



Australian Government



DEFENCE INDUSTRY & INNOVATION



Response to Request for Proposal (RFP) Defence Innovation Hub

Reference: P20-00002 - Gallium Arsenide Photocathode for Night Vision Goggles

TABLE OF CONTENTS

PART 1 – RFP QUESTION FORM	3
A. PROPOSAL AND RESPONDENT DETAILS.....	3
B. ORGANISATIONAL CAPABILITY.....	4
C. INNOVATION SUITABILITY.....	12
D. INNOVATION FEASIBILITY	16
E. INNOVATION TIMELINESS.....	21
F. INNOVATION CONTRIBUTION TO AUSTRALIA’S DEFENCE INDUSTRY CAPABILITY.....	23
G. INNOVATION COSTS.....	26
H. CONFIDENTIAL PROVISIONS.....	28
I. CONFLICT OF INTEREST	29
J. STATEMENTS OF TAX RECORD.....	30
PART 2- PROJECT EXECUTION PLAN	32

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PART 1 – RFP QUESTION FORM

A. PROPOSAL AND RESPONDENT DETAILS

INNOVATION TITLE: Gallium Arsenide Photocathode for Night Vision Goggles

CAPABILITY STREAM: Land Combat, Amphibious Warfare and Special Operations

COMPANY NAME: Night Owl Vision Systems Pty Ltd

INNOVATION HUB PHASE: 1

INNOVATION CATEGORY: Phase One – Concept Exploration

INNOVATION SUMMARY: Night Owl Vision Systems is proposing to advance their Night Vision Goggles (NVGs) with increased visibility during low-light operations, better imaging quality, and greater reliability in both day and night operations. Night Owl Vision Systems' NVG will be a Generation III system that will be developed using gallium arsenide photocathode to achieve higher sensitivity in lower frequency light spectrum and increase compatibility with the night sky light spectrum. Gallium arsenide has not been used for this purpose before, but an initial literature review shows a promising innovation opportunity for NVG to detect light at far greater distance than previously possible with the Generation II systems or any other in its class. Specifically, Research and Develop (R&D) efforts have demonstrated greater than two-fold advancements in cathode gains, resolution and signal to noise ratio. The Generation III NVG will initially be targeted towards helicopter pilots to satisfy critical shortfalls in maintaining situational awareness in different light conditions.

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.

We recognise that we are introducing a new material to technology that already exists and works. Since our CFS submission, we have decided to engage ExtraVision Defence Consulting as a sub-contractor to lead the stakeholder engagement with Defence early in the project.

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.

Night Owl Vision Systems' infrastructure is located in Albury, NSW and have a laboratory suite that can be used to conduct development and testing for the initial phases of the proposed innovation. We will work with ExtraVision Defence Consulting as a sub-contractor to assist in our delivery effort.

Project and Technology development Lead – Night Owl Vision Systems is an Australian company and leader in the design, engineering and manufacturing of optical equipment and advanced materials. With a ten year history in delivering world class engineering solutions in infrastructure and mining, the local business is equipped to offer a next generation product line for Defence. Night Owl Vision Systems provides design, production and through-life support of equipment and platforms. It is our intention to establish a long-term relationship with our client. Our team in Albury is 50 strong with a mix of engineering and technician specialties. Successful applications of our optical product lines include:

- Queensland Olympus Moss mining - Cat Mining Trucks fitted with up to two dozen sensors for night operations;
- MineRESCUE Dragur - Vehicle fitted with monocular night vision optics for search and rescue operations; and

- Illuminator and optic fit out of a full Commercial Energy storage and transmission facility for night works and surveillance.

Systems Engineering and Project Management Lead - ExtraVision Defence Consulting (Subcontractor): Night Owl Vision Systems will engage ExtraVision Defence as a subcontractor for the purposes of managing the project as well as leading the systems engineering activities and engagement with Defence. ExtraVision is a Sydney based professional services firm with experience in supporting organisations in the conduct of projects through the provision of staff with Project Management and systems engineering experience and skills.

