Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy											Date: February 2018	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603713N *I Ocean Engineering Tech Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	60.660	4.639	8.212	5.915	-	5.915	5.619	5.731	5.845	5.965	Continuing	Continuing
0099: *Deep Submergence Bio Med Dev*	32.350	3.555	4.691	4.487	-	4.487	4.360	4.444	4.534	4.627	Continuing	Continuing
0394: *Shallow Depth Diving EQ*	28.310	1.084	3.521	1.428	-	1.428	1.259	1.287	1.311	1.338	Continuing	Continuing

A. Mission Description and Budget Item Justification

Developments in this program will enable the U.S. Navy to overcome deficiencies that constrain manned diving operations in several critical areas such as submarine rescue, recovery, salvage, underwater ship husbandry, underwater construction and naval special operations. This program develops biomedical technology, diver life support equipment, and the systems, tools, and procedures to permit manned underwater operations and enhance diver performance and safety.

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	4.556	8.212	6.021	-	6.021
Current President's Budget	4.639	8.212	5.915	-	5.915
Total Adjustments	0.083	0.000	-0.106	-	-0.106
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.151	0.000			
• SBIR/STTR Transfer	-0.068	0.000			
• Rate/Misc Adjustments	0.000	0.000	-0.106	-	-0.106

Change Summary Explanation

Decrease from FY18 to FY19 is in accordance with planned program profile and is not due to a negative action against this effort.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0099 / *Deep Submergence Bio Med Dev*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0099: *Deep Submergence Bio Med Dev*	32.350	3.555	4.691	4.487	-	4.487	4.360	4.444	4.534	4.627	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project:
1) Develops advanced biomedical and bioengineering technology for medical and life support enhancement to decrease submariner deaths and permanent injury in a disabled submarine (DISSUB) and during submarine escape and rescue;
2) Conducts research for diver health, safety, and effectiveness:
- to increase understanding of human performance and enhanced diver stress management and survivability in high stress environments such as in cold/warm water and at altitude; and - to validate and improve the accuracy of assumptions associated with equipment testing and certification, diving procedures, and diver biomedical physiology.

Deliverables for DISSUB include: medical guidance/procedures increasing submariner survivability for submarine escape and rescue (including new Submarine Rescue Diving and Recompression System (SRDRS)), life support parameters, medical procedures for life support; exposure and mitigation guidance for atmospheric contaminants, high levels of oxygen and/or carbon dioxide; prevention and treatment of decompression sickness and pulmonary oxygen toxicity; and senior survivor expert decision system.

Deliverables for diver health and safety include: decompression guidance in extreme environment diving with various breathing mixtures, temperatures, durations, and altitudes; exposure guidance for oxygen breathing; diver performance guidance based on physiological effects of diving; enhanced underwater swimming efficiency; enhanced diver thermal protection; collection of operational diving depth/time profiles to predict decompression risk, and exposure and mitigation guidance for divers experiencing underwater continuous noise, impulse noise, or underwater blast.

Requirements:
OPNAVINST 3150.27C, Navy Diving Policy and Joint Military Diving Technology and Training Program, 24 Jun 2016
Navy Salvage and Navy Diving Capabilities-Based Assessment (CBA) Report, 19 Dec 2013
NAPDD #587-873, Deep Submergence Biomedical Development, 23 Nov 1999
NAVSEA Instruction 3900.10, Management of the Deep Submergence Biomedical Research and Development Program, 4 Feb 2003

