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Small Business Innovation Research(SBIR) Program - Proposal Cover Sheet

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SBIR Phase I Proposal

Proposal Number: **F244-0001-0037**

Proposal Title: **Interactive Knowledge Graphs for Situational Awareness**

Agency Information

Agency Name: **USAF**

Command: **AFMC**

Topic Number: **AF244-0001**

Firm Information

Firm Name: **Oceanit Laboratories, Inc.**

Address: **Oceanit Center 828 Fort Street Mall, Suite 600, Honolulu, HI 96813-4314**

Website: **<http://www.oceanit.com>**

UEI: **S6X8FST9JAM7**

DUNS: **144540283**

CAGE: **OLGN6**

SBA SBC Identification Number: **000000068**

Firm Certificate

OFFEROR CERTIFIES THAT:

1. It has no more than 500 employees, including the employees of its affiliates. **YES**
2. Number of employees including all affiliates (average for preceding 12 months) **150**
3. The business concern meets the ownership and control requirements set forth in 13 C.F.R. Section 121.702. **YES**
4. Verify that your firm has registered in the SBAS Company Registry at www.sbir.gov by providing the SBC Control ID# and uploading the registration confirmation PDF: **SBC_000000068**

Supporting Documentation:

- [SBA Company Registration.pdf](#)

5. It has more than 50% owned by a <u>single</u> Venture Capital Owned Company (VCOC), hedge fund, or private equity firm	NO
6. It has more than 50% owned by <u>multiple</u> business concerns that are VOCs, hedge funds, or private equity firms?	NO
7. The birth certificates, naturalization papers, or passports show that any individuals it relies upon to meet the eligibility requirements are U.S. citizens or permanent resident aliens in the United States.	YES
8. Is 50% or more of your firm owned or managed by a corporate entity?	NO
9. Is your firm affiliated as set forth in 13 CFR Section 121.103?	NO
10. It has met the performance benchmarks as listed by the SBA on their website as eligible to participate	YES
11. Firms PI, CO, or owner, a faculty member or student of an institution of higher education	NO
12. The offeror qualifies as a:	
<input type="checkbox"/> Socially and economically disadvantaged SBC <input type="checkbox"/> Women-owned SBC <input type="checkbox"/> HUBZone-owned SBC <input type="checkbox"/> Veteran-owned SBC <input type="checkbox"/> Service Disabled Veteran-owned SBC <input checked="" type="checkbox"/> None Listed	
13. Race of the offeror:	
<input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> Asian <input type="checkbox"/> White <input type="checkbox"/> Black or African American <input checked="" type="checkbox"/> Do not wish to Provide	
14. Ethnicity of the offeror:	DO NOT WISH TO PROVIDE
15. It is a corporation that has some unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have not been exhausted or have not lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability:	FALSE
16. Firm been convicted of a fraud-related crime involving SBIR and/or STTR funds or found civilly liable for a fraud-related violation involving federal funds:	NO
17. Firms Principal Investigator (PI) or Corporate Official (CO), or owner been convicted of a fraud-related crime involving SBIR and/or STTR funds or found civilly liable for a fraud-related violation involving federal funds:	NO

Signature:

Printed Name	Signature	Title	Business Name	Date
James Andrews	James Andrews	Marketing Director	Oceanit Laboratories, Inc.	01/08/2020

Audit Information

Summary:

Has your Firm ever had a DCAA review?	YES
	Last Audit Date: 09/27/2022
Was your accounting system approved by the auditing agency?	YES
	Last Update Date: 09/27/2022
Was a rate agreement negotiated with the auditing agency?	YES
	Last Update Date: 09/27/2022
Was an overhead and/or cost audit performed?	YES
	Date of Overhead Audit: 09/27/2022
	Date of Cost Audit: 09/27/2022
Are the rates from the audit agreement used for this firms proposal?	YES

Firm Information:

Agency Firm:	DCAA Pacific Branch Office
Address:	1132 Bishop Street, Suite 620 Honolulu , Hawaii 96813
Point of Contact (POC) Name:	Murako Johnson
POC Phone:	(808) 541-2740
POC Email:	murako.johnson@dcaa.mil

Upload a copy of the audit information:

- [Oceanit Sept 2022 DCAA Letter 041512022M15500020 Final Signed.pdf](#)

VOL I - Proposal Summary

Summary:

Proposed Base Duration (in months):	6
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Technical Abstract:

For this effort, Oceanit proposes to develop a powerful adaptive, interactive dynamic knowledge graph.

Anticipated Benefits/Potential Commercial Applications of the Research or Development:

The benefits of Oceanit's approach is the ability to support faster, more effective situational awareness, pattern of life analysis, threat detection, and targeting operations in time-constrained environments.

Attention:

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Addition:

Enter the page numbers separated by a space of the pages in the proposal that are considered proprietary:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project:

adaptive knowledge graph, dynamic knowledge graph, interactive knowledge graph

VOL I - Proposal Certification

Summary:

1. At a minimum, two thirds of the work in Phase I will be carried out by your small business as defined by [13 C.F.R. Section 701-705](#). The numbers for this certification are derived from the budget template. To update these numbers, review and revise your budget data. If the minimum percentage of work numbers are not met, then a letter of explanation or written approval from the funding officer is required.

Please note that some components will not accept any deviation from the Percentage of Work (POW) minimum requirements. Please check your component instructions regarding the POW requirements.

Firm POW **100%**

Subcontractor POW **0%**

2. Is primary employment of the principal investigator with your firm as defined by [13 C.F.R. Section 701-705?](#) **YES**

3. During the performance of the contract, the research/research and development will be performed in the United States. **YES**

4. During the performance of the contract, the research/research and development will be performed at the offerors facilities by the offerors employees except as otherwise indicated in the technical **YES**

proposal.

5. Do you plan to use Federal facilities, laboratories, or equipment?	NO
6. The offeror understands and shall comply with export control regulations .	YES
7. There will be ITAR/EAR data in this work and/or deliverables.	YES
8. Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	NO
9. Has a contract been awarded for any of the proposals listed above?	NO
10. Firm will notify the Federal agency immediately if all or a portion of the work authorized and funded under this proposal is subsequently funded by another Federal agency.	YES
11. Are you submitting assertions in accordance with DFARS 252.227-7017 Identification and assertions use, release, or disclosure restriction?	NO
12. Are you proposing research that utilizes human/animal subjects or a recombinant DNA as described in DoDI 3216.01 , 32 C.F.R. Section 219 , and National Institutes of Health Guidelines for Research Involving Recombinant DNA of the solicitation:	NO
13. In accordance with Federal Acquisition Regulation 4.2105 , at the time of proposal submission, the required certification template, "Contractor Certification Regarding Provision of Prohibited Video Surveillance and Telecommunications Services and Equipment" will be completed, signed by an authorized company official, and included in Volume V: Supporting Documents of this proposal.	YES

NOTE: Failure to complete and submit the required certifications as a part of the proposal submission process may be cause for rejection of the proposal submission without evaluation.

14. Are teaming partners or subcontractors proposed?	NO
15. Are you proposing to use foreign nationals as defined in 22 CFR 120.16 for work under the proposed effort?	NO
16. What percentage of the principal investigators total time will be on the project?	19.2%
17. Is the principal investigator socially/economically disadvantaged?	NO
18. Does your firm allow for the release of its contact information to Economic Development Organizations?	NO

VOL I - Contact Information

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1. Executive Summary

Maintaining the reliability of knowledge graphs, which must be grounded in high quality and error-free facts, is crucial for real-world applications such as situational awareness, threat detection, and targeting operations. These graphs are often automatically assembled from various sources by extracting semantic triples, each consisting of subject, predicate, object. However, assuring the quality of these extracted triples, especially when dealing with large or low-quality datasets, can pose a significant challenge and adversely affect the performance of downstream applications and the trust in the extracted knowledge.

In this Phase I project, Oceanit will develop REPAIR (Rapid Enumeration of Possible AI Remediations), a powerful tool that allows users to intuitively interact, edit, and update dynamic knowledge graphs. A key feature of REPAIR is its natural language interface for maintaining and updating knowledge graphs. In addition, REPAIR adapts algorithms for complex document processing¹ and uses them for entity, edge, or property resolution which is essential when adding, deleting, merging, or modifying new or existing information in a knowledge graph. In the case where a knowledge graph was built using semantic triples (which is common), we can extract from a subgraph a document whose sentences have subject object verbs from the semantic triples. Thus, algorithms for complex document processing can be applied to knowledge graph modifications in this case. Another key innovation is the link between the natural language chat interface and the knowledge graph itself. Interactions with the knowledge graph (zooming, panning, selecting entities, etc.) affects the *context* of conversations while natural language commands modify graph views, layouts, or objects themselves.

The main components of REPAIR are shown in the following figure. REPAIR first taps into the legacy query interface between a user and their legacy knowledge graph. REPAIR captures those queries and uses them to build up a shadow copy of the legacy knowledge graph (and its schema) using a strongly typed database like TypeDB to assure data integrity and minimize errors. This allows REPAIR to simulate and test changes without affecting the original legacy knowledge graph. In addition, REPAIR integrates a version control system which captures each change made to the knowledge graph over time. This allows users to easily see every change and to undo any modification. Internally, REPAIR also uses the data from the version control system to help suggest additional updates to the knowledge graph. Finally, REPAIR uses a host of algorithms, initially adapted from complex document processing, to handle the modifications of the knowledge graph.

¹Shankar, Shreya, Aditya G. Parameswaran, and Eugene Wu. "DocETL: Agentic Query Rewriting and Evaluation for Complex Document Processing." arXiv preprint arXiv:2410.12189 (2024).

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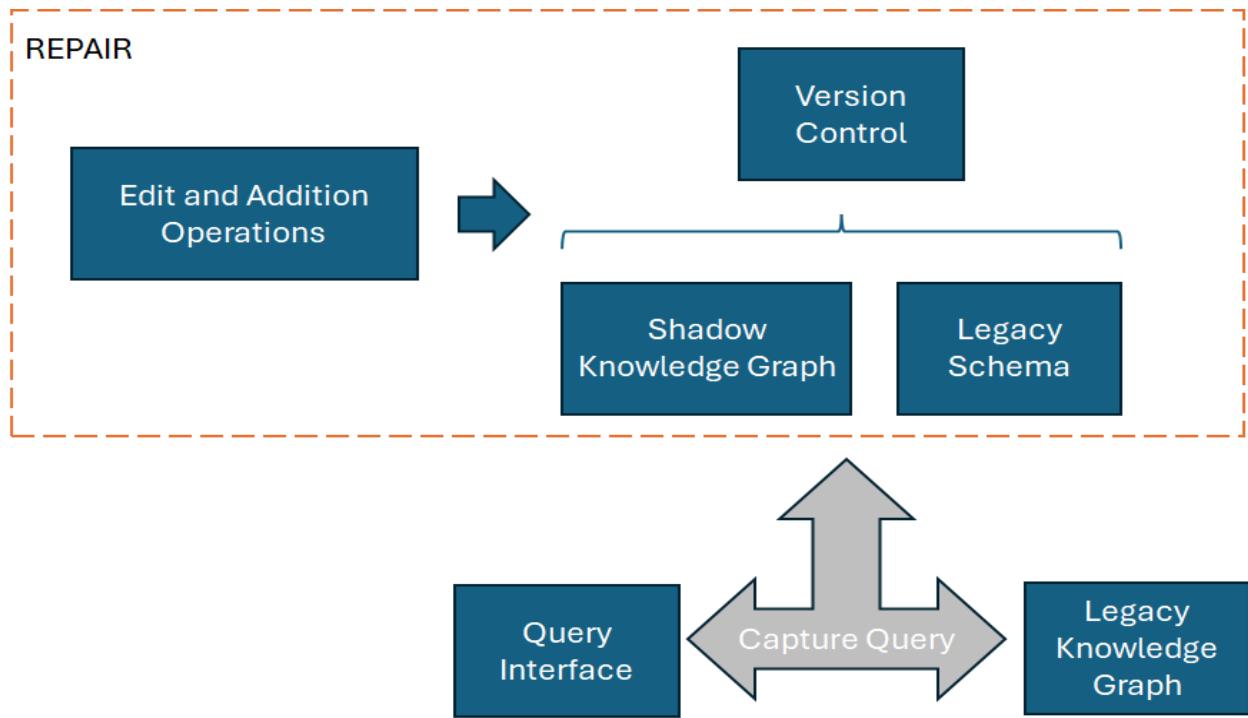


Figure 1: High level architecture of REPAIR.

While the focus of this effort is on the natural language interface and knowledge graph modification algorithms, REPAIR also features an intuitive user interface as shown in the following figure. REPAIR enables users to find, select, and modify entities, relationships, and properties visually via a knowledge graph view or via a natural language chat interface or copilot. The user interface builds analysts' trust by synchronizing the source documents with the extracted knowledge. The interface shows the effect of the changes and references the original source documents, highlighting the specific sentences, numbers, or figures to garner trust in all proposed actions. The user interface enables cross-context analysis, i.e., each view is synchronous with each other, and filtration or selection in one view will result in corresponding filtration and selection in the other views.

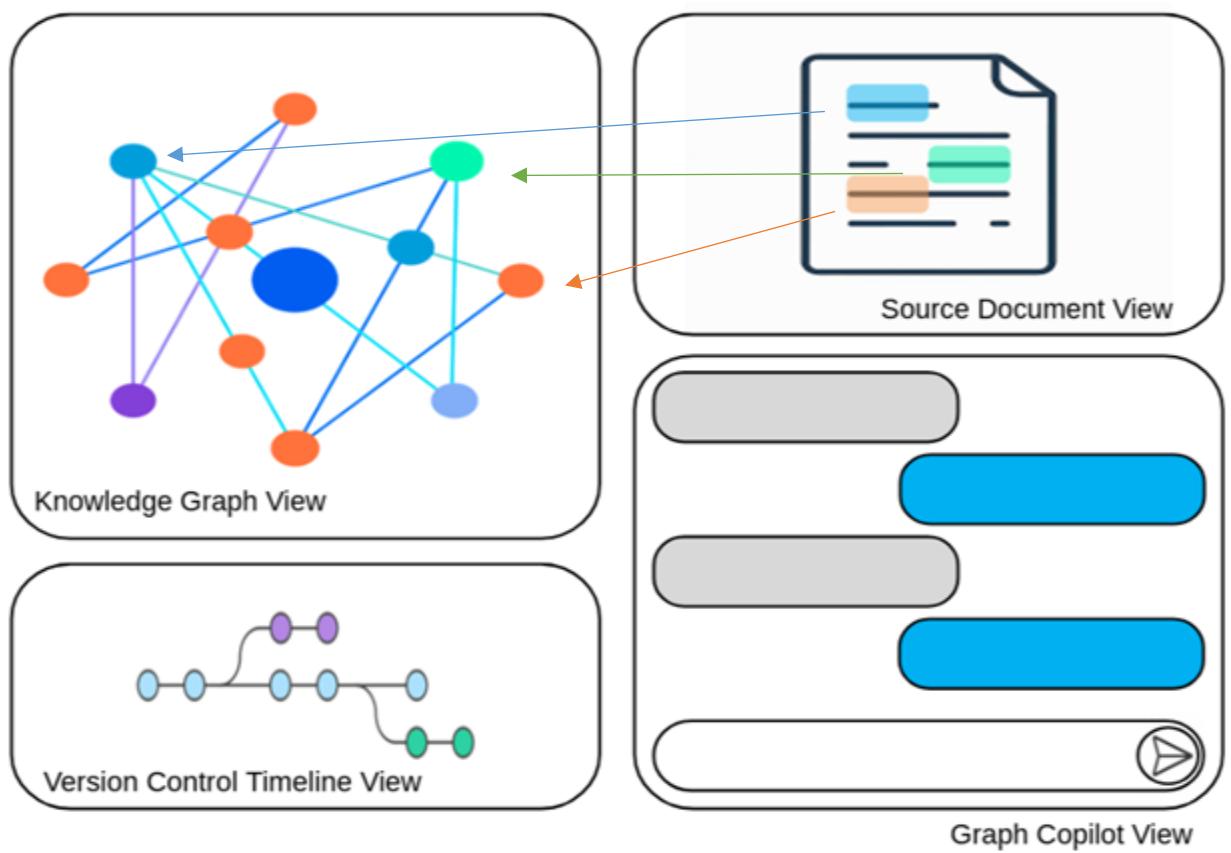


Figure 2: REPAIR user interface with four main views including the knowledge graph, source document, timeline, and natural language interface (copilot). The user interface enables additions to a knowledge graph using the copilot interface to guide the changes. Any modifications are clearly shown in the knowledge graph view and linked to the original source documents (down to the individual sentences) for verification and validation purposes. Additionally, changes can be rolled back via the version control system.

Oceanit has extensive experience building and using knowledge graphs for operations, logistics, and vulnerability discovery as well as devising algorithms to enhance, improve, and explain neural network-based models as described in Section 5. Oceanit also has experience designing intuitive user interfaces based on Stanford's Design Thinking methodology. Design Thinking is an empathy-based process that guides the design of products by placing the end user's needs as the driving factor for building products. Finally, Oceanit has a proven record of commercializing federally funded research with three venture capital-backed spinout companies, numerous licensing deals, and a compelling commercialization plan described in Section 7.

2. Identification and Significance of the Problem or Opportunity

AI/ML approaches for identifying, structuring, and storing data are not 100% trusted by analysts, so there is a requirement to enable the analyst to make corrections to the data as needed and manually add additional data. Currently, these modifications are all entered by manual methods and are not utilized to further improve the overall data store and analysis capability, making it a time-consuming task that will not be feasible in a time-constrained environment, such as a peer fight. Existing approaches for interacting

with a knowledge graph have focused on visualization techniques and query mechanisms, but additional user interaction is required for such graphs to be useful and trusted by users in AF applications, especially when time is of the essence. *A better way is needed to interact with and edit a knowledge graph.*

3. Phase I Technical Approach

A knowledge graph (KG) is a graph-based data model that represents knowledge as a network of interconnected entities (nodes) and relationships (edges) between them. Dynamic knowledge graphs capture the relationships between entities over time. These entities and relationships are labeled with semantic meaning, allowing for a rich contextual understanding of the data. Entities in a knowledge graph can represent practically anything: people, places, concepts, or events. These entities are connected together by edges, which represent the relationships between these entities. Each node and edge can have associated attributes or properties, providing additional information about the data. Knowledge graphs have wide-ranging applications including question-answering, recommendation systems, and search engines, and are widely used for their flexibility in combining disparate data sources and ease of interpretation.

In intelligence analysis, knowledge graphs help derive critical insight into collected information and finished intelligence reports by connecting facts distributed throughout the collected data. From the point of view of corpus linguistics, a knowledge graph connects entities that have been disambiguated across the entire corpus. Because knowledge graphs are derived from a corpus of collected information, intelligence analysts will trust the knowledge graph when they are assured of the soundness of the derivation and can check derived connections between entities by quickly finding the original sources of the information.

The Air Force found in its research that knowledge graphs generated with AI/ML approaches were useful in capturing domain knowledge but were unreliable. Knowledge graphs are oftentimes automatically assembled via entity extraction from unstructured text into semantic triples (graph codifications of semantic text in the form of subject-predicate-object), and the variable quality of these extracted triples can cause data accuracy and integrity problems for downstream operations like situational awareness, command and control, and targeting applications. Correction of knowledge graph problems is exceptionally time-consuming as they are typically performed manually.