ExtraVision has experience in the management of R&D projects, having supported Australian industry with the development and delivery of Defence Innovation Hub submissions and projects. Its recent clients include XXX Pty Ltd, YYY, and ZZZ Australia.

Collectively the listed companies are equipped with Defence experience as well as the technical specialist skillsets from major projects in optical systems.

B.2 GOVERNANCE ARRANGEMENTS

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

Below is an overview of the corporate structure and operational level for the project.

The Managing Director, Mr. Daniel Ayer has overall responsibility for Night Owl Vision Systems and the performance of the company. Accordingly, through the Chief Executive Officer, the overall responsibility for delivery as well as leadership of the Project Management Office (PMO) will reside with the extant Night Owl Vision Systems Executive. The Project Team will have access to Night Owl Vision Systems' corporate enabling functions of Finance, Human Resource, Information Technology and engineering services within the business.

Program Management Organisation

To address the requirement for governance for the project, the PMO will allocate an integrated team derived from principle staff from the company and the subcontractor (ExtraVision Defence).

The Director of the PMO will be supported by the following key positions in order to manage delivery of the project:

- Project Manager;
- Design Engineer;
- Engineering Manager;
- Production Manager;

- Quality and Safety Manager.

The design, engineering and manufacturing activities will occur in Albury NSW, where the Engineering Manager, is collocated with the Lead Design Engineer. The structure is supplemented by sub contract resources that will assist in maturing the innovation needs and framework and deliver to the requirements.

Governance

Night Owl Vision Executive will remain responsible and accountable for the successful delivery and effective leadership of the Project Management Plan. This encompasses the budget, resource, quality, and schedule compliance.

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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).

The PMO will consist of the following positions. The role responsibilities are detailed as the individuals are yet to be confirmed.

Project Manager who will be from ExtraVision Defence and they will be a Certified Practising Project Manager with over 10 years' experience in project management. They will be responsible for the completion of the project and deliverables. This will include:

- Project Oversight;
- Direct Point of Contact with Defence and subcontractors;
- Review of deliverable compliance to the Quality Management System;
- Risk management; and
- Commercial matters.

Engineering Manager will be a Certified Practising Engineer (CPEng) with over 20 years' experience in engineering, 10 years' experience managing a team of engineers and PRINCE2 Qualified. They will be responsible for the overall compliance with Night Owl Vision engineering principles and governance, which includes:

- Design compliance control;
- Participating in design and project reviews;
- Reviewing and approving of the design Request for Information;
- Reviewing of drawings and design input and output data; and
- Reviewing of Verification and Validation (V&V) activities.

Design Engineer will be a CPEng with 15 years' experience designing optical products and PhD in material science. They will report to the Engineering Manager and is responsible for overseeing all aspects of Engineering Design for the Project, which includes:

- Controlling engineering design activities inside and outside of the Albury laboratories;
- Managing the configuration of technical data;
- Preparing and implementing Inspection and Test Plans and the Verification &Validation program;
- Preparing and implementing engineering data for and participating in design review meetings; and
- Supervising the safety engineering aspects of the design.

Production Manager will have over 15 years' experience in production or manufacturing environment and five years' experience as a production manager. They will be responsible for the overall compliance with Night Owl Vision Systems' manufacturing and processing principles, including:

- Liaise with Engineering and project managers to generate objectives and understand requirements;
- Key input to estimate costs and prepare budgets;
- Organise workflow to meet specifications and deadlines, including time sensitive outputs;
- Monitor production to resolve issues;
- Determine amount of necessary resources including personnel and assets; and
- Approve purchasing of equipment and facilities.