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Deep Submergence Bio Med Dev - Diver Health and Safety	2.029	2.396	2.244	0.000	2.244
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Description: Diver Health and Safety Research: Novel methods for decompression safety and treatment of decompression sickness/arterial gas embolism. Advanced decompression models for extreme environments, including thermally challenging, long duration, multi-gas, and/or diving at altitude. Diving physiology advances in exercise, thermal exposure, oxygen/carbon dioxide alterations, other gas mixture alterations, hydration, and sustained operations. Develop pulmonary oxygen toxicity exposure limits. Provide pulmonary and oxygen toxicity mitigation strategies. Develop an advanced diver thermal model. Develop advanced insulation garments for diver thermal protection. Develop guidance for optimizing thermal control during decompression. Develop guidelines for conduct of diving operations at altitude. Develop guidance for infra- and ultra-sound diver exposure. Continue collection of operational and research dive data for inclusion in advanced probabilistic decompression models. Investigate diver in-water maladies. Develop/improve real-time decompression guidance and dive planning. Research procedures for assessing and mitigating risk for diving in contaminated water. ***FY 2018 Plans:*** Perform numerous mixed-gas, manned diving experiments to update surface-supplied helium-oxygen deep diving decompression tables which put divers at high risk for decompression sickness and felt to be too unsafe to use. Develop decompression guidance/procedures for diving at altitude using special diving apparatus. These manned diving experiments, required to evaluate decompression protocols, are labor intensive, requiring long days to provide adequate time for test subjects to decompress under constant supervision of diving watch-standers, investigators, medical personnel and other support staff and consequently more expensive than smaller scale and unmanned studies. The studies also require significant amounts of helium to produce the various helium-oxygen gas mixtures needed for divers breathing gas and the cost of helium continues to rise at double-digit annual rates. Continue development of vital decompression, thermal, physiological, breathing resistance and oxygen tolerance/toxicity recommendations including contributions by reengaged university partners. Reengaging these university partners in FY-18 is essential to sustaining the very small research base needed to support Navy diver occupational health and safety. The university and Navy laboratories (Navy Experimental Diving Unit, Panama City, FL; Naval Submarine Medical Research Laboratory, Groton, CT; Naval Medical Research Center, Bethesda, MD) will continue underwater physiological investigation to mitigate the risks of diving in the expanding Fleet mission areas of salvage, underwater ship husbandry, explosive ordnance disposal, underwater construction and special warfare. Future efforts will depend in part on the outcomes of studies currently in progress.					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Additional work planned for FY18 resulting from the recent Technical Advisory Board proposal review process includes: A software planning tool will be created to provide exposure guidance for divers who may be exposed to continuous, intermittent, or impulse noise while underwater. Decompression during diving at altitude will be man-tested to update current guidance. An updated decompression algorithm will be designed for the Navy Dive Computer for Helium-Oxygen diving with a rebreather. A ketogenic diet will be evaluated for its ability to reduce central nervous system oxygen toxicity (e.g., seizures) in working divers. An underwater pulse oximeter will be designed and tested for its ability to provide timely warning to a diver of impending hypoxia. Investigations into basic physiology for repeated, long hyperoxic dives while exercising will also take place. ***FY 2019 Base Plans:*** FY19 Base plans involve continued support for development of probabilistic models of Central Nervous System and Pulmonary Oxygen Toxicity in our ongoing efforts to expand the range of safe diving depths for divers using rebreathers. This work will also have relevance for disabled submarine response planning. Optimizing performance of dive teams operating at high altitude will continue to be an area of focus. Work will continue investigating the effects of hyperoxia during repeated, exertional, long-duration dives, with the objective of providing guidance to operational divers on mitigating the performance-impairing effects of whole body oxygen toxicity. Development of a software planning tool for divers at risk of exposure to underwater noise hazards will proceed as will work developing expanded altitude decompression tables. Investigation into the utility of a water-proofed pulse oximeter to reduce the risk of hypoxia for rebreather divers will be ongoing and efforts to determine whether a ketogenic diet can reduce the risk of seizures in divers breathing high partial pressures of oxygen will continue. We will also be soliciting research proposals to advance the work described in this section and continue underwater physiological investigation to mitigate the risks of diving in the expanding Fleet mission areas of salvage, underwater ship husbandry, explosive ordnance disposal, underwater construction and special warfare. Future efforts will depend in part on the outcomes of studies currently in progress. Continuing our partnership with Navy and University laboratories will be critical to our success as will cultivating new relationships with industry and academia. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Decrease from FY18 to FY19 is due to process improvements and inflationary changes requiring a decrease of $152 thousand resulting in the funding of one additional research project.					
Title: Deep Submergence Bio Med Dev - Submarine Rescue	1.526	2.295	2.243	0.000	2.243
Articles:	-	-	-	-	-
Description: Submarine Rescue/Escape Research: Provide decompression procedures for pressurized SRDRS operators. Investigate adjunctive therapies for treating DISSUB survivors. Provide updated guidance for food, water, clothing, medical supplies to enhance survival of submarine crews awaiting rescue. Develop/provide flexible computer-generated decompression schedules for wide range of conditions in a DISSUB. Develop DISSUB medical triage procedures and support DISSUB survival trials. Develop mitigation strategies to reduce hyperoxic exposures in closed vehicles/compartments. Develop treatment guidance for decompression sickness and arterial gas embolism in submarine escape and rescue. Investigate the use of novel pharmacologic agents to reduce decompression risk and/or oxygen toxicity in submarine rescuees. Develop/deploy toxic gas analyzer for use in pressurized DISSUB rescue. Investigate interventions for toxicological problems in DISSUB survivors. Develop strategies to minimize decompression sickness and arterial gas embolism with Submarine Escape and Immersion Suit (SEIS) training.					
FY 2018 Plans: Work will continue on development of mitigation strategies for pulmonary oxygen toxicity for rescued submariners, finalizing design of toxic gas analyzers for URC, determining whether an anti-inflammatory medication (Doxycycline) can mitigate the risk of DCS for decompressing submarine rescuees, and sheep studies involving shallow saturation scenarios evaluating oxygen prebreathing to increase surface interval times before onset of DCS. Multiple experimental manned air saturation dives will be performed to develop protocols that can be used to decrease submariner deaths during submarine escape and rescue from a pressurized disabled submarine too shallow for safe attachment of the Navy's submarine rescue vehicle. These saturation diving experiments, required to evaluate decompression protocols, are labor intensive, requiring 24/7 support and consequently more expensive than smaller scale studies. Current submarine rescue deep decompression schedules are theoretical due to ethical concerns about safe manned testing. These schedules will be tested with swine to determine the morbidity/mortality and provide recommendations as to whether the schedules require change. Stressors in a DISSUB will be studied to determine the effect on Senior Survivor cognition and decision making at critical times. Additionally, the disabled submarine and disabled rescue vehicle may result in hyperthermia and dehydration for survivors. Dehydration can worsen hyperthermia. The combination					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
of hyperthermia and dehydration will be tested to determine if current human thermoregulation models are adequate and/or accurate. ***FY 2019 Base Plans:*** FY19 Base plans involve continued support for studies to develop decompression protocols with or without oxygen pre-breathing for use with the Submarine Decompression System (SDS) as well as development of oxygen toxicity probabilistic models (CNS initially, then Pulmonary). Animal work will continue using sheep to develop protocols that will reduce the risk of DCS for submariners rescued without the availability of Transfer Under Pressure capability. Analysis of the impact DISSUB stressors have on submariner cognition and decision-making will continue, leading to recommendations for changes to the Guard Book depending on the results. Finally, investigation of the relationship between hyperthermia and dehydration will proceed, seeking to improve our thermal stress models to allow predictions of environmental conditions and recommendations regarding mitigations. We will also be soliciting research proposals to advance the work described in this section and continue to pursue answers to questions related to the unique physiological stressors associated with the DISSUB environment. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease from FY18 to FY19 is in accordance with planned program profile and is not due to a negative action against this effort.					
Accomplishments/Planned Programs Subtotals	3.555	4.691	4.487	0.000	4.487