REPAIR gives intelligence analysts powerful ways to interact with their data. Chat sessions with REPAIR will update graphical views and the knowledge graph itself, and when the analyst filters or interacts with graphical views, contextual data is updated for natural language generation. When modifying a knowledge graph, either via the natural language interface or the knowledge graph view, REPAIR suggests additional updates to surrounding nodes/edges in the graph including updating the graph's underlying ontology/schema, inferring additional edges between nodes, highlighting conflicting information in the graph, highlighting information gaps, and suggesting additional changes to the graph because of the user's modifications. Algorithms adapted from complex document processing are the key to realizing these capabilities.

3.1. REPAIR'S Sophisticated Algorithms Show Gaps, Suggests Additional Changes

REPAIR provides users with an interface for knowledge graph maintenance operations where they can state their objectives in natural language. Behind the scenes, REPAIR leverages a declarative language to describe the low-level actions to meet the high-level goals, such as modifying or changing this node or

that edge, and showing the propagated effects on connected entities. The high-level goals are translated into a set of detailed steps (a pipeline) and plans to achieve them.

REPAIR employs an agentic framework (an AI system designed to autonomously pursue complex goals and workflows with limited direct human supervision), enabling large language models to generate and evaluate data processing pipelines autonomously. This approach allows the system to independently decide on the most effective strategies for processing complex subgraphs of a knowledge graph. To reduce risk in the Phase I project, Oceanit will utilize an open-source implementation of DocETL², a framework for complex document processing, and adapt it to make changes and additions to a knowledge graph. REPAIR can leverage this code base because of the close relationship between knowledge graph alignment and entity resolution in a corpus of documents. Documents contain sentences that are commonly represented as triples (subject, verb, object), which is similar to knowledge graph entity relationships, which are also semantic triples. *Thus, algorithms developed for one can typically be applied to the other.*

Internally, REPAIR provides a declarative interface to define low-level processing pipelines. An agent-based framework then automatically optimizes these pipelines, leveraging novel agent-based rewrites (rewrite directives) and an optimization and evaluation framework. Specifically, our system provides (i) logical rewriting of pipelines, tailored for LLM-based tasks, (ii) an agent-guided plan evaluation mechanism that synthesizes and orchestrates task-specific validation prompts, and (iii) an optimization algorithm that efficiently finds promising plans, considering the time constraints of LLM-based plan generation and evaluation.

3.1.1. Rewrite Directives and Agent-Driven Logical Rewriting

Rewrite Directives are abstract frameworks designed to improve the quality of outputs from REPAIR pipelines by logically decomposing complex operations into simpler, more accurate ones. Rewrite Directives guide the transformation of user-defined operations into sequences of simpler operations that are more manageable for LLMs. For example, a complex *map* operation might be decomposed into *split*, *gather*, *map*, and *reduce* operations.

REPAIR provides a declarative YAML-based interface to author pipelines with operators specific for use with LLMs, such as *resolve* for entity resolution and *gather* to maintain context when processing knowledge graph changes. A pipeline, expressed in YAML, describes a sequence of operations. Each operation specifies its operator type, input source, prompt template, and output schema. The input source can be either the original dataset or the output of a previous operator. As operators process data, they generate outputs conforming to their schemas, which subsequent operators can use. This structure allows for flexible and modular pipeline composition while maintaining data consistency between steps.

Users can specify complex knowledge graph editing and processing pipelines at a high level with the help of a copilot chat interface that translates the high-level commands into the low-level steps as part of the pipeline. To do so, REPAIR relies on an agent-based framework to decompose and optimize user-specified commands. However, rather than simply relying on agents as-is, which can be error-prone, we rewrite complex operations using novel rewrite directives (shown below). We call these directives instead of rules

²Shankar, Shreya, Aditya G. Parameswaran, and Eugene Wu. "DocETL: Agentic Query Rewriting and Evaluation for Complex Document Processing." arXiv preprint arXiv:2410.12189 (2024).

because they are more abstract and will be interpreted by LLMs in the context of particular tasks and data characteristics, with infinitely many concrete instantiations of each directive.

Operation	Definition	Notes
Map	$D \rightarrow \{d \cup \pi(d) \mid d \in D\}$	π is an LLM-powered projection
Parallel Map	$D \rightarrow \{d \cup \bigcup_{i=1}^n \pi_i(d) \mid d \in D\}$	π_1, \dots, π_n are independent LLM-powered projections operating on the same document
Unnest (Array)	$D \rightarrow \{\{d \setminus \{a\} \cup \{a : v\} \mid v \in d[a]\} \mid d \in D\}$	a is an array-valued attribute; No LLM used
Unnest (Dict)	$D \rightarrow \{d \cup d[a] \mid d \in D\}$	a is a dict-valued attribute; No LLM used
Reduce	$D \rightarrow \{\gamma(\{d \in D \mid d[k] = v\}) \mid v \in \pi_K(D)\}$	K is the reduce key set, γ is an LLM-powered aggregation
Filter	$D \rightarrow \{d \in D \mid \phi(d)\}$	ϕ is an LLM-evaluated condition
Resolve	$D \rightarrow \{d[r \mapsto \gamma(\{d_j \in D \mid \theta(d[r], d_j[r])\})] \mid d \in D\}$	r is the resolve key, θ is an LLM-evaluated equality condition for pairwise comparison, γ is an LLM-evaluated resolution function that consolidates matched entries and returns a new value for r
Equijoin	$D_1 \times D_2 \rightarrow \{d_1 \cup d_2 \mid d_1 \in D_1, d_2 \in D_2, \theta(d_1, d_2)\}$	θ is an LLM-evaluated equality condition
Split	$D \rightarrow \bigcup_{d \in D} \{d_1, \dots, d_n\}$	Given split key k and chunk size c , where $d_i = (d \setminus \{k\}) \cup \{k : t_i\}$, and $\{t_1, \dots, t_n\} = \text{chunk}(d[k], c)$. $\text{chunk}(d[k], c)$ divides $d[k]$ into chunks of size c . No LLM used.
Gather	$D_{\text{split}} \rightarrow \{d \cup \omega(d, D_{\text{split}}) \mid d \in D_{\text{split}}\}$	Applied after Split, in cases where a downstream operator needs contextual information to process a chunk. ω is the gather config specifying contextual information to include around chunk (e.g., previous chunks, next chunks). D_{split} is the dataset after a Split operation.

Figure 3: Summary of operators used in the construction of pipelines. D represents a dataset, d represents a document. LLM refers to a generative language model for evaluating conditions and performing transformations. The expression $d[k]$ denotes attribute k 's value in document d . $\pi_K(D)$ represents the projection of dataset D on key set K .

The core operation for aligning knowledge graphs is the *resolve* operator, circled in red in the figure above. The *resolve* operator is designed to canonicalize one or more attributes across entities, edges, or properties within a knowledge graph, and is particularly useful for consolidating information about the same entity, edge, or attribute that may appear with slight variations for subsequent grouping and aggregation. The *resolve* operator can reconcile slight variations. This is essential to disambiguate and resolve changes that arise when entering new information or modifying existing information in a knowledge graph, for example, adding a new knowledge graph entity “John Smith” and distinguishing it or merging it with “John Franklin Smith”.

3.1.2. Agent-Guided Plan Evaluation Mechanism

REPAIR leverages an agentic framework to evaluate pipelines. Since evaluation can be expensive, an optimization approach uses a top-down rule-based strategy to generate and evaluate a space of equivalent plans, opting to opportunistically decompose (or rewrite) complex and error-prone operators

into simpler ones. This declarative approach allows the agent to focus on evaluating the outputs of the optimized pipeline, and focus on high-level constraints and logic, with the flexibility to drill-down any stage of the pipeline to inspect intermediates and make further changes, as needed. We use LLM agents to synthesize task-specific validation prompts for each operation and use these to assess output quality. The agents then execute plans on sample data and evaluate outputs using these custom prompts, enabling REPAIR to assess plan effectiveness in a data-specific and task-specific manner. This entire process happens without the user having to provide or manually validate examples.

3.1.3. Optimization Algorithm Determines Promising Plans

The optimization algorithm finds the most effective pipeline configuration by evaluating and selecting the best plans generated through the rewrite directives. The optimization algorithm systematically explores different pipeline configurations, applies rewrite directives, and uses validation agents to assess the quality of the outputs. The algorithm aims to balance accuracy, latency, and cost. Unlike traditional query optimizers that generate and evaluate a broad range of possible plans, we leverage an opportunistic recursion strategy. When we use a rewrite directive to decompose operators into new ones, we immediately attempt to optimize each new operator. We first check if each such operator is sufficiently accurate, based on the validation as described above. If sufficiently accurate, we no longer optimize that operator, focusing instead on rewriting other operators. Thus, we opportunistically decompose (or apply rewrite directives to) operators that are not sufficiently accurate. Such an approach is necessary because enumerating and evaluating all possible plans would be prohibitively time-consuming due to the inherent latencies in LLM operations.

3.1.4. Example Knowledge Graph Update Using Complex Document Processing Algorithms

A common knowledge graph modification involves inserting or merging new information from a source document. For example, an analyst would say or type into the copilot natural language interface of REPAIR, “insert this document into the knowledge graph”. REPAIR would then devise the low-level declarative-based pipeline with the *map* and *resolve* operators to perform this operation. The *map* operation extracts entities from a source document as shown in the following figure. At the same time, the *resolve* operator disambiguates the entities so that when they are inserted or merged into the knowledge graph, duplicate entities do not occur. As you can see from the figure, multiple similar entities, such as “UC Berkely” and “University of California, Berkeley” must be resolved; otherwise, inaccurate entities will be created when incorporated into a knowledge graph.

```
[  
 {  
 "src": "DocETL: Agentic Query Rewriting and Evaluation\\nfor Complex Document Processing\\n",  
 "entity": [  
 "DocETL",  
 "UC Berkeley",  
 "Columbia University",  
 "Shreya Shankar",  
 "Aditya G. Parameswaran",  
 "Eugene Wu",  
 "Large Language Models (LLMs)",  
 "California Police Records Access Project",  
 "Investigative Reporting Program at Berkeley",  
 "Officer C",  
 "ACM",  
 "Officer A",  
 "Sgt. B",  
 "GraphRAG",  
 "bids.berkeley.edu",  
 "ACM Reference Format",  
 "Investigative Reporting Program",  
 "Investigative Reporting Program at Berkeley",  
 "Deep Learning",  
 "Natural Language Processing",  
 "California Police Records Access Project",  
 "Investigative Reporting Program",  
 "Investigative Reporting Program at Berkeley",  
 "Investigative Reporting Program",  
 "Gov.uk Digital Services",  
 "UC Berkeley",  
 "University of California, Berkeley",  
 "University of California Police Records Access Project",  
 "University of California, Berkeley",  
 "Investigative Reporting Program",  
 "California Police Records Access Project",  
 "Berkeley",  
 "Investigative Reporting Program at Berkeley",  
 "Officer A",  
 ]  
 }]
```

Figure 4: A portion of the results when the “map” operator is applied to an example document. The source document (the string value of the “src” key) was mapped to the list of entities mentioned in the source document.

The following figure shows the clustering of the embeddings of Figure 4. The 64 entities from the *map* operator are reduced to 21 clusters meaning that there were numerous entities with similar but not exact names. This shows the importance of disambiguation via the *resolve* operator to group similar entities, relationships, or properties to prevent inserting or merging incorrect data into a knowledge graph.

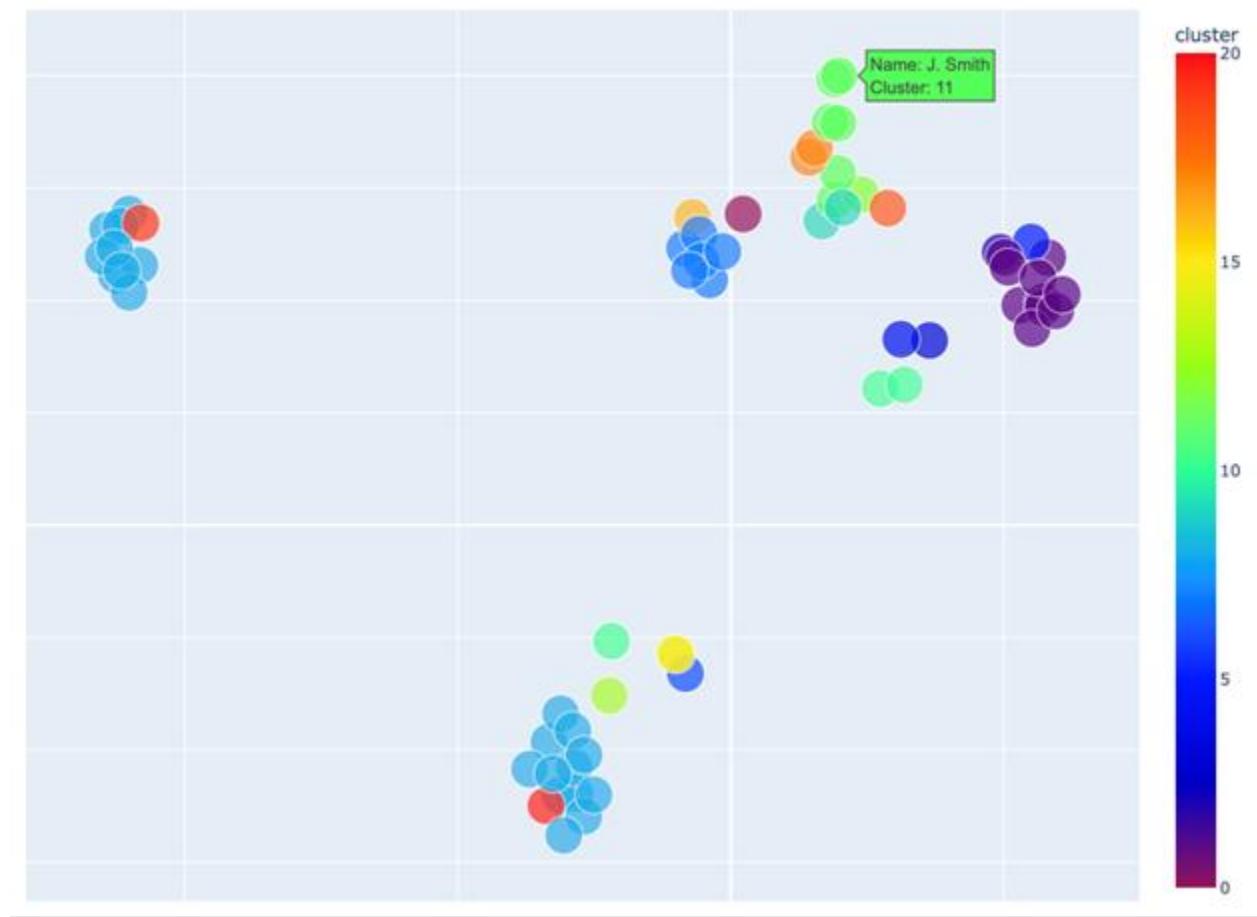


Figure 5: The figure displays the intermediate result of the resolve operator, illustrating the 21 clusters of 64 entities extracted from an example article. The figure is the embedded entities' two-dimensional projection (using the UMAP algorithm). Cluster 11 is the subset of entities mentioning "Officer J. Smith" as one of [Officer A', 'Officer A', 'Officer Smith', 'Officer Smith A', 'J. Smith', 'J. Smith'].

Resolve and equijoin operators involve pairwise comparisons between entities or records, leading to quadratic complexity in LLM calls. This is a huge performance problem. A common technique to mitigate this is blocking to filter the number of pairs. Embedding-based blocking leverages an embedding model to generate vector representations for each entity or subset of key-value pairs in a document (i.e., blocking keys). We compute cosine similarities between these embeddings and only consider pairs whose similarity exceeds a specified threshold for complete LLM-based comparison. We took the 64 entities from our simple example and clustered those into 21 clusters. The average cluster is about three entities in a cluster. Thus you get 100 comparisons instead of 64 times 64 (4096) comparisons, significantly reducing the number of calculations that must be performed.

The following figure shows the steps and operations for a sample pipeline to add new information to a knowledge graph for the example above. The figure shows the operator's *map*, *unnest* (expands either an array or a dictionary into individual elements), and *resolve* as well as the blocking threshold. Using this pipeline, 64 entities were extracted and resolved into 21 clusters, with no more than 10 entities in a cluster. **This ensures an efficient and optimized insertion of new information into a knowledge graph.**

```

operations:
- name: extract_entities
  type: map
  optimize: true
  output:
    schema:
      entity: list[str]
  prompt: |
    Extract the list of entities described in the document.
    {{ input.src }}
- name: unnest_entities
  type: unnest
  unnest_key: entity
- name: resolve_entities
  type: resolve
  blocking_keys:
    - entity
  blocking_threshold: 0.6162
  comparison_prompt: |
    Compare the following two entities:
    Entity 1: {{ input1.entity }}
    Entity 2: {{ input2.entity }}
    Are these entities likely to be the same or closely related?
  embedding_model: text-embedding-3-small
  output:
    schema:
      entity: str
  resolution_prompt: |
    Given the following matched entities:
    {% for entry in inputs %}
    Entry {{ loop.index }}: {{ entry.entity }}
    {% endfor %}
    Determine the best resolved entity for this group of entities. The
    name should be a standardized, widely recognized entity that best
    all matched entities.

```

$D \rightarrow \{d[r \mapsto \gamma(\{d_j \in D | \theta(d[r], d_j[r])\})] | d \in D\}$

r is the resolve key.

θ is the LLM evaluated comparison prompt.

y is an LLM-evaluated resolution function that consolidates matched entries and returns a new value for *r*.

Figure 6: The information set, D , is replaced by a new set of attributes (computed by a prior pipeline stage). For the example pipeline, the attributes are the (unresolved) entities indexed by the “entity” key. This list was generated in the pipeline’s prior “extract_entities” step. In total, the first stage of the pipeline found 64 such entities. The LLM function θ (comparison prompt in this example) is used to compare pairs of entities, so the argument to γ is the set of representatives of matched entities.

3.1.5. REPAIR Also Includes Basic Knowledge Graph Modification Algorithms

Simple one hop edits such as merging and deleting entities, relationships, or properties are also common tasks for REPAIR. A common error in graph databases are duplicate nodes. REPAIR checks for potential conflicts between nodes, and when node names or attributes are changed, REPAIR checks other nodes for potential conflicts with other existing nodes. If a node merge is required, associated properties, errors, and suggestions are also modified from the merge if necessary. In the figure below, nodes G and E are duplicate nodes. When G and E are merged into a single node I, connecting edges to nodes G and E are rejoined to node I.

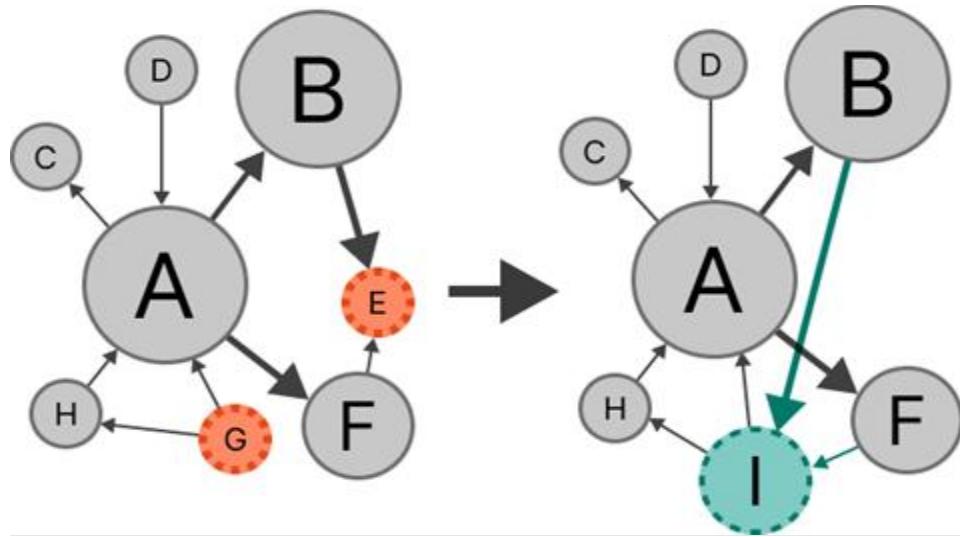


Figure 7: REPAIR node merging keeps track of relevant connecting edges.