Quality and Safety Manager will be certified in WHS and H&S, have 10 years' experience in a quality management role and eight years' experience in safety systems. They will be responsible for the overall compliance against Night Owl Vision Systems' Safety and Engineering management systems; as well as:

- Understanding the customer expectations and needs of the product.
- Developing the quality control processes within the project;
- Aligning the project quality control processes with the company's Safety and Engineering management systems;
- Designing product specifications;
- Monitoring and evaluating the quality of internal production processes;
- Evaluating the final output of products from suppliers and the company to determine their quality;
- Rejecting products that fail quality standards;
- Quarantining fail products and components so that they are not used in the final system;
- Reporting to the PMO on quality standard issues; and
- Improving production efficiency and quality.

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.**

The Project Team in B.3 forms a section within the PMO which will serve as a full-time oversight position throughout the project.

These roles described in Section B.3, will engage full time employees, with a long history in their current business. Night Owl Vision Systems and ExtraVision Defence employees are well versed and adaptable in meeting project demands as shown with the company's 20 years of business.

Most of the staff will be from Night Owl Vision Systems with support from ExtraVision Defence for some of the staff (including the project manager). The important thing is that the right person with the right skills and experience is used for this project and they undertake the responsibilities as outlined in Section B.3.

If one of the key team members becomes unable to fulfil their role or leaves Night Owl Vision Systems, then we have several equally skilled and qualified people to fill that gap.

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.

Night Owl Vision Systems and its subcontractor (ExtraVision Defence Consulting) both have extensive experience in developing products and innovative technology. Some of the recent examples are:

Night Owl Vision Systems Experience:

- Night Owl Vision Systems designed, validated and manufactured the night vision sensors for the Queensland Olympus Moss mine. We modified Cat Mining Trucks by fitting up to two dozen sensors for night operation;
- Night Owl Vision Systems designed, validated and manufactured the monocular night vision optics, which were integrated onto the MineRESCUE Master Vehicle. This vehicle was used for search and rescue operation in low light and night; and

- Night Owl Vision Systems conducted the research and all the work to implement an Illuminator and optic fit out of a fully commercial energy storage and transmission facility. This enabled night works and surveillance.

ExtraVision Defence Consulting Experience:

- Defence Project L6000 engaged ExtraVision to assist with the development of the CONOPS for an Infantry Carrier Vehicle. ExtraVision completed a series of engagements and were able to develop a full system CONOPS according to DEFGRAM345. This enabled the prime contractor of the project to fabricate a design and production program to deliver the asset on time, on budget and to the required quality.

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?

The top three risks that we have identified within this innovation project are:

1. Unforeseen Design

We have identified longevity and efficiency as possible design risks and have detailed this in section E. The reason is that at the time of writing this proposal, Defence needs and functional requirements of the NVG are yet to be elicited and may be beyond the range of the capability of the Gallium Arsenide NVG solution space. To mitigate this risk, Stage 1 of our project is focused on determining user needs and requirements before progressing further into the concept design. In addition, Night Owl Vision Systems would request inspection of pilot head-units and cockpit environments to ensure that this risk is further mitigated.

2. Low Return on Investment

We acknowledge a risk that the capability benefits provided by the innovation may not match the effort required to industrialise the product. We propose to mitigate this issue by clearly identifying the merits provided by various prototype options; the technical risks associated; the cost and timescale of future development; and the impact from non-functional constraints such as cockpit and interior lighting. This information will be made available in our technology maturation plan for consideration in releasing future funding beyond the current phase.

3. Inadequate in-house facilities

Our in-house facilities have been enough, thus far, to complete initial evaluation and R&D activities. As we go deeper into laboratory validation of the gallium arsenide and establish Defence requirements, it is possible that additional specialist machines or equipment may be needed; and will delay our schedule to find the right resources. To mitigate this risk, our previous pursuits in similar infrastructure and mining projects have suggested that our facilities will remain adequate. In addition, the Production Manager has a key responsibility to plan for this resource against the requirements at the outset, and we are confident that early identification of additional requirements will help minimise the impact on our proposed 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.

Our Financial Statements for the 3 previous Financial Years is provided in the RFP submission package, as an attachment.

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.

Night Owl Visions Systems has filed a patent for the Gallium Arsenide Photocathode, and this is the foundation for the innovation.

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 evaluation process.