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/0955: *Deep Subm Sys Proj (DSSP) Equip*	0.806	4.178	3.629	-	3.629	2.909	2.971	3.029	3.091	Continuing	Continuing

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

D. Acquisition Strategy

Integrated thrust area teams (e.g., decompression research) are established with university, commercial, and in-house Navy labs to jointly execute biomedical R&D. Peer review of research proposals accomplished by independent Technical Advisory Board. Annual review of progress by Executive Review Board (CNO/NAVSEA/ ONR/BUMED). Program management by 0-6 Undersea Medical Officer. Contracting by competitive process using BAA and leveraging ONR capabilities.

E. Performance Metrics

Quarterly Program Reviews of researcher progress measured against research proposal goals and timelines.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Diving Equipment Product Development	C/CPAF	Phoenix International : Largo, MD	0.738	0.133	Aug 2017	0.000		0.000		-		0.000	0.000	0.871	-
		Subtotal	0.738	0.133		0.000		0.000		-		0.000	0.000	0.871	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NEDU : Panama City, FL	21.248	1.745	Nov 2016	1.270	Nov 2017	0.671	Nov 2018	-		0.671	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NMRC : Silver Spring, MD	8.061	0.349	Nov 2016	1.069	Nov 2017	0.484	Nov 2018	-		0.484	Continuing	Continuing	Continuing
Development Test & Evaluation	Various	DUKE UNIV : Durham, NC	0.940	0.181	Jul 2017	1.115	Jul 2018	1.060	Jul 2019	-		1.060	Continuing	Continuing	Continuing
Development Test & Evaluation	C/CPFF	ROH : Arlington, VA	0.077	0.205	May 2017	0.030	May 2018	0.030	May 2019	-		0.030	Continuing	Continuing	Continuing
Development Test & Evaluation	Various	Various : Various	0.000	0.000		0.236	Mar 2018	1.261	Mar 2019	-		1.261	Continuing	Continuing	Continuing
Development Test & Evaluation	C/FFP	WISCONSIN : Madison, WI	0.523	0.464	Feb 2017	0.349	Feb 2018	0.335	Feb 2019	-		0.335	Continuing	Continuing	Continuing
Development Test & Evaluation	C/FFP	SUNY : Buffalo, NY	0.272	0.414	Apr 2017	0.592	Apr 2018	0.614	Apr 2019	-		0.614	Continuing	Continuing	Continuing
Development Test & Evaluation	WR	NSWC : Panama City, FL	0.000	0.039	Jun 2017	0.000		0.000		-		0.000	0.000	0.039	-
		Subtotal	31.121	3.397		4.661		4.455		-		4.455	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Various	Various : Various	0.491	0.025	Oct 2016	0.030	Oct 2017	0.032	Oct 2018	-		0.032	Continuing	Continuing	Continuing
		Subtotal	0.491	0.025		0.030		0.032		-		0.032	Continuing	Continuing	N/A

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	32.350	3.555		4.691		4.487		-		4.487	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