When nodes with edges are deleted, 1-hop edge removal is automatically propagated. Shown in the figure below, when node A is deleted, nodes C and D are deleted, and the connecting edges to and from nodes B, C, D, F, G, H, and F are also deleted.

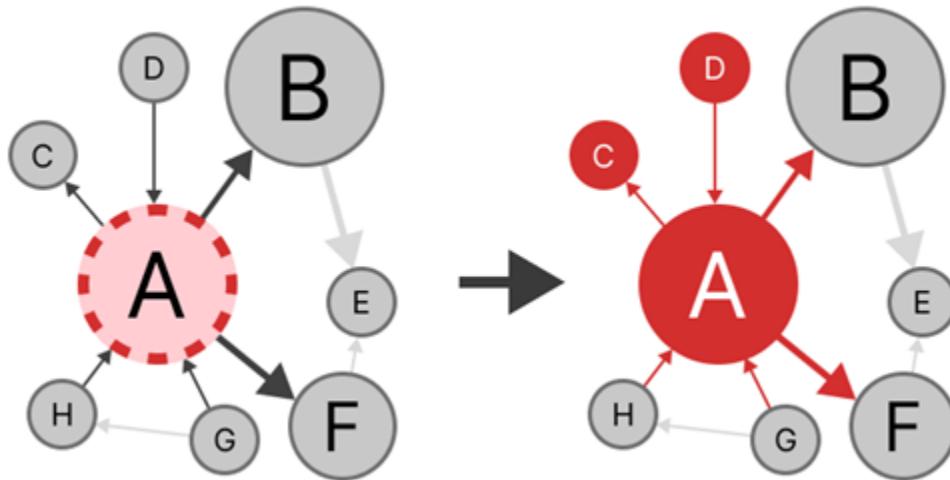


Figure 8: Native node deletion automatically deletes one-hop connections.

REPAIR suggests these operations via the copilot natural language interface when editing or modifying any node, edge, or property of a knowledge graph. Especially when a target node is deleted, every connected node one hop away is also deleted if those nodes aren't connected to any other nodes, as shown in the previous figure. These connecting nodes could contain important data and should perhaps not be deleted in every instance. The operations suggested by the copilot is based on the context from three different sources: the knowledge graph schema, the commit history, and the domain knowledge from the knowledge graph itself.

3.2. Graph Version Control Records Each and Every Knowledge Graph Modification

REPAIR integrates a version control system for the knowledge graph so that every change is logged and can be rolled back at any time. REPAIR allows users to follow an agile development philosophy in editing

and updating their knowledge graphs. When users make changes, a language model will help them to generate effective commit messages to summarize the change and, based on the tool's intimate understanding of the knowledge graph, will suggest breaking larger commits into a sequence of micro commits.

Managing a dynamic knowledge graph that is constantly being modified and appended is difficult. A constantly changing data landscape means that the graph must also be updated constantly, and the graph database schema is likely to be frequently changed. For the sake of efficient reporting by the analyst and improved database management, a robust version control system of the knowledge graph database will be implemented, in which changes made to the graph's data or database schema are recorded and used as context for the AI agent (copilot) to generate suggested modification operations.

REPAIR's version control system is inspired by Git. Git is a distributed version control system widely used for tracking changes in source code during software development. It allows multiple developers to collaborate on a project efficiently by enabling them to work on different branches of the codebase simultaneously. Git keeps a history of changes, allowing users to revert to previous versions of the code or review changes over time. Similar to Git, Oceanit aims to outfit REPAIR with a history of modification operations made to the knowledge graph, and to group these operations together into "logical" units via the copilot pipeline. It is standard practice in version control for changes in a code repository to be grouped into changes called "commits". Changes in multiple lines of code, potentially across multiple files can be conceptualized as a single feature, e.g. "updated user authentication system to two-factor authentication". Similarly, a sequence of multiple UPDATE and DELETE operations in the knowledge graph can be recorded and labeled singularly, e.g. "movement of Hamas brigade from location A to location B".

3.3. Shadow Knowledge Graph Allows Testing Modifications

The version control system taps into the normal query interface of the legacy knowledge graph and simply records and stores each and every knowledge graph command along with a timestamp and the user that performed the operation. From these commands, a shadow copy of the legacy knowledge graph can be constructed to run "what if" scenarios and to test modifications before committing them to the original knowledge graph. The shadow knowledge graph is constructed with a strongly typed graph database, TypeDB, which requires incoming data to follow a predefined graph database schema, assuring data integrity and limiting errors upon data entry.

TypeDB is an open-source database framework with a rich, logical type system that enables the modeling and querying of complex knowledge domains using their query language, TypeQL. Through TypeQL, TypeDB provides powerful abstractions over low-level and complex data patterns. TypeDB's type system provides a way to encode the logical structure of a knowledge domain through an explicitly defined schema – a user-defined set of data types and rules.

As illustrated in the figure below, TypeDB encompasses both the underlying graph database and tools to provide structure to the user's conceptual model of their knowledge domain. Because a schema is defined explicitly and more abstractly than nodes and edges, TypeDB removes the need of a specialist in ontology engineering to translate, or normalize, the knowledge domain to nodes and edges of a graph, and any analyst can define their own schema with relative ease.

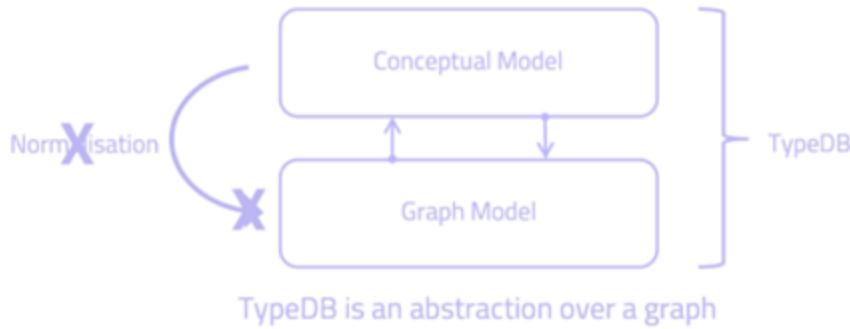


Figure 9: TypeDB provides the framework for translating a knowledge domain to a graph database without the need to manually normalize the knowledge domain to nodes and edges.

With TypeDB, data can be modeled as instances of three types:

- **Entities** – Representations of objects in the problem domain, e.g. vehicles, troops, locations, roads, etc.
- **Relations** – Representations of relationships between entities. These can represent an arbitrary number (n-ary) of connections between different types of entities, as opposed to the typical binary relation in most graph database systems.
- **Attributes** – Values that can represent characteristics of both relations and entities

We are particularly interested in TypeDB for its Type Hierarchy feature that allows a user to define a schema of subtypes of entities, relations, and attributes. This feature is analogous to the concept of inheritance in object-oriented programming, where a class can inherit methods and attributes from a parent class. This schema is used in combination with the domain knowledge graph and the knowledge graph commit history to generate context for the natural language copilot interface when suggesting modification operations.

3.4. User Interface Provides Powerful Ways For Knowledge Graph Interaction

While the focus of this effort is on the natural language interface and knowledge graph modification algorithms, a basic user interface is required to use REPAIR. Oceanit will develop the user interface using Design Thinking techniques to ensure REPAIR is intuitive and meets the end user's needs. Design Thinking is a problem-solving process that puts the end user at the center of a problem-solving process. Design thinking was developed by the Stanford d.school (School of Design) as well as IDEO, an internationally renowned product design and consulting firm.

The first step in the Design Thinking Process is to gain Empathy for end users in order to understand the people for whom the product is designed for, in this case, intelligence analysts. Analysts will be interviewed to review mockups and prototypes. Oceanit will redefine the design objectives to meet any new concerns discovered through the Empathy sessions. Redefining the design objectives based on user input is the part of the process where previously unconsidered needs or unforeseen problems are added as design constraints. With this new set of criteria, Oceanit will then focus on Idea generation. By leveraging the diverse background of Oceanit's staff, Oceanit can create a varied group of staff to brainstorm innovative design improvements to address each of the design problems identified. Finally, Oceanit will integrate the collective list of improvements and solutions to develop a Prototype concept.

This prototype concept will define the ideal system. This concept will be improved iteratively as new concerns are discovered through the project work and further interviews.

A mockup of the REPAIR user interface is shown in Figure 2. There are four primary windows that the user can interact with to modify nodes, properties, and edges: the Knowledge Graph View, the Source Document View, the Version Control Timeline View, and finally the Graph Copilot View. This user interface enables cross-context analysis, i.e. each view is synchronous with each other, and filtration or selection in one view will result in corresponding filtration and selection in the other views. This provides a powerful visual way for intelligence analysts to interact with and modify knowledge graphs.

3.4.1. Knowledge Graph View

The Knowledge Graph View, in the top left of Figure 2, displays a network graph visualization of the knowledge graph generated from a given knowledge graph that must be edited. The Knowledge Graph View will be developed in React using the Regraph library developed by Cambridge Intelligence, a company dedicated to developing a suite of visualization tools for data-driven insights, with wide applications in cyber-threat detection, supply chain vulnerability detection, financial risk management, and others. While the analyst will execute the bulk of the graph editing using the natural language copilot interface, the analyst can also pan and zoom in and out of the graph and select individual nodes and edges for manual editing in the Knowledge Graph View. Regraph is developed with WebGL's powerful rendering engine for high performance in any modern web browser.

Regraph enables users to quickly and effectively develop powerful visualizations for intelligence analysis which allows viewing a knowledge graph in different ways (node-links, matrix, treemaps, etc.). Below is an example of a Regraph visualization applied to pattern-of-life analysis: interactions between actors are displayed over time, and the user is able to zoom in and out to specific time frames, filter and select specific actors and specific interactions. This chronological style is one way of many that a knowledge graph can be displayed, besides the typical force-directed knowledge graph that is shown in Figure 2.



Figure 10: Example of interactive Regraph visualization applied to pattern-of-life analysis

Large knowledge graphs can also be effectively displayed and managed via a pagination system, where the graph is partitioned into focused subgraphs. In the illustration below, a subgraph centered on node "A" has 12 connected edges is split up into three pages of five triples each, where each page groups nodes by semantic concept. The user interacts with the subgraph via the three pages instead of the individual nodes and edges, enabling more efficient and manageable graph editing.

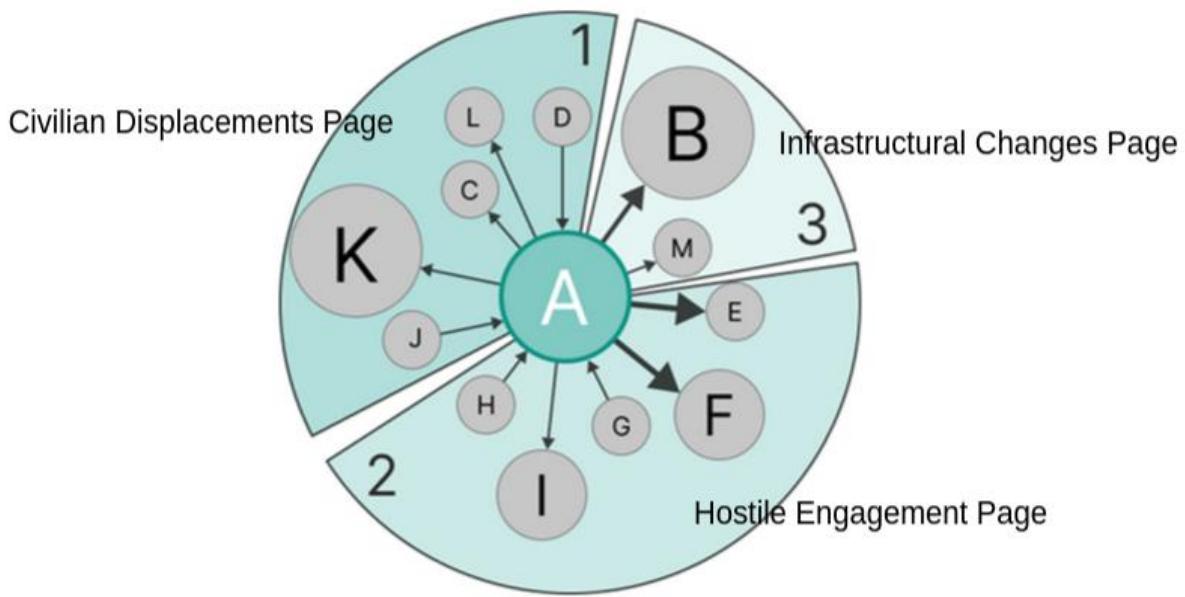


Figure 11: Graph nodes are split up into conceptual pages for ease of viewing

Subgraphs are created via clustering graph embeddings. In machine learning, an embedding is a mathematical representation of objects (such as words, sentences, images, etc.) in a continuous vector space. The goal of embedding is to capture meaningful relationships or similarities between these objects. For example, in natural language processing (NLP), word embeddings represent words as dense vectors in a high-dimensional space, where similar words are located closer to each other. These embeddings are learned from large corpora of text using techniques like Word2Vec, GloVe, or more recently, transformer-based models like BERT or GPT. By embedding the text attributes of graph nodes and edges, and clustering these embeddings via techniques such as HDBSCAN, graph nodes and edges can be paginated by semantic concepts. For example, the graph could paginate by military engagements, civilian displacements, instances of infrastructural damage as shown above.

3.4.2. Source Document View

The Source Document View, on the top right of Figure 2, displays the source document of the subgraph displayed in the knowledge graph view. Similar to Diffbot's natural language knowledge graph tool that crawls websites and automatically constructs knowledge graphs, terms in the original document will be highlighted with corresponding colors to their respective nodes in the Knowledge Graph View. Cross-context analysis enables the user to filter the knowledge graph view for highlighted terms the user clicks on in the source document and vice versa.

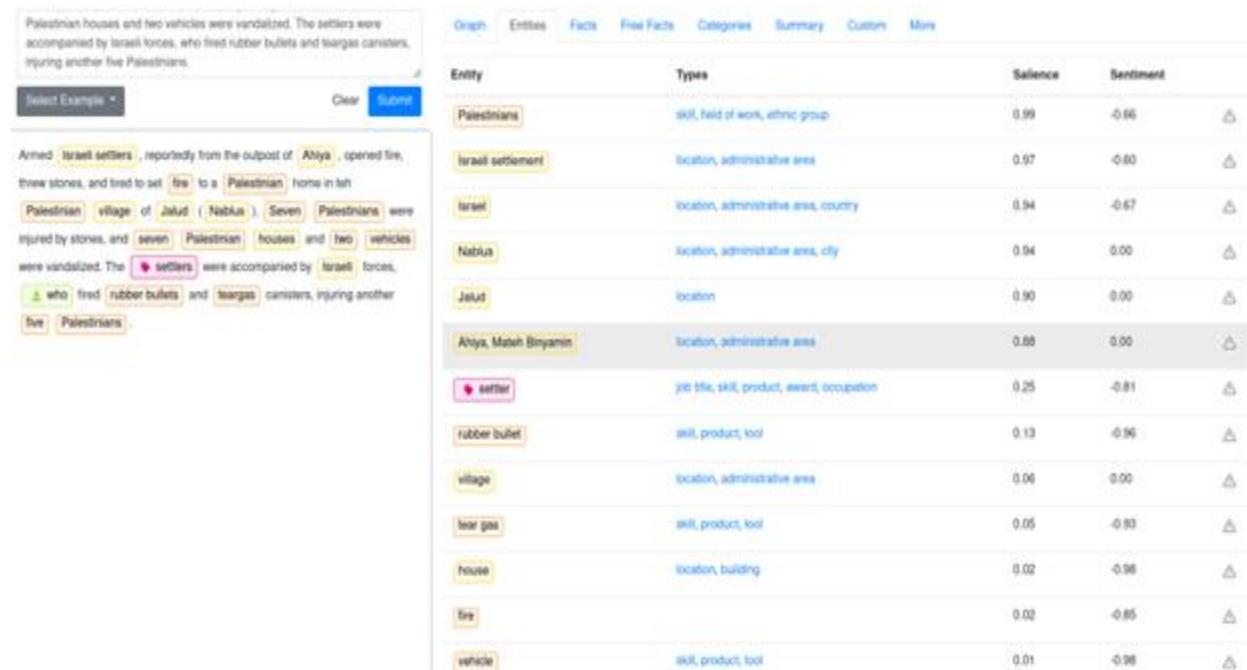


Figure 12: Diffbot’s natural language processing tool links the extracted entities to the original text. Diffbot color-codes entities by their type: location entities are highlighted in yellow, objects and people are highlighted in orange, and types of people (“settler”) are in red.

The Source Document view is inspired by prior work done by AFRL, where they discovered through user feedback that analysts prefer a conservative approach where extracted information is visible in the context of the original document, as opposed to a “black box” that simply outputs structured information³. A clear map between source document and extracted knowledge is key to developing a system trusted by analysts. The figure below is a screenshot of ATEA, a system developed by AFRL that displays a source document with extracted entities highlighted (left), and a network graph view of source documents connected by matching referenced entities (right). ATEA displays the source document with extracted entities highlighted, providing full transparency to the analyst. **This key feature of REPAIR will strengthen the trust in using our tool and algorithms in the eyes of intelligence analysts as they will be able to visually see not only the proposed knowledge graph changes but also the linked source documents and specific sentences, numbers, or figures responsible for the changes.**

³Budlong, E., Pine, C., Zappavigna, M., Homer, J. . . . , Proefrock, C., Gucwa, J., Crystal, M., & Weischedel, R. (2013). Interactive Information Extraction and Navigation to Enable Effective Link Analysis and Visualization of Unstructured Text. Proceedings of the AAAI Conference on Artificial Intelligence, 27(2), 1493-1500. <https://doi.org/10.1609/aaai.v27i2.18988>

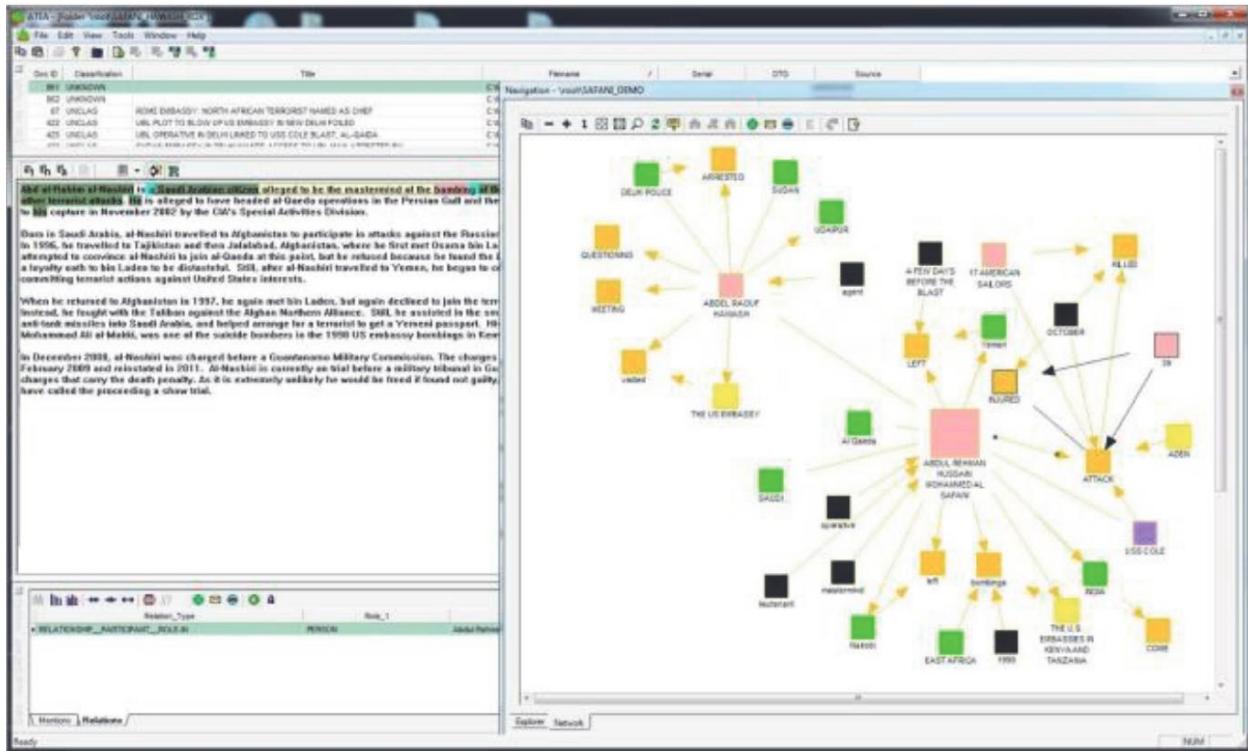


Figure 13: User interface of ATEA, developed by AFRL, involves both source document view (left) and knowledge graph view (right).