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.

This project will develop a Generation III Gallium Arsenide Photocathode Night Vision Goggles (NVG) to replace the existing Generation II NVG employed by helicopter pilots in Army and Navy. The aim is to advance NVG capability using existing Night Owl Vision Systems' Gallium Arsenide IP on pilot head-units.

The innovation in this proposal is to integrate our unique photocathode made from gallium arsenide, and film coated micro-channel plates (MCP) into a test head-unit. The first phase of development will be to build on our prior research and initiate a concept exploration; and we will explore configurations of the Gallium Arsenide photocathode. Existing gallium arsenide cathodes have shown greater than two-fold increases in gains, resolution and signal to noise ratios for NVG, providing advanced light sensitivity and image quality.

Night Owl Vision Systems, with ExtraVision Defence Consulting, will analyse, design and develop the two key components of the Generation III NVG. ExtraVision will lead and facilitate the critical Stakeholder engagement and Needs Definition Stage of our project with the appropriate Defence personnel. We are firm on the bounds of the project scope as per the CFS submission and have not changed our approach.

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).

Once the preliminary requirements definition is captured for survivability, ruggedness, and human machine interface, the proposed innovation will be designed for critical Defence mission needs. We foresee major positive impacts on night, ISR, and search and rescue mission effectiveness particularly. The innovation integrated as a head-unit, will provide the wearer an advanced level of situational awareness.

Once a proof of concept is validated by laboratory tests of a user mounted headset, the innovation will undergo design review to identify technical risks, and design impacts to the helicopter pilot cockpit environment (i.e. cockpit and interior lighting, and training programs) followed by achieving airworthiness.

When matured, the proposed innovation will be useful across Defence combat platforms for soldiers, scouts, drivers and pilots, providing advanced viewing power needed for safe and effective night (or low light) operations, that is not offered by current systems.

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?

Defence will benefit from increased situational awareness and safety in night (or low light) missions, as well as an overall advancement in viewing power from the pilots' point of view. The innovation will provide image resolution that will reveal terrain hazards which are not currently being spotted using existing NVG. The proposed technology will also extend the current viewing distance so the user will have greater intelligence for making mission critical decisions.

This approach will enable CoA to gain advanced vision capability without major changes to existing training programs and head-unit integration and interoperability with other Defence platforms and systems. The Innovation involves changes in technology at the component level rather than an overhaul of an entire system or platform. The

photocathode and MCP are critical to achieving high quality and enlarged images. The ADF will receive benefits through (with comparison to existing technology):

- **Increased resolution: lighting gain and viewing distance** - These factors are improved from: 10, 000 up to 80,000 lighting gain (from baseline) and extended viewing distance (i.e. from 100m to over 300m). With increases in NVG performance, elements in the surrounding environment and terrain will be more distinguishable. More distinguishable elements will allow for more reliable intelligence reporting and increased operator performance.
- **Improved Safety / Survivability in mission** - Users will have greater awareness of the mission zone, capturing clear images of landing hazards such as low-rise buildings or distressed vehicles from the surrounding terrain. Moreover, there is better intelligence to conduct collision avoidance and improve search and rescue effectiveness by identifying target areas clearly.
- **Increased calibre of Australian Industry innovation** - In-house design and development of Generation III NVG technology will open new supply chain opportunities for businesses within Australia, as well as set a new benchmark for the level of innovation.
- **Adaptation of new technology** - Platform components across air, land and sea may eventually be able to benefit from same adaptation of the proposed innovation.

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.

Night Owl Vision Systems would be pleased to welcome Hub members to visit our R&D Laboratory in Albury, NSW for a half-day or full day innovation brief. During this visit we propose to:

1. Walk through Generation II NVG technology and patented gallium arsenide;
2. Walk through the R&D studies to date and present findings on cathode and MCP components;
3. Demonstrate potential improvements in the Generation III NVG with rendered video sequences;
4. Tour of our current in-house laboratory facilities that were used in R&D and will be used for concept exploration and proof activities.

