK

With respect to the planned Work Breakdown Structure (WBS) and/or schedule for the phase that you will provide in your PEP, please outline the key schedule drivers that you believe will influence your timeline. What are the top risks to achieving your planned schedule of activities and what are your treatment strategies?

The key schedule driver risks are:

1. Our key development cost is labour, and consequently the unavailability of key personnel could impact our schedule. Mitigation of this risk is outlined in Section B.4 via our established resource management process;
2. The availability of the water tank facility during Stage 3 of our proposed development is crucial to the project. This risk and our proposed mitigation have already discussed in Section B.6; and
3. Delay from suppliers will also affect our schedule. To mitigate this risk, we are proposing to purchase commercial off the shelf piezoelectric transducers from an American company. For the scaled submarine model production, we are working with a long-term industrial partner, with discussions already made on the feasibility and timescale.

E.3 INDICATIVE SCHEDULE FOR WHOLE PROPOSAL

Noting E.1-E.2 and the PEP are phase specific, provide an indicative timeline to fully develop the proposed innovation / technology (e.g. from the current proposed phase through to a 'product' ready to engage with a defence procurement agency). What assumptions have been made?

It is our intention that the innovation will be ready for engagement with SEA1234 procurement in five years' time.

The key assumption is in the submarine trials in Phase 4, which will require the integration of our prototype system into an existing V-Class destroyer, and the availability of both the destroyer and an E-Class submarine for the proposed sea trials.

F. INNOVATION CONTRIBUTION TO AUSTRALIA'S DEFENCE INDUSTRY CAPABILITY

In Part F, Defence will evaluate the extent to which the proposed innovation will improve or contribute to Australia's Defence Industry capability and capacity.

To inform the evaluation, Defence will consider your responses to the questions below, as well as the relevant information that you provide in the PEP.

F.1 CONTRIBUTION TO INDUSTRY (CURRENT PHASE)

How will this project contribute to Australia's Defence industry capability and/or capacity?

In your response indicate what work will be undertaken in Australia during the proposed phase. Also consider, where relevant, impacts to employment (e.g. how much Australian labour will be used) and supply chains; collaboration opportunities between businesses or research institutions and/or diffusion of knowledge and skills.

All labour effort will be expended in Australia, mainly by Sonic Urchin, except for the manufacturing of the model submarine, which will be by the Australian company ZZZ Pty Ltd. The 18-month project will require the effort of three full-time equivalent employees from Sonic Urchin.

All materials and equipment will be sourced from Australia, except for the piezoelectric transducers, which for this stage of work will be acquired as a commercial off the shelf product from America to de-risk the development. In the next phase, when the power requirement is confirmed via the laboratory studies in the current proposal, it is our intention to engage a local manufacturer to design and develop a full-scale prototype to ensure the IP is retained within Australia.

The work proposed in this phase will promote Australian industry's understanding of underwater acoustics. A key contribution will likely be the validation target echo strength against theoretical derivation from Phase 1 (using a cylinder), which will help establish knowledge that is world leading.

F.2 CONTRIBUTION TO INDUSTRY (POTENTIAL FUTURE)

How will this project potentially contribute to Australia's Defence industry capability and/or capacity beyond this project phase?

In your response consider impacts to employment (e.g. up-skilling and number of new jobs created) and supply chains; and collaboration opportunities between businesses or research institutions and/or diffusion of knowledge and skills.

The innovation can potentially be deployed to all next generation maritime platforms and be retrofitted to existing ones.

Beyond this project phase, it is our intention that all design, algorithm and software / hardware development, testing and packaging will be conducted in Australia. This will help create jobs and collaboration opportunities between Sonic Urchin, its suppliers and Defence.

In addition to Defence applications, it is also our intention to modify the innovation for other industries like fishing and surveying.

Based on the above, significant up-skilling and job creation is possible in future phases.

F.3 INTELLECTUAL PROPERTY (IP) COMMERCIALISATION

Has the underpinning IP or innovation been previously commercialised (e.g. foreign military, non-defence application etc.)? If so, please describe the application and what role you had in the commercialisation.

The active SONAR is a new innovation that has not been commercialised.

F.4 EXPORT PLANS

Do you have any plans (formal or otherwise) to export your Technology/Product/IP in the future?

In providing a response, you may wish to consider what are you key export markets, how you intend to engage those markets, and how you plan to manage any export barriers.

Our current market is Defence, in which Sonic Urchin has already established strong relationships with while producing other submarine detection systems. The development of SONAR is focussed on meeting the procurement timescale of SEA1234, which is our key objective.

Beyond the Defence development, it is our intention to modify the innovation for the fishing and survey industries. It is envisaged that the latter can have wide ranging usage from the evaluation of shipwreck hazards to subsea oil and gas resource evaluation.

As seen from the organisation chart in Section B.2, Sonic Urchin already has established business in the civil industries including overseas customers. The development of active SONAR will help synergise Sonic Urchin to become an international leader in the relevant industries.

G. INNOVATION COSTS

In Part G, Defence will evaluate the overall cost (GST exclusive) of the proposed innovation, including contract price, Defence items and any other costs to Defence.

A Budget Calculator has been provided as part of this RFP Pack, which you must complete to inform Defence on how you plan on spending any project funds provided under an innovation contract for the proposed innovation phase.

In addition to the information you provide in the Budget Calculator, Defence will also consider your responses to the below questions to inform the evaluation of your proposal.