3.4.3. Version Control View

The bottom left view of Figure 2 displays the graph version control history. Successfully managing a knowledge graph database in a dynamic environment requires that all changes can be saved, viewed, and undone if warranted. A constantly changing data landscape means that the graph must also be updated constantly, and the graph database schema is likely to be frequently changed as well. A robust version control system, inspired by git, where changes made to the graph's data or database schema are recorded and used as context for the natural language copilot to generate suggested knowledge graph modifications is an important component of REPAIR. This view allows a user to see the history of changes over time in different ways including sorted by individual changes, user authorship, and any major branches or merges.

3.4.4. Graph Copilot View

Finally, the Graph Copilot View is a chat window that allows the analyst to interact with REPAIR via natural language. The analyst says in plain English what they want to do and the underlying generative language models synthesize candidate editing plans. These plans are generated, optimized, validated, and executed into combinations of low-level processing operations: resolve, filter, equijoin, split, etc. to perform the desired knowledge graph modification.

3.5. Situational Awareness and Pattern of Live Analysis Demonstration

To demonstrate the power of REPAIR, Oceanit can construct a knowledge graph for applications of interest to the US Air Force such as situational awareness, pattern of life analysis, threat detection, and targeting operations. One example dataset that can be used is a combination of tabular data and

unstructured text from the Armed Conflict Location & Event Data Project (ACLED) and the Assessment Capacities Project (ACAPS) which contains information on the recent developments of the Israeli-Palestinian conflict. We can then use REPAIR to correct errors in this knowledge graph.

3.5.1. Potential Knowledge Graph Data Sources Using Current Conflict Databases

The Israeli-Palestinian conflict is a long-standing and complex struggle primarily rooted in historical, territorial, and political disputes. It dates back to the early 20th century, with significant events such as the establishment of the state of Israel in 1948, the subsequent Arab-Israeli wars, and the ongoing issues surrounding land rights, refugees, and security. Key events leading up to the 2023-2024 conflict include the continued expansion of Israeli settlements in the West Bank, periodic escalations of violence, and failed peace negotiations. Tensions have often been exacerbated by violence in Gaza, the status of Jerusalem, and differing narratives about national identity. In 2023, these tensions reached a boiling point when Hamas launched a surprise attack on Israel, involving a coordinated assault that included rocket fire and ground infiltrations. This attack marked a significant escalation and prompted a swift and forceful military response from Israel, leading to extensive airstrikes on Gaza and significant casualties.

Oceanit aims to construct an all-source reporting dataset of the 2023-2024 Israel-Hamas conflict. According to the Air Force Doctrine publication on intelligence operations, intelligence from all-source reporting can be broken down into various categories: Warning Intelligence, Current Intelligence, General Military Intelligence, Target Intelligence, Scientific and Technical Intelligence, Counterintelligence, and others. Our analysis of this data is centered particularly on Warning and Current Intelligence. Warning Intelligence is concerned with, among other things, emerging crises, potential adversary motivators, significant political, economic, and social situations, and civil or bureaucratic activities that may suggest subsequent military activity. Current Intelligence is focused on adversary intentions and capabilities, adversary centers of gravity, significant military events, and analysis of weapons and transportation capabilities. To start, this dataset will be constructed from two data sources that capture the dynamics of the conflict through both raw datasets and intelligence reporting: the Assessment Capacities Project (ACAPS), and the Armed Conflict Location and Event Data Project (ACLED). These datasets respectively capture Warning Intelligence and Current Intelligence, and together develop a holistic overview of the conflict landscape that together develops a picture of the movement of both civilian and militant entities for pattern-of-life analysis. ACAPS captures data that are relevant to humanitarian efforts including civilian displacements, infrastructural damage, and resources available, which are important data points to consider in developing situational awareness. ACLED keeps a detailed record of militant engagements, which would prove useful in both threat detection and targeting operations. Specifically, ACLED is used to record adversarial information about past and current conflicts, while ACAPS captures the surrounding civil and infrastructural environment, that contains useful predictive information about potential future conflicts.

3.5.2. Assessment Capacities Project Database

ACAPS, or the Assessment Capacities Project, is a humanitarian initiative established in 2014 that focuses on enhancing the quality and effectiveness of needs assessments in crisis situations. It provides a range of tools, methodologies, and resources to support humanitarian organizations in conducting thorough assessments of regions in these crisis situations. The project produces valuable information products such as reports, infographics, and briefs that summarize key findings and trends in various humanitarian crises, helping organizations make informed decisions. ACAPS provides a free-to-use API. Several endpoints are

made available for regional crises, government interventions, and the INFORM severity index. Below is an example of the types of events that are captured.

```
"event_id": "10033",
"country": ["Palestine"],
"iso3": ["PSE"],
"country_wide": false,
"adm1": ["PSE.2_1"],
"adm1_name": ["West Bank"],
"indicator": ["I7 - Insecurity or hostilities affecting humanitarian assistance"],
"subindicator": ["S7.1 - Violence inhibiting the affected population from moving freely and safely to where humanitarian assistance is available"],
"targeting_specific_population_groups": ["Displacement status"],
"event_date": "2023-06-19",
"description": "On 19 June 2023, Israeli Security Forces' operation in Jenin Refugee Camp killed at least seven Palestinians, including a boy and a girl, and injured at least 91 Palestinians. The Israeli Security Forces conducted a series of airstrikes on Jenin Refugee camp, in a major intensification of the use of weaponry more generally associated with the conduct of armed hostilities rather than a law enforcement operation.",
"source_name": "OHCHR",
"source_date": "2023-06-23",
"source_link": https://www.ohchr.org/en/press-releases/2023/06/turk-warns-occupied-west-bank-violence-risks-spiralling-out-control,
"additional_sources": null
```

3.5.3. Armed Conflict Location & Event Data Project Database

ACLED, or the Armed Conflict Location & Event Data Project, is a comprehensive data collection initiative that tracks conflict-related events across the globe. It focuses on documenting the location, actors, and types of violence occurring in areas affected by conflict. ACLED provides valuable data for researchers, policymakers, and organizations working on conflict resolution, humanitarian aid, and peacebuilding, helping them analyze trends and develop strategies based on empirical evidence. The project publishes regular reports and visualizations to inform and raise awareness about conflicts worldwide. Specifically, ACLED focuses on:

- Tracking rebel, militia, and government activity over time and space
- Recording violent acts between and across non-state groups, including political and identity militias
- Recording political violence by unnamed agents, as violent groups may remain unnamed for strategic reasons
- Recording attacks on civilians by all violent political agents
- Distinguishing between territorial transfers of military control from governments (and their affiliates) to non-state agents and vice versa

- Collecting information on rioting and protesting
- Tracking non-violent strategic developments representing crucial junctures in periods of political violence (e.g. recruitment drives, peace talks, high-level arrests)

A spreadsheet of various engagements across Palestine is laid out in the two figures below. These conflicts provide context and meta-attributes for the ACAPS dataset. Each conflict comes with a notes attribute that can be mined for knowledge graph triples.

event_id_cnty	event_date	year	time_precis	disorder_type	event_type	sub_event_type	actor1
SYR134447	2024-10-18	2024		1 Political violence	Violence against civilians	Abduction/forced disappearance	QSD: Syrian Democratic Forces
SYR134459	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Air/drone strike	Military Forces of Israel (2022-)
SYR134495	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Air/drone strike	Military Forces of Syria (2000-)
SYR134543	2024-10-18	2024		1 Political violence	Battles	Armed clash	Islamic State (Syria)
SYR134544	2024-10-18	2024		1 Political violence	Battles	Armed clash	Unidentified Armed Group (Syria)
IRQ59860	2024-10-18	2024		1 Political violence	Battles	Armed clash	Military Forces of Iraq (2022)-Counter-Terrorism Service
IRQ59883	2024-10-18	2024		1 Strategic developments	Strategic developments	Arrests	Military Forces of Iraq (2022)-Counter-Terrorism Service
SYR134550	2024-10-18	2024		1 Political violence	Violence against civilians	Attack	QDW: National Defence Forces
SYR134551	2024-10-18	2024		1 Political violence	Violence against civilians	Attack	QSD: Syrian Democratic Forces
SYR134555	2024-10-18	2024		1 Political violence	Violence against civilians	Attack	Unidentified Armed Group (Syria)
SYR134603	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134604	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134605	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134606	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134607	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134608	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134609	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134610	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134611	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
SYR134612	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Syria)
IRQ59938	2024-10-18	2024		1 Demonstrations	Protests	Peaceful protest	Protesters (Iraq)
SYR134618	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Remote explosive/landmine/IED	Unidentified Armed Group (Syria)
IRQ59941	2024-10-18	2024		1 Strategic developments	Strategic developments	Change to group/activity	Global Coalition Against Daesh
SYR134747	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Global Coalition Against Daesh
SYR134748	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Global Coalition Against Daesh
SYR134749	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Global Coalition Against Daesh
SYR134750	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Global Coalition Against Daesh
SYR134751	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Global Coalition Against Daesh
SYR134752	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134753	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134754	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134755	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134756	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134757	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134758	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134759	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134760	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)
SYR134761	2024-10-18	2024		1 Political violence	Explosions/Remote violen	Shelling/artillery/missile attack	Military Forces of Syria (2000-)

Figure 14: Example spreadsheet from ACLED that records various conflict locations and involved parties.

notes
On 18 October 2024, QSD launched a security operation and raided a man's house accused of belonging to IS in Al-Hasakah city, and confiscated weapons and ammunition.
On 18 October 2024, Israeli warplanes conducted airstrikes targeting an unofficial crossing point with Lebanon in rural Al Qusayr in Homs countryside, as part of the military operation against Hezbollah and its supply lines. Casualties unknown.
On 18 October 2024, regime forces targeted Kafr Taal town in Aleppo countryside with heavy artillery and mortar shells, as well as the same vicinity with a suicide drone. Casualties unknown.
On 18 October 2024, IS members shot and killed a regime soldier in Sakhneh area in Homs countryside. 1 fatality.
On 18 October 2024, unknown gunmen shot and killed a National Police Forces member on Ghadra road in Aleppo countryside. 1 fatality.
On 18 October 2024, Counter-Terrorism Service clashed with a drug dealer in Dijyaniya city (Al Qadissiya) during an attempt to arrest him where he was killed in the armed clashes. 1 fatality.
On 18 October 2024, Counter-Terrorism Service arrested a drug dealer with an unspecified narcotics in Thi Qar province (coded to Nasriya City).
On 18 October 2024, QDW members shot and injured a young man who is accused of dealing drugs after a dispute in Dara - Al-Ba'ad city in Dara countryside. There were no fatalities.
On 18 October 2024, QSD shot and injured a young man at Al Tama checkpoint in Al-Hawiyah town in Deir ez-Zor countryside. There were no fatalities.
On 18 October 2024, QDW members shot and seriously injured a young man who is accused of dealing drugs in Mzeireb town in Dara countryside. There were no fatalities.
On 18 October 2024, dozens of locals staged a protest in Al Bab town in Aleppo countryside, against HTS and its leader, and demanded to release the detainees, and against the Turkish rapprochement with the regime.
On 18 October 2024, locals staged a protest in Abyan Saman town in Aleppo countryside, against HTS and its leader, and demanded to release the detainees, and against the Turkish rapprochement with the regime.
On 18 October 2024, dozens of locals staged a protest in Al Karama square in As-Sweida city, demanding the overthrow of the regime, and the implementation of UN resolution 2254.
On 18 October 2024, locals staged a protest in Arjeh town in Idlib countryside, against HTS and its leader, and demanded to release the detainees, and against the Turkish rapprochement with the regime.
On 18 October 2024, hundreds of locals staged a protest in Armanah town in Idlib countryside, against HTS and its leader, and demanded to release the detainees.
On 18 October 2024, hundreds of locals staged a protest in Atmab town in Idlib countryside, against HTS and its leader, and demanded to release the detainees.
On 18 October 2024, hundreds of locals staged a protest in Kafr Takharim town in Idlib countryside, against HTS and its leader, and demanded to release the detainees.
On 18 October 2024, locals staged a protest in Qourquna town in Idlib countryside, against HTS and its leader, and demanded to release the detainees, and against the Turkish rapprochement with the regime.
On 18 October 2024, locals staged a protest in Bejnish town in Idlib countryside, against HTS and its leader, and demanded to release the detainees, and against the Turkish rapprochement with the regime.
On 18 October 2024, locals staged a protest in Idleb city, against HTS and its leader, and demanded to release the detainees, and against the Turkish rapprochement with the regime.
On 18 October 2024, a demonstration took place in Kerbala (Kerbala) in support of the religious authority, Al-Ajsitan, and in solidarity with Gaza and Lebanon.
On 18 October 2024, an IED planted by unknown gunmen exploded near Al Hamama roundabout in Dara city, targeting a regime State Security patrol, injuring three members one of whom seriously. There were no fatalities.
Security measures: On 18 October 2024, US forces entered a state of sudden alert at the Ain Assad Air Base in Anbar. The measures includes the flight of helicopters in the sky of the base. The increased security is in anticipation of po
On 18 October 2024, Global Coalition positioned in Konjik Gas Field shelled pro-Iran militias positions in Deir-ez-Zor - Hatla town in Deir ez-Zor countryside with artillery. Casualties unknown.
On 18 October 2024, Global Coalition positioned in Konjik Gas Field shelled pro-Iran militias positions on the outskirts of Deir-ez-Zor - Military Airbase in Deir ez-Zor countryside with artillery. Casualties unknown.
On 18 October 2024, Global Coalition positioned in Konjik Gas Field shelled pro-Iran militias positions in Khashqar town in Deir ez-Zor countryside with artillery. Casualties unknown.
On 18 October 2024, Global Coalition positioned in Konjik Gas Field shelled pro-Iran militias positions in Mtat town and its outskirts in Deir ez-Zor countryside with artillery, killing a pro-Iran militiamen, and injuring three others. 1 fatality.
On 18 October 2024, Global Coalition positioned in Konjik Gas Field shelled pro-Iran militias positions in Al Jafra town in Deir ez-Zor countryside with artillery. Casualties unknown.
On 18 October 2024, regime forces shelled Jabal al-Zawiyah axis in Idlib countryside with artillery, killing a HTS member. 1 fatality.
On 18 October 2024, regime forces shelled HTS positions in Tefnaz town and its vicinity in Idlib countryside with heavy artillery, killing 3 HTS members, and injuring five others. 3 fatalities.
On 18 October 2024, regime forces shelled farms in Bahia town in Aleppo countryside. Casualties unknown.
On 18 October 2024, regime forces shelled the vicinity of Al-Sirmaniyah town in Hama countryside with heavy artillery. Casualties unknown.
On 18 October 2024, regime forces shelled Fleifeh axis in Idlib countryside with heavy artillery. Casualties unknown.
On 18 October 2024, regime forces shelled the vicinity of Etireh town in Idlib countryside with artillery. Casualties unknown.
On 18 October 2024, regime forces shelled the vicinity of Kansafra town in Idlib countryside with heavy artillery. Casualties unknown.
On 18 October 2024, regime forces shelled the vicinity of Nayrab town in Idlib countryside with artillery. Casualties unknown.
On 18 October 2024, regime forces shelled the vicinity of Afes town in Idlib countryside with artillery. Casualties unknown.
On 18 October 2024, regime forces shelled the vicinity of the Turkish military point in Maaret Al-Naasan town in Idlib countryside with heavy artillery. Casualties unknown.

Figure 15: ACLED spreadsheets come with text descriptions that can be mined for semantic triples.

3.5.4. Data from ACLED and ACAPS is converted Into A Knowledge Graph

There is extensive research for generating knowledge graphs from unstructured text data, as there is an immense amount of data in the form of text across various domains that can be harnessed for insights via conversion to knowledge graph format. One such solution is Diffbot. Diffbot has its own knowledge graph that can be used to scrape entities from text descriptions. Diffbot's current knowledge graph has over 2 billion entities (corporations, people, articles, products, discussions, and more) and 10 trillion facts. Diffbot's knowledge graph automatically generates entities extracted from a document as well as relationships between entities, as shown in the example below. A solution such as Diffbot will be applied to the ACLED and ACAPS data to automatically generate a knowledge graph from unstructured text. This approach is likely to be error prone (e.g. entity "Israeli Security Forces" and entity "ISF" extracted from a body of text translate to two entities rather than just one. This is commonly known as coreference resolution and thus is perfect to test and validate REPAIR.

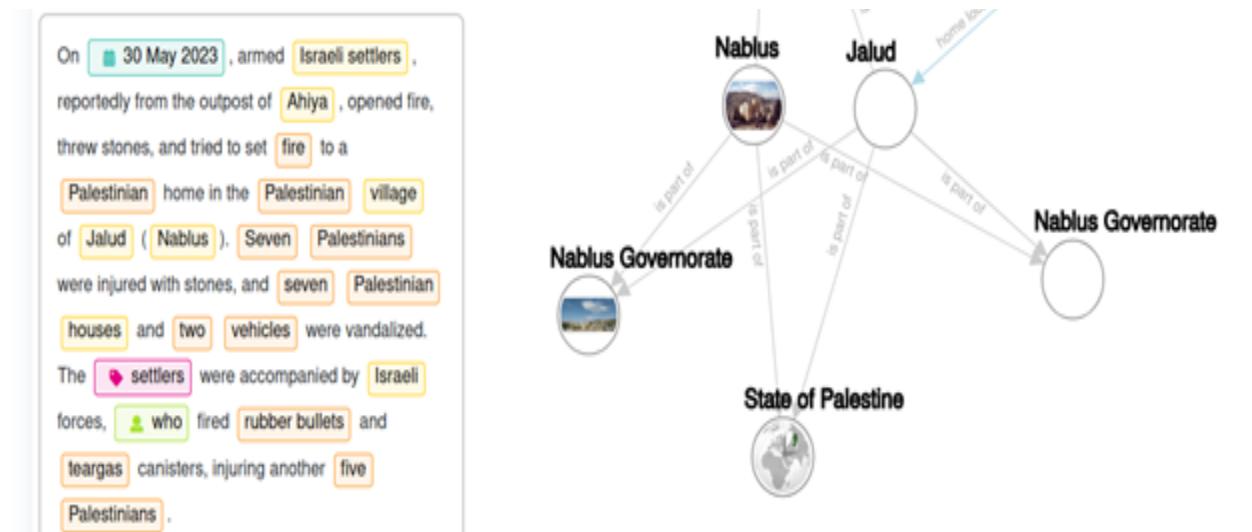


Figure 16: Sentence from ACAPS example description automatically converted to knowledge graph by Diffbot. Automatic construction resulted in duplicate entity nodes with name "Nablus Governorate".