C.5 INNOVATION UNIQUENESS

What are the unique features of this innovation that would set it apart from potential competitors?

The use of our patented gallium arsenide photocathode is a key component in the NVG. A traditional design has been followed for NVG cathodes, and gallium arsenide photocathode will be an industry first for NVG systems. This cathode increases spectrum sensitivity in the 800-900nm range, and particularly effective near the InfraRed (IR) range that is compatible with the night sky light spectrum. The following improved performance characteristics are believed to be best in class if realized:

1. Gains to 80,000 times baseline;
2. Resolution of 45 to 72 lp/mm; and
3. Signal to noise ratio of 19 to 26.

Aside from performance improvements, there is high potential that the NVG will achieve such parameters without any major overhaul of the system. Rather, we are changing two components to achieve a magnified performance enhancement. Our market research has not yet shown any competitor to be following a similar approach to improving NVG capability.

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.

Night Owl Vision Systems has established its business in the NVG market, with continuous development of NVG products, primarily through material science. In the late 1960's, a breakthrough in NVG technology occurred primarily through the production of microchannel plates (MCPs) and second-generation wafers, which allowed for a compact and lightweight design, that was suitable for head-units. The visibility provided in these units, however, has had limited use in aircraft operations. Night Owl Vision Systems has since yielded two generations of the NVG product lines and is now pursuing a new

breakthrough with the use of Gallium Arsenide in photocathode design. Night Owl Vision Systems has successfully produced, tested and integrated the Generation I and II NVG systems, with each iteration providing incremental improvements in performance and robustness.

The Generation III NVG development will follow an effective engineering method, and we have completed the initial R&D on Gallium Arsenide Photocathodes based on literature research and theoretical analysis.

This initial R&D has involved:

- Phototube testing of photocathodes; and
- High power laser testing;

These functional and performance tests have indicated initial parameters to be successful, as claimed in C.5. As a result of that work, the innovation is currently at a TRL 2 and the results provide promising outcomes to progress to a TRL 3 to explore how this component may be integrated as a full system for use via three stages over one years' worth of effort.

A longer period of effort (up to three years) will be required to ensure that the prototype is progressed into a fit-for-purpose system. This system can then be trialled in operational platforms.

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 outcomes of our Phase 1 scope of work will be a series of tangible outcomes that can be reported to Defence personnel. The key end point of this phase would be successful achievement of airworthiness. However, the following phases will involve the critical design and development work that will build a system that can be trialled by Defence systems.

Phase 2 of the program will pursue a single concept of interest in consultation with Defence personnel with the aim of completing an immature prototype. This prototype is to be ready for demonstration in a laboratory environment by the end of Phase 2. The performance characteristics will be demonstrated to showcase the capability of the device. This phase of work is expected to take 12-months at a cost of \$1M. At this phase in the program, the prototype would not be ready for use in an operational environment or form a component of extant systems. However, it will set the foundation for setting feasible technical performance measures for a final NVG system and provide Defence a benchmark to provide further guidance on.

Phases 3 and 4 will focus on prototyping the devices and will include more involvement from our partner in construction of the headset unit. A phase 3 project is expected to take 18-months at a cost of \$1.5M. The phase 4 project will focus on prototyping in an operational environment, with refinement of the design to produce a full working prototype to be tested and verified against the performance specifications.

Phases 3 and 4 will be critical in mitigating technological risks that we have identified in using the bespoke photocathode innovation. We have identified that the efficiency and longevity of Gallium Arsenide photocathodes are known to decay with time, from our initial research. We consider that these issues may also be amplified if the photocathode is used in an unfavourable cockpit environment where the cockpit or external lighting may cause the increase in decay of the photocathode. As such, we expect to dedicate further in-house R&D effort to seek mitigation; as well as work closely with Defence in these stages to inspect the cockpit environments.

By the end of phase 4, if there are no further outstanding risks in the technology nor the platforms on which it is integrated, we will be confident that the night vision goggle set will be mature enough to be directed towards a suitable acquisition program.