G.1 EXISTING ARTEFACTS

With reference to the innovation contract (CPS Item 18 - Deliverables and Deliverable requirements), have any of the proposed deliverables been delivered under a previous Defence funded contract? If so, please detail below.

Response:

G.2 BUDGET RATIONALE (PHASE)

With respect to the financial information that you will provide in the Budget Calculator, please detail your methodology on how you have calculated the financial cost of the project phase. What assumptions have been made? How confident are you in the estimated project costs for the phase? How will you manage a budget shortfall should project costs be greater than expected?

Response:

G.3 INDICATIVE COST FOR WHOLE PROPOSAL

Noting the Budget Calculator and other questions in this section are phase specific, provide an indicative cost (GST exclusive) to fully develop the proposed innovation / technology (e.g. from the current proposed phase through to a product ready to engage with a defence procurement agency). What assumptions have been made?

Response:

G.4 UNIT COST

IF POSSIBLE PLEASE PROVIDE AN ESTIMATE OF THE UNIT COST OF YOUR PRODUCT. AS IT IS LIKELY TO VARY WITH VOLUME, PLEASE PROVIDE AN ESTIMATE ACROSS A RANGE OF RELEVANT QUANTITIES.

Response:

G.5 FINANCIAL RISK

What financial and budgetary risks do you see as being the most likely to negatively affect the ongoing success of your proposal. How do you intend to mitigate these risks?

Response:

G.6 LIABILITY CAP JUSTIFICATION

In completing your draft Contract Phase Statement which is Part of the Innovation Contract, you are required to propose a Liability Cap for your innovation contract (CPS Item 12). Please outline the justification and rationale for your proposed Liability Cap below.

Response:

G.7 INSURANCE JUSTIFICATION

In completing your draft Contract Phase Statement which is part of the Innovation Contract, you are required to propose insurance policy limits for public liability and professional indemnity insurance for your innovation contract (CPS Item 12). Please outline the justification and rationale for your proposed insurance policy limits below.

Response:

H. CONFIDENTIAL PROVISIONS

In completing your draft Contract Phase Statement which is part of Innovation Contract, you are required to propose provisions of the CPS or Annexures to the Innovation Contract that you consider confidential (CPS Item 10). Please outline the justification and rationale for the proposed confidential provisions (if any) below.

Response:

I. CONFLICT OF INTEREST

In Part I, please declare any actual, potential or perceived conflict of interest that exists between:

(i) *the interests of the Commonwealth and the Respondent's interests; and*

(ii) *if the Respondent has Project Partners, the interests of the Commonwealth and the interests of Respondent's project partners or its subcontractors*

in relation to the RFP process.

Response:

J. STATEMENTS OF TAX RECORD

The Black Economy Procurement Connected Policy imposes obligations on the Commonwealth to obtain Satisfactory and Valid Statements of Tax Record from Respondents. Further information about the requirements arising under the Black Economy Procurement Connected Policy is available from the Department of Treasury at http://treasury.gov.au/policy-topics/economy/black-economy/procurement-connected-policy.

Respondents should refer to clauses 2.3 and 6.2.1.b of the RFP Terms. The Commonwealth may exclude a Proposal from consideration if the Respondent does not meet the requirements of clause 2.3 of the RFP Terms.

The Respondent is to:

i. provide as part of their Proposal any of the following Statements of Tax Record (STRs) that are applicable to the Respondent; and

ii. in accordance with clause 2.3.3 of the RFP Terms, obtain and hold any of the following STRs that are applicable to a relevant direct Subcontractor:

Table J1: Respondent / Subcontractor STR requirements

If the Respondent / Subcontractor (as the case may be) is:	Statement of TRs required
(a)	**(b)**
a. a body corporate or natural person;	a satisfactory and valid STR in respect of that body corporate or person;
b. a partner acting for and on behalf of a partnership;	a satisfactory and valid STR: (i) on behalf of the partnership; and (ii) in respect of each partner in the partnership that will be directly involved in the delivery of any resultant Contract or Subcontract (as applicable);
c. a trustee acting in its capacity as trustee of a trust;	a satisfactory and valid STR in respect of the: (i) trustee; and (ii) the trust;
d. a joint venture participant;	a satisfactory and valid STR in respect of: (i) each participant in the joint venture; and

	(ii) if the operator of the joint venture is not a participant in the joint venture, the joint venture operator;
e. a member of a Consolidated Group;	a satisfactory and valid STR in respect of: (i) the relevant member of the Consolidated Group; and (ii) the head company in the Consolidated Group;
f. a member of a GST Group;	a satisfactory and valid STR in respect of the: (i) the GST Group member; and (ii) the GST Group representative.

If the Respondent has requested any of the STRs required under this Item J of the RFP Question Form but the STR has not been issued by the Australian Taxation Office prior to the Proposal Closing Time, the Respondent is to provide as part of their Proposal, the STR receipt issued by the Australian Taxation Office confirming that the STR was requested prior to the Proposal Closing Time. The Respondent is to provide all of the required Satisfactory and Valid STRs to the Contact Officer within 4 Working Days after the Proposal Closing Time.

PART 2- PROJECT EXECUTION PLAN

You will need to submit as part of your response to this RFP a draft Project Execution Plan (PEP) for the project phase. Do not embed your PEP within this document. The PEP will be your core management document for the innovation contract. If successful, the PEP will form part of the Contract Phase Statement once a contract has been signed. The requirements of the PEP are included in this RFP.