This knowledge graph, once constructed, will be used to demonstrate the power of REPAIR to fix the problems typically encountered when adding or modifying information in a knowledge graph. This technical approach described above solidifies REPAIR as a game-changer for an intuitive, yet trustworthy tool for knowledge graph modifications and interactions.

4. Phase I Statement of Work

The primary goal of this Phase I effort is to develop powerful techniques that facilitate interactions with and modifications to dynamic knowledge graphs. To meet this objective, the following tasks are required.

Task 1: Example Knowledge Graph Construction

Work with the Air Force to select a dataset or datasets of interest. One example dataset is the current intelligence from Israeli-Palestinian conflict from ACLED and ACAPS that captures warning and current intelligence relevant to pattern-of-life analysis, situational awareness, threat detection, and targeting operations. Once a dataset is selected, extract relevant data by making the appropriate API calls to download the data. The data will then be preprocessed for ingest into a database with an appropriate database schema. Once the database is developed, unstructured text from chosen data sources is parsed and passed through entity discovery and relation linking algorithms to create an example dynamic knowledge graph which REPAIR can fix.

Task 2: Algorithms Development and Improvements

In this task, we will incorporate and improve upon the complex document processing algorithms to support key knowledge graph modifications. While the existing document processing algorithms support merging, inserting, deleting, and changing entities, relationships, and attributes, more advanced knowledge graph modification algorithms can also be included such as link prediction to suggest additional changes to the graph based on a particular modification. Link prediction uses types and embeddings to make probabilistic predictions of new relationships between entities. In addition, dimensional reduction techniques, such as the Temporal Mapper library, can also be incorporated to

perform temporal topic modeling to show how clusters of entities evolve over time. Further, graph analytics can be devised to help identify information gaps and include node and relation attributes for entity resolution to infer additional edges between nodes.

Task 3: Knowledge Graph Natural Language Copilot Interface

In Task 3, we will design and develop the natural language copilot interface. This includes building appropriate extraction templates for the automated modification of knowledge graph nodes and edges with a declarative language. This task also involves integrating the entity resolution algorithm underlying the automated graph editing that draws useful context from the domain knowledge graph, database schema, and commit history. Benchmarks will be developed for accuracy and graph completeness. Based on previous experience, the backend will be implemented as a Node.js application to better integrate with the front-end react code. Past efforts using a Python backend were easy to get started, but more difficult to deploy.

Task 4: Knowledge Graph Version Control System

This task involves the development of REPAIR's version control system. In order to develop a version control system, the state of the knowledge graph database must be saved every time one or more modification operations are performed. This task also includes the development of large language model chain that translates the history of individual operations and other changes to the knowledge graph into logical groupings of commit messages.

Task 5: Simple User Interface Design

This task involves development of the web-based graphical user interface: Knowledge Graph View and Version Control View in Regraph components, the Graph Copilot chat window interface, the Source Document View, and integrating the views together in a tiling window system. The Regraph components (Knowledge Graph and Version Control Views) require specifying interaction behavior in the Regraph API such as on-click interaction, on-hover interaction, zooming and panning behavior, etc. Entity-highlighting must be developed for the Source Document View. This task also involves developing cross-context analysis between windows, i.e. actions in one view automatically shifts context in the other views. The integrated views window will be developed in React, and cross-context functionality can be efficiently developed with application state management systems such as Redux.

Task 6: Reporting and Project Management

Oceanit has considerable experience in the execution of Phase I/Phase II/Phase III SBIRs and STTRs and holds to a philosophy of active and regular engagement with the customer to ensure a satisfactory conclusion to the project. To that end the following formal contacts are proposed:

Kickoff Meeting: Considered essential by Oceanit, this meeting will serve to acquaint all personnel involved as to the specific needs and preferences of the customer. It will be attended by the Oceanit Principal Investigator and at least one other senior technical staff member.

Regular Reporting: A synopsis of progress, results and charges of the Oceanit effort on the project will be provided on a contractual regular basis to the customer by the Oceanit Principal Investigator.

Final Report: The final report for the basic effort will be prepared at the end of the project. It will detail the entirety of the work performed and will include discussion of any matters arising from the interactions with the program office.

Informal Contacts: In addition to the formal contact mechanism proposed, Oceanit proposes that informal email and telephone contacts will be necessary to maintain adequate information exchange as the program progresses. These contacts will be headed by the Oceanit Principal Investigator.

For all projects, Oceanit holds to a methodology of Total Quality Management (TQM). The Principal Investigator is ultimately responsible for the project and organizes a team that carries out the day-to-day responsibilities of technical development. Team meetings are held frequently and weekly reports containing project technical and financial information are given to the company Chief Scientist, President, and Chief Operating Officer. A system of checks and balances assures speedy resolution to challenges that arise.

The following table illustrates the estimated timeline for each task of the project.

	Month	1	2	3	4	5	6
1	Example Knowledge Graph Construction						
2	Algorithms Development and Improvement						
3	Natural Language Copilot Interface						
4	Knowledge Graph Version Control System						
5	Simple User Interface Design						
6	Reporting and Project Management						

Table 1: Proposed timeline for the project.

Deliverables

- Kickoff meeting within 30 days of contract start
- Quarterly progress reports
- Technical review within 6 months
- Final report with SF 298

5. Related Work

Oceanit's technical team has been involved with a number of similar artificial intelligence, machine learning, and knowledge graph projects. Below is a list of recent programs which are highly relevant to the proposed effort.

Operations and Logistics Susceptibility Due To Publicly Available Information, Air Force, SBIR Phase I

In today's digital age, military units generate significant Publicly Available Information (PAI) when interacting with commercial entities for military logistics. This data, although unclassified, holds immense potential value for adversaries. In this project, Oceanit is building a powerful system that can provide a comprehensive overview of a military organization's digital public footprint which allows them to identify potential vulnerabilities and bolster their operational security. Our tool starts with data from government resources such as the Federal Procurement Data System, System for Award Management (SAM.gov), and Defense Technical Information Center which provides information pertaining to military contracts and opportunities. We then use Diffbot (<https://www.diffbot.com/>) to find related and supplemental information about the companies associated with the government contracts, their employees, and activities using PAI from websites and social media. Diffbot performs intelligent, automated webpage scraping of PAI by extracting only important information that is core to the primary content. **This**

information is organized into a dynamic knowledge graph, a graph database that links relevant facts and features and defines the relationships between them. This graph doesn't just store information; it serves as the backbone for our primary innovation: focusing a Large Language Model (LLM), such as ChatGPT, via Retrieval Augmented Generation (RAG). RAG improves the performance of LLMs to uncover relevant PAI by contextualizing queries. By providing important, contextual information stored in the knowledge graph to the LLM in conjunction with the query, more relevant and accurate responses are generated. To render these insights actionable, our tool boasts an intuitive user interface based on Design Thinking Principles which is being built as part of our proof-of-concept prototype. The user interface presents relevant information from a query and displays heatmap data on a map for visualization.

[Neural Collapse for Responsible Artificial Intelligence in Directed Energy, Air Force, STTR Phase I](#)

Neural-network-based models are extremely powerful and, particularly with the rise of large language models, have become a part of everyday life. However, it remains difficult to justify their use in mission- or safety-critical settings because they are often “black-boxes” whose decisions cannot be explained to a user. While explainable AI approaches exist and have helped to “open” the black-box, the heterogeneity in network architectures, training approaches, etc. have made making a general statement or approach nearly impossible; what works in one place may not work in another.

For this project, we focus on networks exhibiting neural collapse (NC) which can be characterized by the properties of the penultimate layer features⁴. The presence of NC has implications for a network’s performance, transferability, and robustness, and the long-term objectives of this effort are to (i) understand if it also impacts the interpretability of the network and use this to (ii) design explainable and simpler networks that remain capable of exhibiting NC.

Oceanit’s system is called Explaining Neural Collapse by Analyzing Prototypes (ENCAP), which leverages an important property of NC, namely that test points can be classified by the nearest training class mean. Thus, one way of understanding such a network is to analyze how prototypes (i.e., example points against which test data are compared) change throughput the network. This will be accomplished in four steps: (i) generating a dataset and baseline model that exhibits NC, (ii) performing a post hoc analysis to extract prototypes at various layers in the baseline model, (iii) retrain/modify the baseline model to explicitly include prototype information, and (iv) implementing all the above into a software package that can be delivered to the government.

[Cognitively Inspired AI for Automated Detection, Classification, and Characterization, Navy Phase II SBIR](#)

In this Phase II SBIR, Oceanit is developing a cognitively inspired AI system to help detect, localize, and characterize objects of interest in time series data. The core of Oceanit’s solution is the Noetic Mathematical Engine (NoME), which is a biomimetic approach to artificial intelligence that replicates how we reason on an abstract level rather than the physical neurons that comprise the brain. Given a set of data, NoME uses a formal grammar to define a “language” of possible scenarios that could have produced those data. Then, it uses a variant of the transformer models that power large language models (LLMs) to search through the space and find specific scenarios that best describe the data. By combining symbolic

⁴V. Kothapalli, Neural Collapse: A Review on Modelling Principles and Generalization, arXiv, 2023.

techniques with neural networks, NoME produces models that are interpretable (scenarios are composed of human-understandable symbols) while minimizing the computational cost associated with a combinatorically growing search space. Oceanit has applied this approach to synthetic data generated as a proof of concept as well as field data provided by the government.

[Encountering Vulnerabilities through Analysis of Disclosures and Exploits \(EVADE\), DARPA Direct to SBIR Phase II](#)

Oceanit is developing a powerful system that accurately detects and identifies semantically equivalent programs, subroutines, and vulnerable code across multiple devices and architectural frameworks. Oceanit's solution is called EDIFI which stands for Enumeration of Devices Impacted by Faulty Instructions. EDIFI uses a semantics-based approach for both signature generation and search to detect known vulnerabilities across instruction set architectures (ISA) and compiler configurations. EDIFI leverages an intermediate representation to unify representations of binaries from various ISAs, compilers, etc. and extracts semantic signatures of a vulnerability by dynamically emulating its execution. This approach overcomes the issues of binary clone detection using syntactic and structural techniques which are brittle and prone to false positives. In addition, EDIFI stores the extracted semantic signatures into a state-of-the-art knowledge graph, enabling semantic search capabilities. This allows for the use of additional information such as product documentation, code author history and relationships which provides a second modality of context for each vulnerability via link prediction (making connections between entities) and helps to more accurately detect vulnerabilities across devices and different architectures. Forced Execution and Pre-Memory Planning allow us to dynamically search through an unknown binary for vulnerabilities without required peripherals such as co-processors and interface components. This allows us to scale our approach without having to purchase and test every possible device. Retrieval Augmented Generation and Large Language Models are also employed along with the knowledge graph to create accurate queries to uncover known vulnerabilities across devices and instruction sets.

[Design Thinking Expertise](#)

Oceanit has been contracted by various cross-sector organizations such as Hawaiian Tel, Bank of Hawaii, Chaminade University, City and County of Honolulu, and the Hawaii State Department of Health to conduct design thinking workshops that ranged from introductory overviews of design thinking to multi day workshops that included multiple design challenges. Each organization was looking for a way to bring more innovation and creativity into their organization's culture and modify processes and tools for achieving organizational change.

Each workshop was tailored to meet the needs of the organization, their timeframe, goals and team size. Because the design thinking process mindset is focused on action vs. planning, the workshops are an intense experience and project based learning event that takes a skilled and passionate team of consultants to facilitate. Many of the workshops are conducted with small teams, each team being guided by a coach. Because of Oceanit's support and coordination of the Design Thinking Hawaii Stanford Bootcamp and our involvement with the design thinking movement in Hawaii, we have a team of 11 professionals on our staff that have been certified as instructor/experts and have facilitated design thinking workshops or exercises. Oceanit has built custom challenges for our customers that take an ordinary product or experience that most everyone can relate to and through the process, view it from a new perspective, someone else's. After facilitating a workshop, Oceanit can then provide consulting services to help an organization tackle a design challenge of their own, focused on an internal problem.

Hawaiian Telcom is an example of a team that went through a full design thinking workshop where they designed solutions for two separate institutional challenges. From there, Oceanit recommended scoping a challenge that was not too large as their first design challenge. Oceanit then supported them through this challenge, which focused on internal communication within Hawaiian Telcom. The Hawaiian Telcom staff worked in two separate teams in parallel, designing solutions for the same problem. The solutions to the communication design challenge were presented to the Hawaiian Telcom Executive level of management before being successfully implemented.

6. Relationship with Future Research or Research and Development

With the successful completion of the Phase II project, Oceanit will have developed a fully working minimum viable product that can be tested with analysts and planners at Pacific Air Forces (PACAF) or other Major Command (MAJCOM). User testing will gather feedback on the prototype to evaluate its usability and to identify areas for improvement. Once built and tested, we will demonstrate REPAIR in an operational warfighter environment (such as PACAF or MAJCOM exercises) to show the necessary changes to the graph to support faster, more effective situational awareness in time-constrained operations. Phase III will focus on transitioning REPAIR to multiple warfighting organizations across the Department of Defense through refinements required to be accepted into a targeted system of Record.

7. Commercialization Strategy

First Planned Product

Oceanit plans for its first product coming out of this SBIR effort to be a powerful software tool that helps analysts interact with sophisticated knowledge graph data to edit and modify incorrect entities, their relationships, properties, and dependencies. The Phase II work will be completed with a prototype demonstration of REPAIR's capability in an operational environment such as a military exercise at PACAF or other MAJCOM. In the first year after the Phase II, the focus of our efforts will be on creating a fully featured product to address a specified need of direct concern to both the US Air Force and DoD.

Market and Market Size

According to Polaris Market Research, the global large language model market size (which heavily relies on knowledge graphs) is expected to hit \$36.1 billion by 2030 with a compound annual growth rate of an astounding 33.2%⁵. The surge in the adoption of LLM solutions can be attributed to the increasing requirement for improved human-machine interaction, couple with the necessity to create more seamless and intuitive interfaces for users across a wide range of domains. In addition, escalating demand for automated content creation and curation are driving forces propelling the market forward. Key industry players include large multinational technology companies including Microsoft, Google, and Meta and extremely well-funded startups such as OpenAI and Anthropic. While the market is saturated with many large companies, REPAIR helps with the ecosystem behind LLMs that helps to support and maintain the knowledge underlying the technology. Thus, we believe REPAIR will be invaluable to these market leaders and as such, we have already started to reach out to them for partnerships.

⁵<https://www.fortunebusinessinsights.com/data-privacy-software-market-105420>

Funding Requirements and Methods

The funding requirements and productization goals to commercialize REPAIR are shown in the following table. Following the transition from the US Air Force, \$6.5M in additional funding will be required to set up licensing deals with LLM companies and continue development for the commercial product launch as shown in the following table. Many different sources of funding will be pursued including Phase III funding, angel investment, and corporate co-development. For angel investments, Oceanit will leverage existing relationships established from its last three spinout companies that raised over \$50 million in venture capital funding: Hoana Medical (contactless vital signs monitoring), Nanopoint (intra-cellular imaging), and Ibis Networks (enterprise energy management). Oceanit also has corporate co-development agreements in place with Shell, Chevron, and Haliburton for advanced materials and coating technologies and thus has experience with licensing deals and development agreements.

Oceanit will seek to establish a partnership with LLM companies to establish a licensing deal and/or corporate co-development project. **Based on our experience, this is the fastest way to build market share and the least capital-intensive way to enter the market.**

	2025	2026	2027	2028	2029	2030
Phase II	\$500K ▪Product Concept	\$500K ▪Beta Release				
Phase III, RIF, Angel Investment			\$1M ▪Website	\$1M ▪Marketing		
Licensing and Corporate Co-Development					\$1.5M ▪Secure IP	\$2M ▪License Deal

Table 2: Required financing and productization goals for commercialization.

Marketing Expertise

Business development and marketing are activities already being undertaken by Oceanit staff at this early stage. Oceanit has a talented team of business development professionals with years of experience in raising funds, forging licensing deals, and building relationships with stakeholders. Oceanit will commercialize REPAIR by working with a co-development partner to mature and license the technology. Oceanit has been issued 65 patents for its innovations and is engaging its customary external counsel, Fresh IP, to secure IP protections for REPAIR and its underlying innovations.

Matthew Sullivan – Director of Commercialization: Mr. Sullivan is the Director of Commercialization at Oceanit and is responsible for commercializing technology from Oceanit's research and development portfolio into the commercial market. Mr. Sullivan works closely with Oceanit's research teams to transition early-stage technology into useful commercial applications. At the same time, he collaborates with market leading companies who have an interest in utilizing Oceanit's technology in their existing portfolios and product development pipelines. Prior to joining Oceanit, Mr. Sullivan was the founder and CEO of a successful venture-backed company in Silicon Valley that generated millions of dollars in annual revenues. He has a background in design consulting from the leading design firm IDEO, received his graduate degree from the Hasso Plattner Institute of Design at Stanford University, and received his undergraduate in Physics from Middlebury College.

Jay Andrews – Director of Marketing: Mr. Andrews is Director of Marketing at Oceanit and leads corporate communication and marketing for legacy and novel products. He graduated from the University of Colorado ENVD School of Architecture & Planning. Mr. Andrews has experience in digital media, communications and marketing in client-facing, performance-based roles. Throughout his career he has developed experience in owned, earned and paid digital strategy, storytelling, digital infrastructure, and media planning. He believes that storytelling sits at the core of any marketing, advertising, communications, or content effort - and that it is key to driving forward commercial, new business, and marketing goals. Mr. Andrews is supported by a team of audiovisual and print content creators.

[Competitors and Our Advantage](#)

Currently there are no tools or companies that can seamlessly edit and modify entities and their related and connected edges, properties, and entities of a knowledge graph. As such, REPAIR will be a trailblazer and pioneer in a new field that is sorely needed to support the vast new ecosystem that LLMs have created.

8. Key Personnel

[David J. Siu, MS, Director of Cybersecurity, Oceanit, Principal Investigator](#)

Mr. Siu received his BS degree in Mechanical Engineering from U.C. Irvine, graduating cum laude, followed by an MS degree in Smart Product Design Engineering from Stanford University in 1998. Prior to working at Oceanit, he was a Design Engineer at Mosaic Industries (a computer company in Silicon Valley), designing, building, and testing embedded systems for analytical instruments and real-time industrial control systems. At Oceanit, he leads the cybersecurity research division and received GIAC certification for securing and auditing Unix and Linux systems. Mr. Siu is a skilled Principal Investigator leading the research for more than 30 projects including the Operations and Logistics Susceptibility Due To Publicly Available Information, Encountering Vulnerabilities through Analysis of Disclosures and Exploits, Mitigation of Ransomware, Self-Healing Ship Systems, Novel IDS for Vehicle CAN bus, and Software Supply Chain Identification for Compiled Windows Binaries. Mr. Siu has extensive experience in reverse engineering, malware analysis, security assessments, and penetration testing. Mr. Siu also has experience in technology commercialization as he co-founded and served as Chief Technology Officer of Ibis Networks, an IOT-based energy management company spun out of Oceanit based on DHS-funded technology. Mr. Siu is a US citizen. As the Principal Investigator, Mr. Siu will be responsible for all aspects of this project.