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.

We expect our phase 3 and 4 scopes of work to comprise of the primary implementation effort for both us and Defence to implement the innovation into the helicopter platform. During these phases, we will investigate design solutions according to the helicopter pilot's extant cockpit environment and avionics system. Pending further Defence input, we will measure the following criteria, to ensure success of the designed product:

1. Cockpit lighting – Generation III NVG Prototype performs to minimum baseline of TPM when implemented by the pilot in cockpit with NVIS compatible lighting. At the same time, we need to ensure that pilots can clearly see helicopter instruments with NVG activated; and
2. External lighting – Generation III NVG image retains advanced image quality as per TPM when strobe lighting is in effect.

If these two operating conditions can be satisfied, then we would be confident that the Generation III NVG system has been designed according to the desired performance specifications and retain the baseline capability during the expected operating disturbances. Overall, we believe this part of the program to comprise the bulk of the effort, up to three years.

Given the head-unit itself is an existing piece of equipment, it is expected that the level of effort required for the end user(s) to be trained to utilise and benefit from this innovation will be low. The major change in using Generation III NVG for the user will be the viewing power – they will see more clearly and further and have more cognitive demand. We expect that comfortable visual perception will be subjective so it will be different each personnel and vary based on operating conditions. Training for using NVG in different operating missions and conductions should be critically to cover the new performance, and to use the goggles in conjunction with avionics.

There are no foreseen special requirements or specific knowledge, transport and storage of the equipment nor are there any anticipated implications for the current national security/safety policy and legislation.

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.

The safety requirements for the project will be undertaken in accordance with the principles outlined in our Risk Management Policy. Our Risk Management System is ISO 31000 certified.

Night Owl Vision Systems has a role in identifying and managing risk including identifying opportunities, like enhanced user performance together with minimising threats in order to achieve project objectives. This approach should have the benefit of enabling us to sustainably grow our business and enhance the value for our clients and shareholders. The following objectives drive Night Owl Vision Systems' risk management system:

- Achieving an integrated risk management approach where risk forms part of our supply chain, our partners and our in-house delivery
- Enhancing organisational efficiencies in management and delivery
- Establishing and maintaining a culture that is risk conscious and which is supported by high standards of accountability at all levels of research, design, manufacture and testing
- Establishing and maintaining stakeholder confidence and trust; and
- Safeguarding assets including human, knowledge property and reputation.

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.

Our WHS Management System is developed and certified in accordance with AS/NZS 4801:2001 OHS Management Systems. Night Owl Vision Systems' Workplace Health and safety will be managed in accordance with the our WHS policy which contains the following objectives:

- Complying with the relevant legislation, codes, guidelines and standards
- Managing environmental and safety management code certifications
- Managing exposure of risks in all areas of our business on the basis that all incidents can be prevented
- Preventing illness and injuries to staff and sub-contractors
- The provisioning of adequate resources to maintain a safe working environment; and
- Protecting the health and safety of our employees and of those who may be affected by our operations.

We have additional safety operating procedures for our laboratories and test benches, which are also zoned with controlled access points to reduce hazardous material exposure and only suitable personnel having access to hazardous material.

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.

Night Owl Vision Systems will conduct a staged approach at every phase of the proposed innovation Program. This approach captures the critical path of achieving a design solution that meets Defence agreed TPMs and a solution that is fit for purpose for pilots in existing cockpit environments.

The current phase 1 proposal includes three stages, which are fully resourced and costed. We have assigned effort to each of the subtasks as indicated in our Gantt Chart in the Project Execution Plan, based on experience carrying out a similar innovation development. This schedule includes the identification of critical paths and has been prepared down to the granularity of individual staff commitment to ensure our estimates are realistic. This MS Project file can be shared with the Defence Innovation Hub on request.

A key assumption driving the schedule is that Defence stakeholders will be available for the needs and requirements capture during our first stage of development. As this is crucial to the whole proposal, we will engage Defence to confirm availability at the earliest opportunity once the contract is awarded.