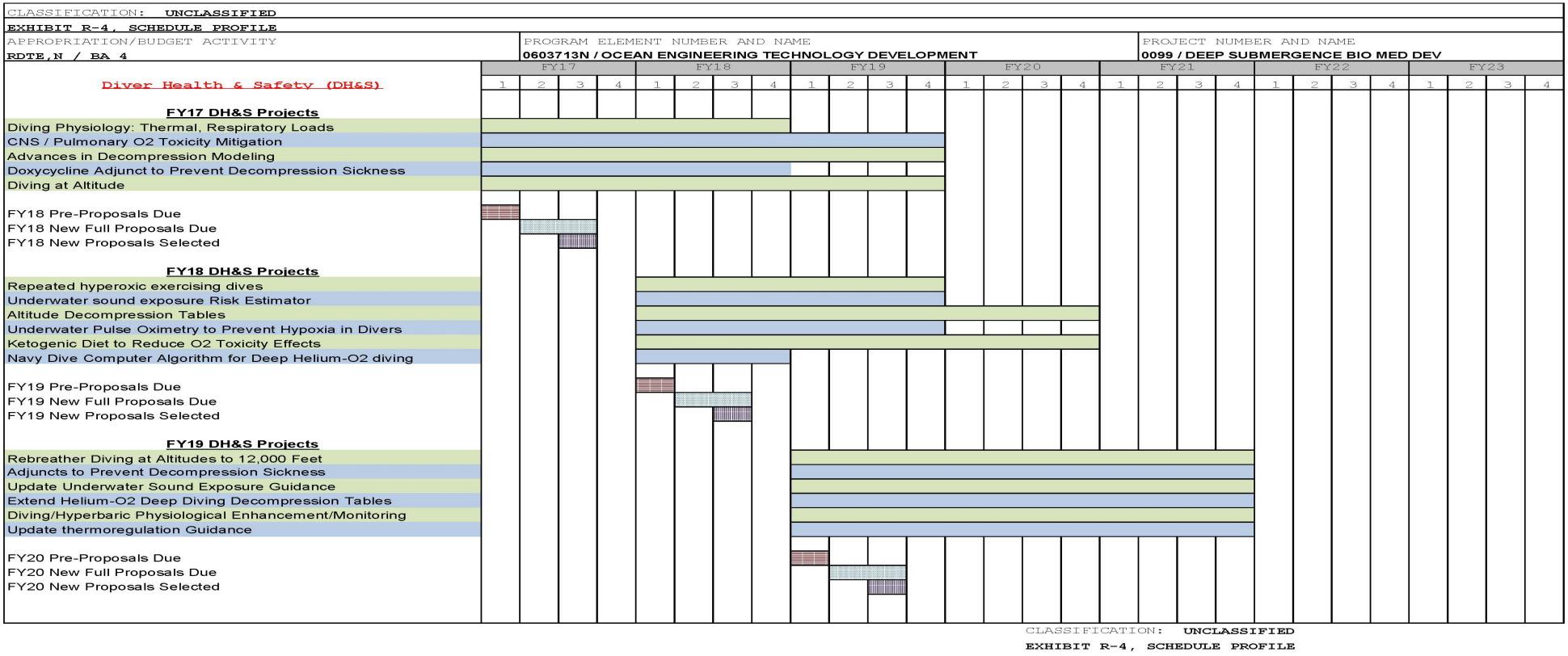

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

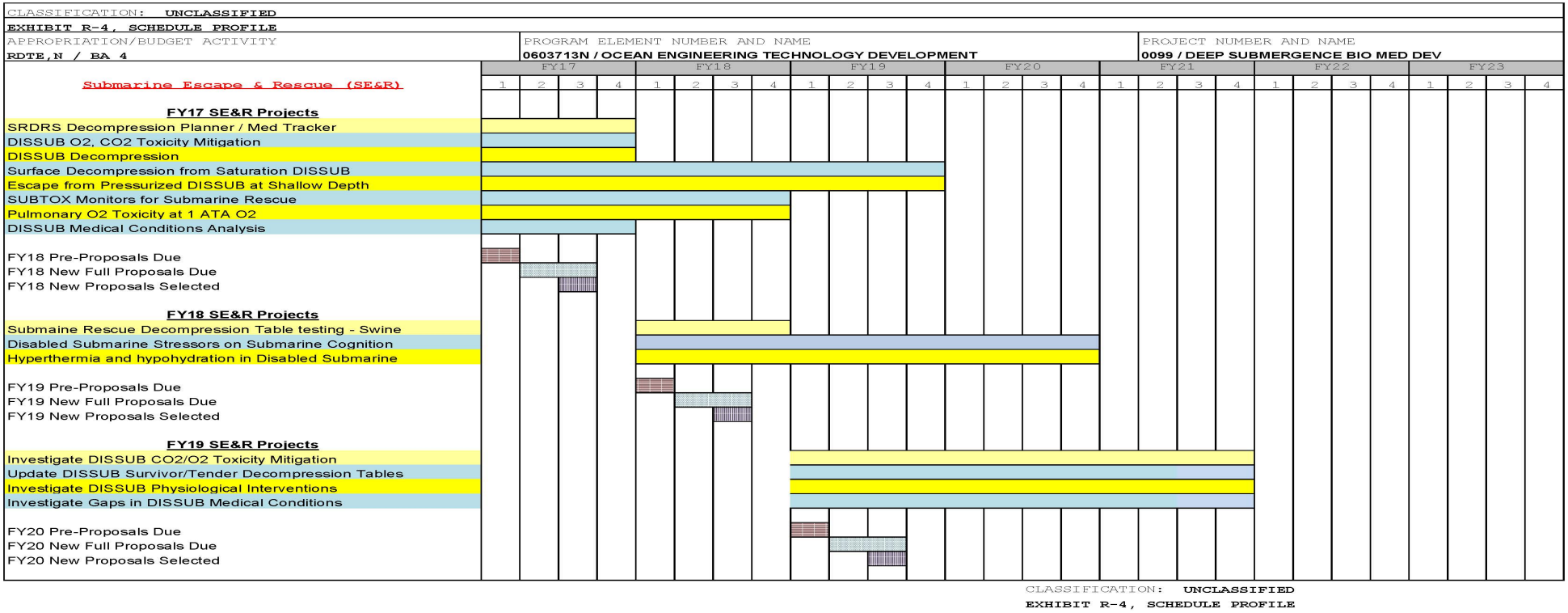

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0099				
Diver Health & Safety (DH&S): FY17 DH&S Projects: Diving Physiology: Thermal, Respiratory Loads	1	2017	4	2018
Diver Health & Safety (DH&S): FY17 DH&S Projects: CNS / Pulmonary O2 Toxicity Mitigration	1	2017	4	2019
Diver Health & Safety (DH&S): FY17 DH&S Projects: Advances in Decompression Modeling	1	2017	4	2019
Diver Health & Safety (DH&S): FY17 DH&S Projects: Doxycycline Adjunct to Prevent Decompression Sickness	1	2017	4	2018
Diver Health & Safety (DH&S): FY17 DH&S Projects: Diving at Altitude	1	2017	4	2019
Diver Health & Safety (DH&S): FY18 Pre-Proposals Due	1	2017	1	2017
Diver Health & Safety (DH&S): FY18 New Full Proposals Due	2	2017	3	2017
Diver Health & Safety (DH&S): FY18 New Proposals Selected	3	2017	3	2017
Diver Health & Safety (DH&S): FY18 DH&S Projects: Repeated hyperoxic exercising dives	1	2018	4	2019
Diver Health & Safety (DH&S): FY18 DH&S Projects: Underwater sound exposure Risk Estimator	1	2018	4	2019
Diver Health & Safety (DH&S): FY18 DH&S Projects: Altitude Decompression Tables	1	2018	4	2020
Diver Health & Safety (DH&S): FY18 DH&S Projects: Underwater Pulse Oximetry to Prevent Hypoxia in Divers	1	2018	4	2019
Diver Health & Safety (DH&S): FY18 DH&S Projects: Ketogenic Diet to Reduce O2 Toxicity Effects	1	2018	4	2020
Diver Health & Safety (DH&S): FY18 DH&S Projects: Navy Dive Computer Algorithm for Deep Helium-O2 diving	1	2018	4	2018