[Ray Nowell, MS, Senior Applied Data Scientist, Oceanit](#)

Mr. Nowell received his BS degree in Mathematics from Cal State Long Beach and an MS degree in Applied Mathematics from the University of Missouri. At Oceanit, Mr. Nowell leads the technical work EVADE the Operations and Logistics projects described above in Section 5. Prior to working at Oceanit, he was a Program Manager at DARPA, managing a portfolio of classified programs for STO on software and network security. Prior to DARPA, Mr. Nowell was a Divisional Technical Director and Branch Chief at NSA Headquarters in Fort Meade, Maryland. In these positions, he developed software vulnerability analysis research and projects for the division using automated static and dynamic analysis software. Mr. Nowell recruited, managed, and retained a large team of software vulnerability analysts. He also reverse engineered and audited various software systems and developed tools for automated discovery. Mr. Nowell also led a study of telecommunications infrastructure and backbone routing protocols and

developed analytics for large-scale sets of network data. He applied insights from bulk analytics to operations to develop map/reduce jobs. He led the NSA Hawaii team to develop custom data science applications for the site intelligence analysts. He also processed large graph datasets for filtering and graph clustering, researched telecommunications infrastructure and routing protocols, and formatted graph analytic results for presentation and consumption by analysts. Mr. Nowell is a US citizen. For this project, Mr. Nowell will be responsible for developing and integrating the algorithms.

[Matthew O. Williams, Ph.D., Machine Learning Lead, Oceanit](#)

Dr. Matthew O. Williams received his Ph.D. in Applied Mathematics from the University of Washington, where he developed data-driven models of mode-locked lasers and other systems in nonlinear optics. From 2012 - 2015, he was an NSF Mathematical Sciences Postdoctoral Research Fellow at Princeton University and conducted research that lies at intersection of scientific computing, machine learning, and nonlinear dynamics. In 2015, he joined the United Technologies Research Center (UTRC). At UTRC, he designed and implemented data-processing algorithms/pipelines for sustainment of the F135 engine and for the automated inspection of the Geared Turbofan engine. Concurrently, he was also the PI. for a project on transfer learning and physics-informed machine learning. Dr. Williams joined Oceanit in 2017, where he is currently developing the computational frameworks that support Oceanit's explainable AI system – the Noetic Mathematical Engine (NoME). NoME is currently being used to assess the cyber-security posture of air delivered weapons systems running on the MIL-STD-1553 bus. Dr. Williams is also leading the Cognitively Inspired AI project described above. Dr. Williams has published over 20 peer reviewed papers including five specifically focused on AI/machine learning. Dr. Williams is a US citizen. Dr. Williams will be responsible for developing the natural language copilot interface.

[Jake Koki, Knowledge Graph Expert, Oceanit](#)

Mr. Koki received his BS degree in Mathematics from the University of Hawaii at Manoa. Prior to working at Oceanit, he was a software engineer and data scientist at Ai.Fish, a startup company partnered with the National Oceanic and Atmospheric Administration (NOAA) and the National Fish and Wildlife Foundation (NFWF) to develop computer vision technologies for the electronic monitoring of longline fishing vessels. There, he developed a machine-learning-enabled video preprocessing pipeline that cut down video annotation times by up to 85% as well as computer vision models that can identify the species of longline catches with above 95% accuracy. At Oceanit, Mr. Koki designs and implements knowledge graphs for many different projects. For Mitigation of Ransomware and the NSA, he designed the knowledge graph used to understand and label the behavior of zero-day malware. For Software Supply Chain Identification, he built the knowledge graph that links product documentation to binary features. Mr. Koki is a U.S. citizen. For this project, Mr. Koki will be responsible for the knowledge graph construction and user interface development.

[9. Foreign Citizens](#)

None

[10. Facilities/Equipment](#)

Oceanit's Computing Infrastructure: Oceanit has a computing cluster consisting of an IBM Blade Center 14 slot chassis, with 9 dual hex core 64-bit Intel Xeon processors for a total of 108 cores and teraflops of processing power. 40 Gbit Infiniband and 10 Gbit Ethernet connect the nodes. On this high-performance

computing cluster, large language models can be adapted, trained, and run as part of our natural language processing pipeline.

Classified Work Capability: Oceanit currently maintains personnel at the TOP SECRET level as well as maintaining storage and processing capability at the SECRET level at two facilities. Oceanit's headquarters maintains its own secure storage vault with 24-hour monitoring and security. It is one of the few commercial facilities on Oahu that has the capability of upgrading and supporting TS SCI access, storage, and processing with the appropriate contract.

Oceanit has over 15 years of working on many classified projects and contracts. As with all classified contracts, Oceanit's Facility Security Officer will ensure all project team members understand the nature of the project and any provided classification guidance. A security plan will be developed to ensure all classified materials are accessed and handled properly and in accordance with the National Industrial Security Program Operating Manual (NISPOM). Oceanit has approved secured areas to review and store work product and as needed can set up systems to process classified information.

11. Subcontractors/Consultants

None

12. Prior, Current, or Pending Support of Similar Proposals

None



SBIR Phase I Proposal

Proposal Number	F244-0001-0037
Topic Number	AF244-0001
Proposal Title	Interactive Knowledge Graphs for Situational Awareness
Date Submitted	11/05/2024 07:40:46 PM

Firm Information

Firm Name	Oceanit Laboratories, Inc.
Mail Address	Oceanit Center 828 Fort Street Mall, Suite 600, Honolulu, Hawaii, 96813
Website Address	http://www.oceanit.com
UEI	S6X8FST9JAM7
Duns	144540283
Cage	OLGN6

Total Dollar Amount for this Proposal	\$139,999.79
Base Year	\$139,999.79
Year 2	\$0.00
Technical and Business Assistance(TABA)- Base	\$0.00
TABA- Year 2	\$0.00

Base Year Summary

Total Direct Labor (TDL)	\$130,753.93
Total Direct Material Costs (TDM)	\$87.00
Total Direct Supplies Costs (TDS)	\$0.00
Total Direct Equipment Costs (TDE)	\$0.00
Total Direct Travel Costs (TDT)	\$0.00
Total Other Direct Costs (TODC)	\$0.00
G&A (rate 0%) x Base ()	\$0.00
Total Firm Costs	\$130,840.93
Subcontractor Costs	
Total Subcontractor Costs (TSC)	\$0.00
Cost Sharing	-\$0.00
Profit Rate (7%)	\$9,158.86
Total Estimated Cost	\$139,999.79
TABA	\$0.00

Year 2 Summary

Total Direct Labor (TDL)	\$0.00
Total Direct Material Costs (TDM)	\$0.00

Total Direct Supplies Costs (TDS)	\$0.00
Total Direct Equipment Costs (TDE)	\$0.00
Total Direct Travel Costs (TDT)	\$0.00
Total Other Direct Costs (TODC)	\$0.00
G&A (rate 0%) x Base ()	\$0.00
Total Firm Costs	\$0.00
Subcontractor Costs	
Total Subcontractor Costs (TSC)	\$0.00
Cost Sharing	-\$0.00
Profit Rate (7%)	\$0.00
Total Estimated Cost	\$0.00
TABA	\$0.00

Base Year

Direct Labor Costs						
Category / Individual-TR	Rate/Hour	Estimated Hours	Fringe Rate (%)	Fringe Cost	Cost	
Engineers, All Other/ Principal Investigator (david siu)	\$70.07	200	28.40	\$3979.98	\$17,993.98	
Software Developer/ Software Engineers (Jake Koki)	\$48.71	476	28.40	\$6584.81	\$29,770.77	
Software Developer/ Senior Software Engineer	\$68.15	199	28.40	\$3851.57	\$17,413.42	
Subtotal Direct Labor (DL)					\$65,178.17	
Labor Overhead (rate 100.61%) x (DL)					\$65,575.76	
Total Direct Labor (TDL)					\$130,753.93	

Direct Material Costs

Various parts	\$87.00
Total Direct Material Costs (TDM)	\$87.00
G&A (rate 0%) x Base ()	\$0.00
Cost Sharing	-\$0.00
Profit Rate (7%)	\$9,158.86
Total Estimated Cost	\$139,999.79
TABA	\$0.00

Year 2

Direct Labor Costs						
Category / Individual-TR	Rate/Hour	Estimated Hours	Fringe Rate (%)	Fringe Cost	Cost	

Engineers, All Other/ Principal Investigator (david siu)	\$70.07	0	28.40	\$0.00	\$0.00
Software Developer/ Software Developer (Jake Koki)	\$48.71	0	28.40	\$0.00	\$0.00
Software Developer/ Senior Software Engineer	\$68.15	0	28.40	\$0.00	\$0.00
Subtotal Direct Labor (DL)					\$0.00
Labor Overhead (rate 100.61%) x (DL)					\$0.00
Total Direct Labor (TDL)					\$0.00

Direct Material Costs

Various parts	\$0.00
Total Direct Material Costs (TDM)	\$0.00

G&A (rate 0%) x Base ()	\$0.00
Cost Sharing	-\$0.00
Profit Rate (7%)	\$0.00
Total Estimated Cost	\$0.00
TABA	\$0.00

Explanatory Material Relating to the Cost Volume

The Official From the Firm that is responsible for the cost breakdown

Name: James Andrews

Phone: (808) 531-3017

Phone: proposals@oceanit.com

Title: Proposal Owner

If the Defence Contracting Audit Agency has performed a review of your projects within the past 12 months, please provide: Yes

Audit Agency Name: DCAA Pacific Branch Office

Audit Agency POC: Murako Johnson

Address: 1132 Bishop Street, Suite 620, Honolulu, Hawaii,96813

Phone: (808) 541-2740

Email: murako.johnson@dcaa.mil

Select the Type of Payment Desired: Partial payments

Cost Volume Details

Direct Labor

Base

Category	Description	Education	Yrs Experience	Hours	Rate	Fringe Rate	Total
Engineers, All Other	Principal Investigator	Master's Degree	26	200	\$70.07	28.40	\$17,993.98
Software Developer	Software Engineers	Bachelor's Degree	5	476	\$48.71	28.40	\$29,770.77
Software Developer	Senior Software Engineer	PhD	15	199	\$68.15	28.40	\$17,413.42

Are the labor rates detailed below fully loaded?

NO

Provide any additional information and cost support data related to the nature of the direct labor detailed above.

**DCAA established billing rates FY24 San Diego Branch Office (04151), Ms. Fei Lincoln,
fei.lincoln.civ@mail.mil - Documentation is marked CUI but can be made available upon request.**

Direct Labor Cost (\$):

\$65,178.17

Year2

Category	Description	Education	Yrs Experience	Hours	Rate	Fringe Rate	Total
Engineers, All Other	Principal Investigator	Master's Degree	26	0	\$70.07	28.40	\$0.00
Software Developer	Software Developer	Bachelor's Degree	5	0	\$48.71	28.40	\$0.00
Software Developer	Senior Software Engineer	PhD	15	0	\$68.15	28.40	\$0.00

Are the labor rates detailed below fully loaded?

NO

Provide any additional information and cost support data related to the nature of the direct labor detailed above.

**DCAA established billing rates FY24 San Diego Branch Office (04151), Ms. Fei Lincoln,
fei.lincoln.civ@mail.mil - Documentation is marked CUI but can be made available upon request.**

Direct Labor Cost (\$):

\$0.00

Sum of all Direct Labor Costs is(\$): \$65,178.17

Overhead

Base

Labor Cost Overhead Rate (%) 100.61

Apply Overhead to Direct Materials Cost? NO

Overhead Comments:

**DCAA established billing rates FY24 San Diego Branch Office (04151), Ms. Fei Lincoln,
fei.lincoln.civ@mail.mil - Documentation is marked CUI but can be made available upon request.**

Overhead Cost (\$): \$65,575.76

Year2

Labor Cost Overhead Rate (%) 100.61

Apply Overhead to Direct Materials Cost? NO

Overhead Comments:

**DCAA established billing rates FY24 San Diego Branch Office (04151), Ms. Fei Lincoln,
fei.lincoln.civ@mail.mil - Documentation is marked CUI but can be made available upon request.**

Overhead Cost (\$): \$0.00

Sum of all Overhead Costs is (\$): \$65,575.76

General and Administration Cost

Base

G&A Rate (%): 0

Apply G&A Rate to Overhead Costs? NO

Apply G&A Rate to Direct Labor Costs? NO

Apply G&A Rate to Direct Material Costs? NO

Please specify the different cost sources below from which your company's General and Administrative costs are calculated.

N/A

G&A Cost (\$): **\$0.00**

Year2

G&A Rate (%): **0**

Apply G&A Rate to Overhead Costs? **NO**

Apply G&A Rate to Direct Labor Costs? **NO**

Apply G&A Rate to Direct Material Costs? **NO**

Please specify the different cost sources below from which your company's General and Administrative costs are calculated.

N/A

G&A Cost (\$): **\$0.00**

Sum of all G&A Costs is (\$): **\$0.00**

ODC-Materials

Base

Description: Various parts Vendor: Various

Quantity: 1 Total Cost(\$): \$87.00

Consumable? yes Competitively Sourced? yes

Exclusive for this Contract? yes

Supporting Comments:

Funds will be used to buy spare computer parts if needed or literature papers to support the project.

Year2

Description: Various parts Vendor: Various

Quantity: 1 Total Cost(\$): \$0.00

Consumable? yes Competitively Sourced? yes

Exclusive for this Contract? yes

Supporting Comments:

N/A

ODC-Summary

Base

Do you have any additional information to provide?

NO

Year2

Do you have any additional information to provide?

NO

Profit Rate/Cost Sharing

Base

Cost Sharing (\$):

-\$0.00

Cost Sharing Explanation:

N/A

Profit Rate (%):

7

Profit Explanation:

**DCAA established billing rates FY24 San Diego Branch Office (04151), Ms. Fei Lincoln,
fei.lincoln.civ@mail.mil - Documentation is marked CUI but can be made available upon request.**

Total Profit Cost (\$):

\$9,158.86

Year2

Cost Sharing (\$):

-\$0.00

Cost Sharing Explanation:

N/A

Profit Rate (%):

7

Profit Explanation:

**DCAA established billing rates FY24 San Diego Branch Office (04151), Ms. Fei Lincoln,
fei.lincoln.civ@mail.mil - Documentation is marked CUI but can be made available upon request.**

Total Profit Cost (\$):

\$9,158.86

Total Proposed Amount (\$):

\$139,999.79

OCEANIT LABORATORIES INC

DISCLAIMER: Information provided herein is privileged and confidential, and not subject to disclosure, pursuant to 15 U.S.C. 638 (k)(4) and 5 U.S.C. 552. This information shall only be used or disclosed for evaluation purposes.

Privileged and confidential and not subject to disclosure pursuant to 15 U.S.C. 638 (k)(4) and 5 U.S.C. 552.



SBIR Company Commercialization Report

Total Investments:	Total Sales:	Total Patents:	Government Designated Phase III Funding:
\$183,900,399.66	\$12,696,611.87	50	\$111,526,245.58

Company Information

Address:

828 FORT STREET MALL STE 600
HONOLULU, HI 96813-4314
United States

SBC Control ID:	SBC_000000068	Company Url:	https://www.oceanit.com
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Company POC		Commercialization POC	
Title:	Mr.	Title:	Science & Technology Director
Full Name:	James G Andrews	Full Name:	Ken Cheung
Phone:	8085313017	Phone:	(808) 531-3017
Email:	jgandrews@oceanit.com	Email:	kcheung@oceanit.com

Additional Company Information

% Revenue for last fiscal year from SBIR/STTR funding:	Total revenue for last fiscal year:
38.0%	\$20,000,000 - \$99,999,999
Year Founded:	# Employees Currently:
1985	128
Year first Phase I award received:	# SBIR/STTR Phase I Awards:
1995	145
Year first Phase II award received:	# SBIR/STTR Phase II Awards:
1996	87
# Employees at first Phase II award:	Mergers and Acquisition within past 2 years:
25	No
Spin-offs resulting from SBIR/STTR:	IPO resulting from SBIR/STTR Year of IPO:
Yes	No N/A
Patents resulting from SBIR/STTR #Patents:	List of Patents:
Yes 50	US-7663546-B1; US-7666327-B1; US-7713448-B1; US-7763187-B1; US-20100268094-A1; US-7875211-B1; US-7894044-B1; US-7985354-B1; US-8048372-B1; US-8153978-B1; US-8173734-B1; US-8193929-B1; US-8399089-B1; US-8421015-B1; US-8451448-B1; US-8536998-B1; US-8688833-B1; US-8802801-B1; US-20140224662-A1; US-9051216-B1; US-9233147-B1; US-9277964-B1; US-9290671-B1; US-9423341-B1; US-9845264-B1; US-9890464-B2; US-10150203-B1; US-10190229-B1; US-10240244-B2; US-10247707-B1; US-10254424-B1; US-10342705-B1; US-10364931-B1; US-10467753-B1; US-10575710-B1; US-10759084-B1; US-10967097-B1; US-11085125-B2; US-11105091-B1; US-11118270-B1; US-11140355-B1; US-11274227-B1; US-11352505-B1; US-11362431-B1; US-11363233-B1; US-11387906-B1; US-11383349-B2; US-11466355-B1; US-11613691-B1; US-11639456-B1
Woman-Owned:	Socially and Economically Disadvantaged:
No	No
HUBZone-Certified:	SBC majority-owned by multiple VCOC, HF, PE firms By what percent (%):
No	No N/A

Additional Investment From

	Last Submitted Version (05-22-2023 10:33 PM)	Current Version
DoD contracts/DoD subcontracts	\$135,348,715.58	\$158,547,974.58

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SBIR Company Commercialization Report

Angel Investors	\$25,000.00	\$25,000.00
Venture Capital	\$19,000,000.00	\$19,000,000.00
Self Funded	\$584,249.00	\$584,249.00
Private Sector	\$3,342,537.00	\$2,842,537.00
Other Federal Contracts/Grants	\$6,910,390.00	\$910,390.00
Other Sources	\$1,357,878.00	\$1,990,249.08
Additional Investment	\$0.00	\$0.00
Total Investment	\$166,568,769.58	\$183,900,399.66

Privileged and confidential and not subject to disclosure pursuant to 15 U.S.C. 638 (k)(4) and 5 U.S.C. 552.



SBIR Company Commercialization Report

Phase III Sales To

	Last Submitted Version (05-22-2023 10:33 PM)	Current Version
DoD or DoD prime contractors	\$0.00	\$0.00
Private Sector	\$9,883,878.00	\$12,021,611.87
Export Markets	\$100,000.00	\$100,000.00
Other Federal Agencies	\$0.00	\$0.00
Additional commercialization by 3rd Party Revenue	\$575,000.00	\$575,000.00
Other Customers	\$0.00	\$0.00
Additional Sales	\$0.00	\$0.00
Total Sales	\$10,558,878.00	\$12,696,611.87

Government Phase III Contracts

	Last Submitted Version (05-22-2023 10:33 PM)	Current Version
Funding Obligated	\$76,821,993.58	\$111,526,245.58

Commercialization Narrative

Founded in 1985, Oceanit is a diversified engineering and R&D firm that develops technology from deep science to customer-focused commercialization in fields such as aerospace, health care, information technology, advanced materials, AI, optics, and energy. Oceanit's 'Mind to Market' approach brings together disruptive thinking with trans-disciplinary knowledge to deliver new innovations to market for humans and society. Oceanit develops solutions to the world's toughest challenges like, waste-to-energy systems, clean hydrogen fuel production, H2 transportation technologies, human-style anthrozoetic artificial intelligence, lasers that can pass through skin and bone to treat traumatic brain injuries, sniper detection systems that can spot the shooter before hearing the gun shot, and much more. Oceanit commercialization strategies include spin-outs, direct manufacturing and distribution, licensing and managed acquisitions, and co-development. Oceanit received the 1997 and 2006 National Tibbets Award in recognition of outstanding contributions to the SBIR program.