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?

There are two key schedule drivers which are also the top risks in achieving our planned schedule of activities. These are:

- In E.1 we identified that a key assumption driving the schedule is that Defence stakeholders will be available for the needs and requirements capture during our first stage of development. If the Defence stakeholders are not available, then there is a risk that planned schedule may not be achieved. To mitigate this risk, we will engage Defence early to confirm availability, once the contract is awarded; and
- In D.3 we identified that gallium arsenide photocathodes have exhibited longevity and efficiency decay over time and that the cockpit environment may restrict the NVG from achieving maximum performance. We consider these technological issues as critical risks to maintaining the planned schedule. The impact of this risk is an extension to schedule due to additional time required in R&D, design and prototyping. Our primary mitigation strategy for this risk is to implement free float delivery tasks into the schedule against lead time sensitive items.

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?

The indicative timeline from starting the current Phase of work all through to procurement ready product is approximately 36 months. Noting that within 24 months we would expect to complete a prototype for demonstration. The final 12 months can involve a series of iterative tests and improvements to ensure that the Gen III NVG is fit for purpose in cockpit. This may be labour-intensive process.

For this 3-year schedule, we have made the following assumptions:

- Access to existing head-units and inspection of sample aircraft cockpit environments from the CoA in a timely manner;
- Development of photocathode and tube components are successful and bond together without any issue or problems; and
- Initial NVG testing is successful and does not require any reworking of components or systems.

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.

This project aims to advance the mission capabilities in night or low-light conditions for helicopter pilots. That is, we are increasing the capacity of situational awareness in unfavourable conditions and enhancing the safety and survivability of those missions and helicopter aircrew.

To that end Night Owl Vision and our sub-contractor will develop Australian Defence industry capability and capacity in NVG. Areas of contribution include engineering, designing, testing and manufacturing whereby the companies will focus on developing their core service offering primarily to sustain the existing workforce or grow. The objective is to create a design and manufacture capability that can confidently apply this innovation to other platforms within the Australian and allied defence forces.

All of the project value will involve Australian labour, materials and services with the exception of support by US Optics Headsets Pty Ltd, in the United States, for the development of the head mount unit.

Additionally, there may be a long-term need to maintain engagement with the team from the University of Albury, NSW in a research capacity for evaluation on the Quantum Efficiency of gallium arsenide photocathodes.

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.

As the concept matures, the NVG concept may be extended to other user head-units across soldier, land vehicle, sea vessel, and other Air Force platforms – that is any platform or system that requires viewing power in unfavourable seeing conditions (i.e. night-time and low-light). Thus, the innovation may have widespread impact on ADF capability. These opportunities will require highly skills and experience personnel like project managers, contractor managers, sales, marketing, engineers and technicians to deliver the new solutions.

Further, there are opportunities to enhance existing Night Owl Vision laboratories and manufacturing facilities as well as engaging other Australian small to medium enterprises (SMEs) to support inputs to the Generation III NVG and the NVG future product lines.

The opportunity for further collaboration with research institutions to ensure that we are leaders in NVG capabilities and improve the longevity, reliability and survivability of the Generation III NVG. Moreover, research may extend into the mass production capability for industry of the NVG product lines such as making manufacturing processes more efficient or effective.

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.

Night Owl Vision possesses the underpinning IP for Gallium Arsenide. The innovation is now in using this material in a key component of NVG to advance performance and capability.

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.

The resulting product and technology will be used to engage domestic and international markets in the Defence and Industry sectors respectively. We have been successful already in the infrastructure and mining markets so we will investigate using the NVG technology into these industries.

EXEMPLAR

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:

EXEMPLAR

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:

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EXEMPLAR

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: <ol style="list-style-type: none"> (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: <ol style="list-style-type: none"> (i) trustee; and (ii) the trust;
d. a joint venture participant;	a satisfactory and valid STR in respect of: <ol style="list-style-type: none"> (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.

EXEMPLAR