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Diver Health & Safety (DH&S): FY19 Pre-Proposals Due	1	2018	1	2018
Diver Health & Safety (DH&S): FY19 New Full Proposals Due	2	2018	3	2018
Diver Health & Safety (DH&S): FY19 New Proposals Selected	3	2018	3	2018
Diver Health & Safety (DH&S): FY19 DH&S Projects: Rebreather Diving at Altitudes to 12,000 Feet	1	2019	4	2021
Diver Health & Safety (DH&S): FY19 DH&S Projects: Adjuncts to Prevent Decompression Sickness	1	2019	4	2021
Diver Health & Safety (DH&S): FY19 DH&S Projects: Update Underwater Sound Exposure Guidance	1	2019	4	2021
Diver Health & Safety (DH&S): FY19 DH&S Projects: Extend Helium-O2 Deep Diving Decompression Tables	1	2019	4	2021
Diver Health & Safety (DH&S): FY19 DH&S Projects: Diving/Hyperbaric Physiological Enhancement/Monitoring	1	2019	4	2021
Diver Health & Safety (DH&S): FY19 DH&S Projects: Update thermoregulation Guidance	1	2019	4	2021
Diver Health & Safety (DH&S): FY20 Pre-Proposals Due	1	2019	1	2019
Diver Health & Safety (DH&S): FY20 New Full Proposals Due	2	2019	3	2019
Diver Health & Safety (DH&S): FY20 New Proposals Selected	3	2019	3	2019
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: SRDRS Decompression Planner / Med Tracker	1	2017	4	2017
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: DISSUB O2, CO2 Toxicity Mitigation	1	2017	4	2017
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: DISSUB Decompression	1	2017	4	2017
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: Surface Decompression from Saturation DISSUB	1	2017	4	2019
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: Escape from Pressurized DISSUB at Shallow Depth	1	2017	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: SUBTOX Monitors for Submarine Rescue	1	2017	4	2018
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: Pulmonary O2 Toxicity at 1 ATA O2	1	2017	4	2018
Submarine Escape & Rescue (SE&R): FY17 SE&R Projects: DISSUB Medical Conditions Analysis	1	2017	4	2017
Submarine Escape & Rescue (SE&R): FY18 Pre-Proposals Due	1	2017	1	2017
Submarine Escape & Rescue (SE&R): FY18 New Full Proposals Due	2	2017	3	2017
Submarine Escape & Rescue (SE&R): FY18 New Proposals Selected	3	2017	3	2017
Submarine Escape & Rescue (SE&R): FY18 SE&R Projects: Submarine Rescue Decompression Table testing - Swine	1	2018	4	2018
Submarine Escape & Rescue (SE&R): FY18 SE&R Projects: Disabled Submarine Stressors on Submarine Cognition	1	2018	4	2020
Submarine Escape & Rescue (SE&R): FY18 SE&R Projects: Hyperthermia and hypohydration in Disabled Submarine	1	2018	4	2020
Submarine Escape & Rescue (SE&R): FY19 Pre-Proposals Due	1	2018	1	2018
Submarine Escape & Rescue (SE&R): FY19 New Full Proposals Due	2	2018	3	2018
Submarine Escape & Rescue (SE&R): FY19 New Proposals Selected	3	2018	3	2018
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Investigate DISSUB CO2/O2 Toxicity Mitigation	1	2019	4	2021
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Update DISSUB Survivor/Tender Decompression Tables	1	2019	4	2021
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Investigate DISSUB Physiological Interventions	1	2019	4	2021
Submarine Escape & Rescue (SE&R): 'FY19 SE&R Projects: Investigate Gaps in DISSUB Medical Conditions	1	2019	4	2021
Submarine Escape & Rescue (SE&R): FY20 Pre-Proposals Due	1	2019	1	2019
Submarine Escape & Rescue (SE&R): FY20 New Full Proposals Due	2	2019	3	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Submarine Escape & Rescue (SE&R): FY20 New Proposals Selected	3	2019	3	2019

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0394 / *Shallow Depth Diving EQ*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
0394: *Shallow Depth Diving EQ*	28.310	1.084	3.521	1.428	-	1.428	1.259	1.287	1.311	1.338	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops systems to support submarine escape and rescue missions, and conventional diver operations. Diver operations include ship husbandry, salvage/ recovery, and submarine rescue operations to support national, as well as Navy, needs around the world. Modern certifiable diving systems that ensure diver safety and allow maximum work efficiency will replace currently antiquated systems. R&D will be performed in the areas of diver efficiency, visual enhancement, contaminated water diving, diver thermal protection, and recompression chamber technology.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: Shallow Depth Diving EQ - Diving	0.933	1.747	1.379	0.000	1.379
Articles:	-	-	-	-	-
Description: Continued research on contaminated water diving and research on diver thermal protection, C02 monitors and diver sound protection.					
FY 2018 Plans: Work will be completed on the HUD portion of the Divers Augmented Visual Display (DAVD) and manned testing of the new equipment will be conducted. This will complete one of three parts of this system. Continue work on a 3D sonar and diver tracking system that is intended to integrate with the DAVD system. This will create a virtual model of the underwater environment that will be linked to real-time location of the diver thus allowing extensive visual range and target location even in no-visability waters. A flexible, double lock recompression chamber system contract (3-year) will be initiated that will provide a lightweight and small volume alternative to the existing Transportable Recompression Chamber System (TRCS). Testing will begin on a new SCUBA regulator to replace our inventory of older regulators that were designed in the 1960s.					
FY 2019 Base Plans: Begin work on a high resolution, high frequency, short range visualization system (HI RES SONAR) that will integrate with the Divers Augmented Visual Display (DAVD) system. This will allow accurate, real time visualization for use when conducting underwater search, salvage, ship husbandry, or construction in low visibility water. Testing on the modernized SCUBA regulator will be completed for all COTS versions selected for testing. Work will continue on the design and testing of a flexible double lock recompression chamber.					
FY 2019 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease of $0.368 million is accounted for by a reduced 2nd year cost for the PCCI FLEX Chamber project and a reduction in the number and cost of DAVD projects in FY19.					
Title: Shallow Depth Diving EQ - Submarine Rescue	0.151	1.774	0.049	0.000	0.049
Articles:	-	-	-	-	-
Description: Submarine rescue decompression system permits decompression of submarine crew rescued from a pressurized, disabled submarine of pressures up to 6 atmospheres (ATA). ***FY 2018 Plans:*** Will complete manned testing, sea trials, certification and IOC for SRDRS TUP. ***FY 2019 Base Plans:*** Engineering analysis of pressurized rescue skirt. ***FY 2019 OCO Plans:*** N/A ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease of $1.725M from FY18 to FY19 is due to scheduled certification and delivery of the Transfer Under Pressure (TUP) capability to the Navy during FY18. Decrease from FY18 to FY19 is in accordance with planned program profile and is not due to a negative action against this effort.					
Accomplishments/Planned Programs Subtotals	1.084	3.521	1.428	0.000	1.428