Oceanit has successfully spun off four private equity funded companies (ESportsTraining, Inc., Hoana Medical, Nanopoint and IBiS Networks (now WATTIQ)), with more than \$165M from private equity investors. Oceanit recently received FDA clearance for sales of an OTC medical diagnostic (The ASSURE-100 Rapid COVID-19 Test for Point-of-Care and home use) and received foreign certification for sale (ASSURE development was featured as a 2022 DLA SBIR success story). Oceanit also developed and commercialized a noise-reducing abrasive blasting nozzle, Blast Ninja – going from Phase I SBIR research to a commercially-successful, internationally available product. These products and companies were originally funded by SBIR programs.

To focus on driving more technology from the lab to market, Oceanit is expanding a talented team of commercialization professionals that have years of experience in fundraising, forging licensing deals, and building relationships with SMEs and industry stakeholders.

In 1999, Oceanit established a wholly-owned subsidiary, ESportsTraining, Inc., for the purpose of providing sports training and instructional information in training facilities and via the internet as well as providing computer-oriented interactive multimedia for accessing and interacting with the services offered. In the process, ESportsTraining raised \$5M from private equity investors. As the parent company, Oceanit had full operational control of its subsidiary and strategically invested a portion of the subsidiary's returns in the parent company.

In 2002, Oceanit spun off Hoana Medical, a medical device company that uses technology incubated at Oceanit, and funded by the Army, to gather vital signs passively and transparently from patients without wires, electrodes, or other attachments placed upon the patient – think Star Trek's sick bay bed. Hoana Medical received FDA approval in 2006. Hoana Medical has raised approximately \$100M in private equity from U.S. and Asian venture firms in four rounds of financing.

In 2003, Oceanit launched MOSAIC, Hawaii's first and only optical design and fabrication facility. After two years, MOSAIC achieved positive cash-flow with clients including the Department of Defense, NASA, the University of Hawaii, and world-class observatories.

In 2005, Oceanit spun off Nanopoint Technologies, based upon the NSF SBIR program, "POINT - Precision Optical Intra-Cellular Near-field Technology". Nanopoint's technology, funded by NSF via two Phase IIs and a Phase II, enables non-destructive intracellular imaging at ultra-high nanoscale resolutions, to create new ways to image and study the dynamic processes within a live cell. In November of 2005, Nanopoint closed Series A round of financing led by Advantage Capital, with Global Venture Capital, Sulphur Creek Ventures, and several angels. In 2007, Nanopoint closed Series B round, and to date has raised more than \$20M in private investment.

In March 2013, Ibis Networks, now called WattIQ, became Oceanit's latest spin-out. WattIQ is an energy service and data analytics company focused on outlet plug load energy management, providing energy savings for large commercial organizations. The company has raised \$30M to date and is poised for growth in key vertical markets including the military, hospitality, and education. WattIQ is based on WISPER (Wireless Intelligent Sensor Platform for Emergency Responders) technology developed under a Department of Homeland Security SBIR Phase II.

In February 2022, Oceanit's ASSURE-100 Rapid COVID-19 Test received point-of-care emergency use authorization (EUA) from the U.S. Food & Drug Administration and in December 2022 received an over-the-counter EUA for use by consumers at home. ASSURE-100 is currently ramping up production with partners for increased sales - federal support originated with the SBIR program. In particular, the Dept of Defense's Defense

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SBIR Company Commercialization Report

Logistics Agency supported development for rapid testing of DOD employees around the world. ASSURE-100 also received support from the NIH RADx program. It is one of just 13 rapid tests to receive FDA EUA in 2022.

In January 2023, Oceanit's Blast Ninja noise-reducing abrasive blast nozzle was acquired by American tooling manufacturer, Kennametal. Blast Ninja is the commercial results of SBIR funding that began in 2013 with support from an Air Force SBIR. The SBIR program continued to support the design and development of Blast Ninja until commercial sales began in 2020. Sales grew year on year, showing that the novel nozzle design had commercial and health merits; in reducing noise and protecting operators.

Commercialized Awards

- Listed below are the sales revenue and investment details resulting from the technology developed under these SBIR/STTR awards.

Development of Approaches to Minimize Icing in Aircraft Heat Exchanger/Condenser Applications

1 of 76

Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2015	Subsidiaries	N/A
Topic #:	AF141-082	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-15-C-2562	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$8,800,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$3,770,733.87
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$8,800,000.00	Sales Total:	\$3,770,733.87

Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N00014-20-C-1108 - P00001	NAVY	LANCE I	2020	\$8,800,000.00

Multimodal-Multidimensional image fusion for morphological and functional evaluation of the retina

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2016	Subsidiaries	N/A
Topic #:	AF141-028	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-16-C-6678	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00

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SBIR Company Commercialization Report

Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$271,500.00		
Other Sources Description: Hawaii Small Business Innovation Research Grant Program, High Technology Development Corporation, matching grant funding.			
Investment Total:	\$271,500.00	Sales Total:	\$0.00

Cool Suits

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	NX19-005	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N00014-19-9-0017	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$150,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$25,000.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$100,000.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$250,000.00	Sales Total:	\$25,000.00

Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N00014-19-9-0017	NAVY	Cool Suits	2022	\$2,000,000.00

Acoustic Smart Cement for Well Integrity Diagnostics

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Agency/Branch:	Department of Energy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	19b	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	DE-SC0018836	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$1,650,000.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,650,000.00	Sales Total:	\$0.00

Privileged and confidential and not subject to disclosure pursuant to 15 U.S.C. 638 (k)(4) and 5 U.S.C. 552.



SBIR Company Commercialization Report

Government Designated Phase III Contracts				
Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N00014-23-C-1020	NAVY	LANCE II	2023	\$6,548,025.00

Managing Digital Communications via Virtual Staff

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2017	Subsidiaries	N/A
Topic #:	A15-034	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W56KGU-17-C-0023	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

DoD contract/subcontract:	\$1,579,627.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$360,871.08

Other Sources Description:

HTDC (Hawaii Technology Development Corporation) "Hawaii Alternative Energy Research and Development Program Matching grant"

Investment Total:

\$1,940,498.08

Sales Total:

\$0.00

Phase III Sales To

Dod or DoD prime contractors:	\$0.00
Other Federal Agencies:	\$0.00
Private Sector:	\$0.00
Export Market:	\$0.00
3rd Party Revenue:	\$0.00
Other Customers:	\$0.00

Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N00014-16-C-1053	NAVY	Strong AI	2016	\$1,579,627.00

Innovative Imagery Processing Architecture

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2012	Subsidiaries	N/A
Topic #:	N103-205	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-12-C-0307	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

DoD contract/subcontract:	\$36,551,672.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$5,000.00
Private Sector:	\$10,000.00
Other Sources:	\$0.00

Investment Total:

\$36,566,672.00

Sales Total:

\$0.00

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SBIR Company Commercialization Report

Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N68335-14-C-0364	NAVY	Innovative Imagery Processing Architecture	2014	\$121,000.00
N68335-16-G-0028	NAVY	ADAPT	2016	\$3,631,413.00
N68335-19-F-0393	NAVY	ADAPT At Sea Demo	2019	\$9,500,000.00
N68335-20-F-0506	NAVY	ADAPT PTU Cameras	2020	\$8,900,000.00
68335-16-G-0028 - N6833517F0045	NAVY	ADAPT	2017	\$375,017.00
N68335-16-G-0028 - 0001	NAVY	ADAPT	2016	\$3,289,982.00
Modification P00001	NAVY	ADAPT	2024	\$2,795,445.00
N6833523G0015	NAVY	ADAPT	2024	\$8,512,274.00
N68335-16-G-0028 - N6833518F0066	NAVY	ADAPT	2018	\$2,383,509.00

Prodrugs - Nano Vector
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Agency/Branch:	Department of Defense/Army	Manufacturing related Subsidiaries	No N/A
Program/Phase/Year:	SBIR/Phase II/2010		N/A
Topic #:	A08-123	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W81XWH-09-C-0016	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To	
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
	Sales Total:
	\$0.00

Tools to Enable Systematic Testing of Avionics Cyber Security
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Agency/Branch:	Department of Defense/Air Force	Manufacturing related Subsidiaries	No N/A
Program/Phase/Year:	SBIR/Phase II/2020		N/A
Topic #:	AF182-102	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8649-20-C-0028	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To	
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
	Sales Total:
	\$0.00

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**SBIR Phase II: POINT - Precision Optical Intra-Cellular Near-field Technology**

Agency/Branch:	National Science Foundation	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2006	Subsidiaries	Nanopoint Technologies
Topic #:	BT	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	0548768	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$1,000,000.00
Venture Capital:	\$9,000,000.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$9,000,000.00	Sales Total:	\$1,000,000.00

Optimization Algorithm to Enhance Antenna Array Beamforming for Radar and Early Warning (EW) Application

Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2013	Subsidiaries	N/A
Topic #:	AF112-141	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-13-C-1506	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Orthogonal Approach to Malware Detection and Classification

Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2016	Subsidiaries	N/A
Topic #:	N151-067	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-16-C-0288	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

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SBIR Company Commercialization Report

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Concrete Joint Sealant for High-Temperature Applications

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2012	Subsidiaries	N/A
Topic #:	AF103-152	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-12-C-5116	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

High Accuracy, Automated Satellite Surveillance Network

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2001	Subsidiaries	N/A
Topic #:	N/A	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	F29601-01-C-0175	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$46,815,464.58	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$46,815,464.58	Sales Total:	\$0.00

Government Designated Phase III Contracts

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SBIR Company Commercialization Report

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
FA9451-04-C-0381	USAF	High Accuracy, Automated Satellite Surveillance Network	2004	\$35,353,830.68
FA8819-10-C-0002	USAF	Hands Ions (SAMBA)	2010	\$8,238,909.90
FA8823-19-C-0002	USAF	HANDS ATS	2019	\$3,222,724.00

Field Drying System using no power for clothing and boots

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	Yes Unit Process Level Manufacturing
Program/Phase/Year:	SBIR/Phase II/2014	Subsidiaries	N/A
Topic #:	N123-155	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	M67854-14-C-6520	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Blast Booth Noise Reduction - An OSHA Compliance Issue

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	Yes Machine Level Manufacturing
Program/Phase/Year:	SBIR/Phase II/2015	Subsidiaries	N/A
Topic #:	AF131-199	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8222-15-C-0004	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Novel Acoustic Materials for Passive Hearing Protection

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Agency/Branch:	Department of Defense/Defense Advanced Research Projects Agency	Manufacturing related	No N/A
		Subsidiaries	N/A

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SBIR Company Commercialization Report

Program/Phase/Year: SBIR/Phase II/2012	Other contributing SBIR/STTR awards N/A
Topic #: SB103-006	Used in Federal or acquisitions program? No
Contract/Grant #: D12PC00354	
Achieved a cost saving or cost avoidance?: No	
Additional Investment From	Phase III Sales To
DoD contract/subcontract: \$0.00	Dod or DoD prime contractors: \$0.00
Other Federal contract/grants: \$0.00	Other Federal Agencies: \$0.00
Angel Investors: \$0.00	Private Sector: \$0.00
Venture Capital: \$0.00	Export Market: \$0.00
Self-Funded: \$0.00	3rd Party Revenue: \$0.00
Private Sector: \$0.00	Other Customers: \$0.00
Other Sources: \$0.00	
Investment Total: \$0.00	Sales Total: \$0.00

Investigations of Internal Waves Around Steep Slopes and Their Influence on Convergence Zone Formation

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Agency/Branch: Department of Defense/Navy	Manufacturing related No N/A
Program/Phase/Year: SBIR/Phase II/1996	Subsidiaries N/A
Topic #: N/A	Other contributing SBIR/STTR awards N/A
Contract/Grant #: N/A	Used in Federal or acquisitions program? No
Achieved a cost saving or cost avoidance?: No	
Additional Investment From	Phase III Sales To
DoD contract/subcontract: \$1,000,000.00	Dod or DoD prime contractors: \$0.00
Other Federal contract/grants: \$0.00	Other Federal Agencies: \$0.00
Angel Investors: \$25,000.00	Private Sector: \$0.00
Venture Capital: \$0.00	Export Market: \$0.00
Self-Funded: \$0.00	3rd Party Revenue: \$0.00
Private Sector: \$0.00	Other Customers: \$0.00
Other Sources: \$0.00	
Investment Total: \$1,025,000.00	Sales Total: \$0.00

Ultra-Wideband Radio Frequency (RF) Vector Signal Generator for Early Warning (EW) Applications

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Agency/Branch: Department of Defense/Air Force	Manufacturing related No N/A
Program/Phase/Year: SBIR/Phase II/2013	Subsidiaries N/A
Topic #: AF112-146	Other contributing SBIR/STTR awards N/A
Contract/Grant #: FA8650-13-C-1511	Used in Federal or acquisitions program? No
Achieved a cost saving or cost avoidance?: No	
Additional Investment From	Phase III Sales To
DoD contract/subcontract: \$0.00	Dod or DoD prime contractors: \$0.00
Other Federal contract/grants: \$0.00	Other Federal Agencies: \$0.00
Angel Investors: \$0.00	Private Sector: \$0.00

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SBIR Company Commercialization Report

Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Improved Coupling Factor of Personal Cooling Systems

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2017	Subsidiaries	N/A
Topic #:	OSD11-H06	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W911QY-17-C-0031	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$1,500,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$26,439.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$45,000.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,545,000.00	Sales Total:	\$26,439.00

Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N0004-19-C-0017	NAVY	ONR Cool Suits	2019	\$1,500,000.00

Rhizomatic: Next Generation Image Processing for In Situ Fine Root Measurement

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Agency/Branch:	Department of Energy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2021	Subsidiaries	N/A
Topic #:	26b	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	DE-SC0020462	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

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Crushed Aggregate Gradation Evaluation System

Agency/Branch:	Department of Transportation	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2021	Subsidiaries	N/A
Topic #:	20-FR4	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	6913G621C100015	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
	Sales Total:
	\$0.00

All-Sky Thermal Infrared Camera for Atmospheric Water Vapor Measurement

Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2020	Subsidiaries	N/A
Topic #:	N132-090	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W56KGU-20-C-0027	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
	Sales Total:
	\$0.00

Disposable Coagulation Profiler

Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2012	Subsidiaries	iFirst Medical Technologies
Topic #:	A10-156	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W81XWH-11-C-0055	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To

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SBIR Company Commercialization Report

DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Hostile Fire Indicator (HFI)

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2006	Subsidiaries	N/A
Topic #:	A05-080	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W15P7T-06-C-M212	Used in Federal or acquisitions program?	Yes
Achieved a cost saving or cost avoidance?:	No	a. Primary Agency:	Navy
		b. System/Program:	OSD Missile Analysis Program
		c. Phase III Contract #:	N00178-13-P-4228

Additional Investment From

DoD contract/subcontract:	\$4,062,415.00	Phase III Sales To	
Other Federal contract/grants:	\$0.00	Dod or DoD prime contractors:	\$0.00
Angel Investors:	\$0.00	Other Federal Agencies:	\$0.00
Venture Capital:	\$0.00	Private Sector:	\$0.00
Self-Funded:	\$89,249.00	Export Market:	\$0.00
Private Sector:	\$0.00	3rd Party Revenue:	\$0.00
Other Sources:	\$1,345,378.00	Other Customers:	\$0.00

Other Sources Description:
OSD Advanced Testing program

Investment Total:	\$5,497,042.00	Sales Total:	\$0.00
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Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
N00178-10-C-1041		Airborne/Ground-based HFDS for Multiple Users	2010	\$2,964,462.00
N00178-13-P-4228		OSD Missile Analysis Program	2013	\$149,046.00
N68355-12-C-0307		VIPA ISITE	2014	\$160,996.00

Lead Acid Battery Monitoring, Diagnostics, and Prognostics

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2018	Subsidiaries	N/A
Topic #:	A17-023	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W911NF-18-C-0083	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To

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SBIR Company Commercialization Report

DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Non-Lethal Avian Active Denial System Using Directed Energy

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2012	Subsidiaries	N/A
Topic #:	AF093-224	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA9302-12-C-0005	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$1,248,813.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,248,813.00	Sales Total:	\$0.00

Development of a Shipboard Ultrasonic Ballast Water Organism Control

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Agency/Branch:	Department of Commerce	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/1999	Subsidiaries	N/A
Topic #:	N/A	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N/A	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$100,000.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$39,000.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$100,000.00	Sales Total:	\$39,000.00

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SBIR Company Commercialization Report

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Miniature Quickscan Receiver

Agency/Branch:	Department of Defense/Special Operations Command	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2005	Subsidiaries	N/A
Topic #:	SOCOM04-004	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	H92222-05-C-0039	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

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Atmospheric Environmental Metrology for Electro-Optical/Infra-Red (EO/IR) Sensor Flight Test

Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2015	Subsidiaries	N/A
Topic #:	N132-090	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-15-C-0117	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$1,000,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,000,000.00	Sales Total:	\$0.00

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Omni-Directional Cloud Height Indicator

Agency/Branch:	Department of Commerce	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/1998	Subsidiaries	N/A
Topic #:	N/A	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N/A	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00

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SBIR Company Commercialization Report

Other Federal contract/grants:	\$360,390.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$360,390.00	Sales Total:	\$0.00

Physics-Based Models for Transient Behavior of Two Phase Flow Cooling Systems

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2013	Subsidiaries	N/A
Topic #:	AF112-010	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-13-C-2324	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Airborne Network using Spectrum-Efficient Communications Technologies (ANSECT)

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2017	Subsidiaries	N/A
Topic #:	AF161-051	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8750-17-C-0200	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$500,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$500,000.00	Sales Total:	\$0.00

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SBIR Company Commercialization Report

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Shockwave Consolidation of Materials

Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2016	Subsidiaries	N/A
Topic #:	AF141-006	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA9550-16-C-0007	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00

Phase III Sales To

Dod or DoD prime contractors:	\$0.00
Other Federal Agencies:	\$0.00
Private Sector:	\$0.00
Export Market:	\$0.00
3rd Party Revenue:	\$0.00
Other Customers:	\$0.00
Sales Total:	\$0.00

SBIR PHASE I: Utilization of Deep Ocean Water for Water Desalination: The Hurricane Tower

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Agency/Branch:

National Science Foundation

Program/Phase/Year:

SBIR/Phase II/1997

Topic #:

N/A

Contract/Grant #:

9561408

Achieved a cost saving or cost avoidance?:

No

Manufacturing related

No | N/A

Subsidiaries

N/A

Other contributing SBIR/STTR awards

N/A

Used in Federal or acquisitions program?

No

Additional Investment From

DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$150,000.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$150,000.00

Phase III Sales To

Dod or DoD prime contractors:	\$0.00
Other Federal Agencies:	\$0.00
Private Sector:	\$0.00
Export Market:	\$0.00
3rd Party Revenue:	\$0.00
Other Customers:	\$0.00
Sales Total:	\$0.00

Integrated or Fused Multi-spectral Sensor Technologies for Missile Warning Sensors (MWS), Hostile Fire Indication (HFI), and Laser Warning (LW)

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Agency/Branch:

Department of Defense/Air Force

Program/Phase/Year:

SBIR/Phase II/2013

Topic #:

AF112-132

Contract/Grant #:

FA8650-13-C-1500

Achieved a cost saving or cost avoidance?:

No

Manufacturing related

No | N/A

Subsidiaries

N/A

Other contributing SBIR/STTR awards

N/A

Used in Federal or acquisitions program?

No

Additional Investment From

Phase III Sales To

Privileged and confidential and not subject to disclosure pursuant to 15 U.S.C. 638 (k)(4) and 5 U.S.C. 552.



SBIR Company Commercialization Report

DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

FIND (First responder INdoor Determination)

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Agency/Branch:	Department of Homeland Security	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2017	Subsidiaries	N/A
Topic #:	H-SB016.1-004	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	HSHQDC-17-C-00014	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To	
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
Sales Total:	\$0.00

Dive Helmet Noise Quieting

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	STTR/Phase II/2013	Subsidiaries	N/A
Topic #:	N12A-T020	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N00014-13-C-0340	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To	
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
Sales Total:	\$100,000.00

STTR Specific Information

Who initiated the collaboration?:	Research Institution	Number of months taken to negotiate the Allocation of Rights agreement:	2
Who initiated the technology?:	Small Business	Percentage of proceeds going to the small business:	66%

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SBIR Company Commercialization Report

Percentage of proceeds going to the research institution:

33%

Advanced Interceptor Infra-Red Search and Track System (IRSTS) for Missile Defense Applications

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Agency/Branch:	Department of Defense/Missile Defense Agency	Manufacturing related Subsidiaries	No N/A N/A
Program/Phase/Year:	STTR/Phase II/2010	Other contributing SBIR/STTR awards	N/A
Topic #:	MDA08-T002	Used in Federal or acquisitions program?	No
Contract/Grant #:	W9113M-10-c-0032		
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$50,000,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$50,000,000.00	Sales Total:	\$0.00

STTR Specific Information

Who initiated the collaboration?:	Research Institution	Number of months taken to negotiate the Allocation of Rights agreement:	2
Who initiated the technology?:	Small Business	Percentage of proceeds going to the small business:	66%

Percentage of proceeds going to the research institution: 34%

Infrared Search and Threat Identification

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Agency/Branch:	Department of Defense/Navy	Manufacturing related Subsidiaries	No N/A N/A
Program/Phase/Year:	SBIR/Phase II/2017	Other contributing SBIR/STTR awards	N/A
Topic #:	N152-088	Used in Federal or acquisitions program?	No
Contract/Grant #:	N68335-17-C-0118		
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

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SBIR Company Commercialization Report

WISPER (Wireless Intelligent Sensor Platform for Emergency Responders)

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Agency/Branch:	Department of Homeland Security	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2008	Subsidiaries	Ibis Networks WattIQ
Topic #:	H-SB07.2-004	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	D09PC75455 (formerly NBCHC090011)	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$5,000,000.00
Venture Capital:	\$10,000,000.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$10,000,000.00	Sales Total:	\$5,000,000.00

Demonstration and Validation of Brush LHE Alkaline Zn-Ni as a Brush Cadmium (Cd) Alternative

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	Yes Systems Level Manufacturing
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	AF172-002	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8571-19-C-A005	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$130,000.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$130,000.00

Application Level Cybersecurity Threat Detection

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2021	Subsidiaries	N/A
Topic #:	N192-118	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-21-C-0203	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00

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SBIR Company Commercialization Report

Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

AI-Accelerated Biosensor Design

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Agency/Branch:	Department of Defense/Defense Advanced Research Projects Agency	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2021	Subsidiaries	N/A
Topic #:	HR001120S0019-14	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	HR001121C0082	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Ultra Wideband Receiver Phase II

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	STTR/Phase II/2021	Subsidiaries	N/A
Topic #:	AF18C-T003	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8571-21-C-0008	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

STTR Specific Information

Who initiated the collaboration?:	Research Institution	Number of months taken to negotiate the Allocation of Rights agreement:	1
Who initiated the technology?:	Small Business	Percentage of proceeds going to the small business:	70%

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SBIR Company Commercialization Report

Percentage of proceeds going to the research institution:

30%

Mitigation of Ransomware

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	STTR/Phase II/2021	Subsidiaries	N/A
Topic #:	A18B-T010	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W911NF-21-C-0009	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To		
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

STTR Specific Information

Who initiated the collaboration?:	Research Institution	Number of months taken to negotiate the Allocation of Rights agreement:	4
Who initiated the technology?:	Small Business	Percentage of proceeds going to the small business:	70%

Percentage of proceeds going to the research institution: 30%

Dynamic Collaborative Visualization Ecosystem (DynaCoVE)

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	A18-032	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W911QX-20-C-0004	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To		
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Innovative Imagery Processing Architecture

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SBIR Company Commercialization Report

Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2017	Subsidiaries	N/A
Topic #:	N103-205	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-17-C-0701	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$0.00
Private Sector:	\$0.00
Other Sources:	\$0.00
Investment Total:	\$0.00
	Sales Total:
	\$0.00

Novel Approaches for Detection of and Protection from Emerging Viral Pandemics

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Agency/Branch:	Department of Defense/Defense Logistics Agency	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2021	Subsidiaries	Oceanit Foundry LLC
Topic #:	DLA202-D013	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	SP4701-21-C-0019	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$200,000.00
Angel Investors:	\$0.00
Venture Capital:	\$0.00
Self-Funded:	\$150,000.00
Private Sector:	\$50,000.00
Other Sources:	\$0.00
Investment Total:	\$400,000.00
	Sales Total:
	\$1,500,000.00

Abrasive Blasting Nozzle Noise Control

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	Yes Machine Level Manufacturing
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	N172-134	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-19-C-0068	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

	Phase III Sales To
DoD contract/subcontract:	\$0.00
Other Federal contract/grants:	\$0.00
	Other Federal Agencies:
	\$0.00

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SBIR Company Commercialization Report

Angel Investors:	\$0.00	Private Sector:	\$200,000.00
Venture Capital:	\$0.00	Export Market:	\$100,000.00
Self-Funded:	\$150,000.00	3rd Party Revenue:	\$575,000.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$150,000.00	Sales Total:	\$875,000.00

Development of a Clinical Decision Support Tool for Early-Detection of Directed Energy Induced Injury to the Retina

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Agency/Branch:	Department of Defense/Defense Health Agency	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2021	Subsidiaries	N/A
Topic #:	DHA192-001	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W81XWH21C0015	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Novel Separator Materials for Achieving High Energy/Power Density, Safe, Long-Lasting Lithium-ion Batteries for Navy Aircraft Applications.

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	Yes Unit Process Level Manufacturing
Program/Phase/Year:	STTR/Phase II/2018	Subsidiaries	N/A
Topic #:	N16A-T008	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-18-C-0164	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$250,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$250,000.00	Sales Total:	\$0.00

STTR Specific Information

Who initiated the	Research Institution	Number of months taken to negotiate the Allocation of	1

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SBIR Company Commercialization Report

collaboration?:	Rights agreement:
Who initiated the technology?: Small Business	Percentage of proceeds going to the small business: 60%
	Percentage of proceeds going to the research institution: 40%

Passive Acoustic Metamaterial Proppants for Advanced Fracture Diagnostics 52 of 76

Agency/Branch: Department of Energy	Manufacturing related	No N/A
Program/Phase/Year: SBIR/Phase II/2018	Subsidiaries	N/A
Topic #: 17b	Other contributing SBIR/STTR awards	N/A
Contract/Grant #: DE-SC0017738	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?: No		

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$504,000.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$504,000.00	Sales Total:	\$0.00

A Rapid Damage Assessment System Using Machine Vision to Detect Damage to Utility Grid Infrastructure 53 of 76

Agency/Branch: Department of Energy	Manufacturing related	No N/A
Program/Phase/Year: SBIR/Phase II/2018	Subsidiaries	N/A
Topic #: 05b	Other contributing SBIR/STTR awards	N/A
Contract/Grant #: DE-SC0017739	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?: No		

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$528,537.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$528,537.00	Sales Total:	\$0.00

VEIL (Vulnerability-reducing Engineered Infrared-obscurant Load) 54 of 76

Agency/Branch: Department of Defense/Army	Manufacturing related	No N/A
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SBIR Company Commercialization Report

Program/Phase/Year: SBIR/Phase II/2017	Subsidiaries	N/A	
Topic #: A13-044	Other contributing SBIR/STTR awards	N/A	
Contract/Grant #: W911SR-16-C-0065	Used in Federal or acquisitions program?	No	
Achieved a cost saving or cost avoidance?: No			
Additional Investment From			
DoD contract/subcontract:	\$0.00	Phase III Sales To	
Other Federal contract/grants:	\$0.00	Dod or DoD prime contractors:	\$0.00
Angel Investors:	\$0.00	Other Federal Agencies:	\$0.00
Venture Capital:	\$0.00	Private Sector:	\$104,000.00
Self-Funded:	\$0.00	Export Market:	\$0.00
Private Sector:	\$0.00	3rd Party Revenue:	\$0.00
Other Sources:	\$0.00	Other Customers:	\$0.00
Investment Total:	\$0.00	Sales Total:	\$104,000.00

Dive Helmet Communication System		55 of 76	
Agency/Branch: Department of Defense/Navy	Manufacturing related	No N/A	
Program/Phase/Year: SBIR/Phase II/2017	Subsidiaries	N/A	
Topic #: N152-110	Other contributing SBIR/STTR awards	N/A	
Contract/Grant #: N68335-17-C-0526	Used in Federal or acquisitions program?	No	
Achieved a cost saving or cost avoidance?: No			
Additional Investment From			
DoD contract/subcontract:	\$0.00	Phase III Sales To	
Other Federal contract/grants:	\$0.00	Dod or DoD prime contractors:	\$0.00
Angel Investors:	\$0.00	Other Federal Agencies:	\$0.00
Venture Capital:	\$0.00	Private Sector:	\$100,000.00
Self-Funded:	\$0.00	Export Market:	\$0.00
Private Sector:	\$0.00	3rd Party Revenue:	\$0.00
Other Sources:	\$0.00	Other Customers:	\$0.00
Investment Total:	\$0.00	Sales Total:	\$100,000.00

Improved Coupling Factor of Personal Cooling Systems		56 of 76	
Agency/Branch: Department of Defense/Defense Health Agency	Manufacturing related	No N/A	
Program/Phase/Year: SBIR/Phase II/2013	Subsidiaries	N/A	
Topic #: OSD11-H06	Other contributing SBIR/STTR awards	N/A	
Contract/Grant #: FA8650-13-C-6386	Used in Federal or acquisitions program?	No	
Achieved a cost saving or cost avoidance?: No			
Additional Investment From			
DoD contract/subcontract:	\$1,500,000.00	Phase III Sales To	
Other Federal contract/grants:	\$0.00	Dod or DoD prime contractors:	\$0.00
Angel Investors:	\$0.00	Other Federal Agencies:	\$0.00
Venture Capital:	\$0.00	Private Sector:	\$26,439.00
		Export Market:	\$0.00

Privileged and confidential and not subject to disclosure pursuant to 15 U.S.C. 638 (k)(4) and 5 U.S.C. 552.



SBIR Company Commercialization Report

Self-Funded:	\$45,000.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,545,000.00	Sales Total:	\$26,439.00

Multi Product UHF L-band System Extension (MPULSE)

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2017	Subsidiaries	N/A
Topic #:	A16-035	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W56KGU-17-C-0079	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$590,000.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$590,000.00	Sales Total:	\$0.00

Development of Metallic Nanostructures for Infrared Obscurants

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2015	Subsidiaries	N/A
Topic #:	A13-044	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W911SR-15-C-0011	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$100,000.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$100,000.00	Sales Total:	\$0.00

Disruptive Military Navigation Architectures

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2015	Subsidiaries	N/A

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SBIR Company Commercialization Report

Topic #:	AF141-253	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA9453-15-C-0438	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$1,499,985.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,499,985.00	Sales Total:	\$0.00

Government Designated Phase III Contracts

Funding Agreement / Contract #	Agency	Project Title	Year Awarded	Funding Obligated
FA9422-17-C-8002	USAF	LSOP RIF	2017	\$1,499,985.00

Oxygen Mask Development to Improve and Facilitate Mask Discipline

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	N171-007	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-19-C-0010	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Vertical Wind Profile Data Collection Using Laser Technology on Unmanned Delivery Platforms.

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Agency/Branch:	Department of Defense/Special Operations Command	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2006	Subsidiaries	N/A
Topic #:	SOCOM04-007	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	H92222-06-C-0021	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

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SBIR Company Commercialization Report

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Effects of GPS Degraded or Denied Environments on Delivery Vehicles

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2018	Subsidiaries	N/A
Topic #:	AF171-065	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA9453-18-C-0264	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Miniature Oriented Tri-Axial Fluxgate Magnetometer Sensor

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2019	Subsidiaries	N/A
Topic #:	N172-116	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N68335-19-C-0011	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$1,499,998.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$1,499,998.00	Sales Total:	\$0.00

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**High Temporal Bandwidth Optical Wavefront Sensor Technologies**

Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	STTR/Phase II/2002	Subsidiaries	N/A
Topic #:	N/A	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	F49620-02-C-0031	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To			
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$100,000.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$100,000.00	Sales Total:	\$0.00

STTR Specific Information

Who initiated the collaboration?:	Research Institution	Number of months taken to negotiate the Allocation of Rights agreement:	2
Who initiated the technology?:	Small Business	Percentage of proceeds going to the small business:	66%

Directing Monopulse Jamming Toward Antenna of Semiactive or Antiradiation Missile

Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2008	Subsidiaries	N/A
Topic #:	AF071-214	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-08-C-1398	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From

Phase III Sales To			
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Low-Cost Automated Aerosol Lidar for Air Quality Assessment and Prediction

Agency/Branch:	Department of Commerce	Manufacturing related	No N/A
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SBIR Company Commercialization Report

Program/Phase/Year: SBIR/Phase II/2003	Subsidiaries	N/A	
Topic #: 8.1.2	Other contributing SBIR/STTR awards	N/A	
Contract/Grant #: DG133R-03-CN-0065	Used in Federal or acquisitions program?	No	
Achieved a cost saving or cost avoidance?: No			
Additional Investment From			
DoD contract/subcontract:	\$0.00	Phase III Sales To	
Other Federal contract/grants:	\$0.00	Dod or DoD prime contractors:	\$0.00
Angel Investors:	\$0.00	Other Federal Agencies:	\$0.00
Venture Capital:	\$0.00	Private Sector:	\$0.00
Self-Funded:	\$0.00	Export Market:	\$0.00
Private Sector:	\$0.00	3rd Party Revenue:	\$0.00
Other Sources:	\$12,500.00	Other Customers:	\$0.00
Other Sources Description: Hawaii Technology Development Corporation, State entity			
Investment Total:	\$12,500.00	Sales Total:	\$0.00

Next-Generation Ear Seals for Circumaural Headsets and Hearing Protectors

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Agency/Branch: Department of Defense/Defense Health Agency	Manufacturing related	No N/A	
Program/Phase/Year: SBIR/Phase II/2019	Subsidiaries	N/A	
Topic #: DHA172-007	Other contributing SBIR/STTR awards	N/A	
Contract/Grant #: W81XWH19C0060	Used in Federal or acquisitions program?	No	
Achieved a cost saving or cost avoidance?: No			
Additional Investment From			
DoD contract/subcontract:	\$0.00	Phase III Sales To	
Other Federal contract/grants:	\$0.00	Dod or DoD prime contractors:	\$0.00
Angel Investors:	\$0.00	Other Federal Agencies:	\$0.00
Venture Capital:	\$0.00	Private Sector:	\$0.00
Self-Funded:	\$0.00	Export Market:	\$0.00
Private Sector:	\$0.00	3rd Party Revenue:	\$0.00
Other Sources:	\$0.00	Other Customers:	\$0.00
Investment Total:	\$0.00	Sales Total:	\$0.00

Remote Sensor Data Protection and Anti-Spoofing

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Agency/Branch: Department of Homeland Security	Manufacturing related	No N/A
Program/Phase/Year: SBIR/Phase II/2021	Subsidiaries	N/A
Topic #: DHS201-002	Other contributing SBIR/STTR awards	N/A
Contract/Grant #: 70RSAT21C00000017	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?: No		
Additional Investment From		
DoD contract/subcontract:	\$0.00	Phase III Sales To
Dod or DoD prime contractors:		\$0.00

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SBIR Company Commercialization Report

Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Mobile Sensor Systems for Intelligence Collection Using Doppler Shifting of Existing Communication Technology

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2005	Subsidiaries	N/A
Topic #:	A04-115	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W15P7T-06-C-B602	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Flexible Broad-band Optical Device

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	STTR/Phase II/2019	Subsidiaries	N/A
Topic #:	AF17A-T010	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-19-C-6988	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

STTR Specific Information

Who initiated the collaboration?:	Small Business Concern	Number of months taken to negotiate the Allocation of Rights agreement:	1
Who initiated the technology?:	Small Business	Percentage of proceeds going to the small business:	60%

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SBIR Company Commercialization Report

Percentage of proceeds going to the research institution:

40%

Noncoherent Dual Platform Advanced Monopulse Countermeasures (AMCs) Standoff Jammer

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Agency/Branch:	Department of Defense/Air Force	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2008	Subsidiaries	N/A
Topic #:	AF071-220	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	FA8650-08-C-1403	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Submarine Radar Vulnerability Reduction

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Agency/Branch:	Department of Defense/Navy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2015	Subsidiaries	N/A
Topic #:	N131-033	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	N00024-15-C-4006	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		
Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

MEMS Technology for Sense Through the Wall Applications

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Agency/Branch:	Department of Defense/Army	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2006	Subsidiaries	N/A
Topic #:	A05-079	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	W15P7T-06-C-W207	Used in Federal or acquisitions program?	No

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SBIR Company Commercialization Report

Achieved a cost saving or cost avoidance?:	No
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Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Software Supply Chain Identification for Compiled Binary Executables

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Agency/Branch:	Department of Homeland Security
Program/Phase/Year:	SBIR/Phase II/2022
Topic #:	DHS211-007
Contract/Grant #:	70RSAT22C00000018
Achieved a cost saving or cost avoidance?:	No

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

Multi-Octave, High Power Efficiency Active Electronically Scanned Array (AESA)

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Agency/Branch:	Department of Defense/Navy
Program/Phase/Year:	SBIR/Phase II/2022
Topic #:	N201-012
Contract/Grant #:	N68936-22-C-0005
Achieved a cost saving or cost avoidance?:	No

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00

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SBIR Company Commercialization Report

Other Sources:	\$0.00
Investment Total:	\$0.00 Sales Total: \$0.00

NANOCOMPOSITE ADVANCED SURFACE PROTECTION FOR SAFE AND EFFICIENT HYDROGEN TRANSPORT IN EXISTING STEEL PIPELINES

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Agency/Branch:	Department of Energy	Manufacturing related	No N/A
Program/Phase/Year:	SBIR/Phase II/2022	Subsidiaries	N/A
Topic #:	C52-27a	Other contributing SBIR/STTR awards	N/A
Contract/Grant #:	DE-SC0021946	Used in Federal or acquisitions program?	No
Achieved a cost saving or cost avoidance?:	No		

Additional Investment From		Phase III Sales To	
DoD contract/subcontract:	\$0.00	Dod or DoD prime contractors:	\$0.00
Other Federal contract/grants:	\$0.00	Other Federal Agencies:	\$0.00
Angel Investors:	\$0.00	Private Sector:	\$0.00
Venture Capital:	\$0.00	Export Market:	\$0.00
Self-Funded:	\$0.00	3rd Party Revenue:	\$0.00
Private Sector:	\$0.00	Other Customers:	\$0.00
Other Sources:	\$0.00		
Investment Total:	\$0.00	Sales Total:	\$0.00

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CERTIFICATE OF COMPLETION

THIS CERTIFICATE IS PRESENTED TO

James Andrews, Oceanit Laboratories, Inc.

FOR SUCCESSFULLY COMPLETING FRAUD, WASTE AND
ABUSE TRAINING AND MEETING ALL REQUIREMENTS SET
FORTH BY THE OFFICE OF SMALL BUSINESS PROGRAMS



Nov 05, 2024

COMPLETION DATE

Nov 05, 2025

EXPIRATION DATE