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• OPN/0955: *Deep Subm Sys Proj (DSSP) Equip*	0.806	4.178	3.629	-	3.629	2.909	2.971	3.029	3.091	Continuing	Continuing
• OPN/1130: *Diving and Salvage Equipment*	8.176	10.619	10.706	-	10.706	11.940	10.814	10.881	11.078	0.000	121.031

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2019 Navy		Date: February 2018
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D. Acquisition Strategy

Diving Program acquisitions are executed and managed by SEA00C. Acquisitions are made for both COTS and developmental items as required to ensure adequate operational availability and safety of the diver. R&D projects are selected in March for a November award using a Broad Area Announcement.
Submarine Rescue Systems - prime integration contract is in place and final efforts in pursuit of certification are underway.

E. Performance Metrics

Diving - Semi-annual program review with NEDU.
Diving - Annual program review for each R&D project.
Diving & Submarine Rescue - Quarterly execution assessments.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy		Date: February 2018
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering - Design, Integration (PMS-391 TUP)	C/CPAF	Oceaneering : Hanover, MD	24.258	0.151	Oct 2017	1.774	Oct 2017	0.049	Jan 2019	-		0.049	0.000	26.232	-
Diving Equipment Product Development (00C)	Various	Various : Various	2.622	0.000		0.000		0.337	Oct 2018	-		0.337	Continuing	Continuing	Continuing
Diving Equipment Product Development (00C)	C/CPFF	PCCI : Alexandria, VA	0.329	0.000		0.887	Mar 2018	0.680	Jan 2019	-		0.680	0.000	1.896	-
Diving Equipment Product Development (00C)	C/CPFF	Penn state UARC : Not Specified	0.000	0.400	Jan 2017	0.200	Jan 2018	0.000		-		0.000	Continuing	Continuing	Continuing
Diving Equipment Product Development (00C)	WR	NSWC-PC : Panama City, FL	0.453	0.130	Mar 2017	0.464	Nov 2017	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	27.662	0.681		3.325		1.066		-		1.066	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test and Evaluation (00C)	WR	NEDU : Panama City, FL	0.048	0.403	Nov 2016	0.075	Mar 2018	0.250	Jan 2019	-		0.250	0.000	0.776	-
		Subtotal	0.048	0.403		0.075		0.250		-		0.250	0.000	0.776	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel (00C)	Various	NAVSEA : Washington, DC	0.140	0.000		0.020	Oct 2017	0.022	Oct 2018	-		0.022	Continuing	Continuing	Continuing
SBIR Assessment	Various	Various : Various	0.443	0.000		0.074	Oct 2017	0.062	Oct 2018	-		0.062	0.000	0.579	-
Program Management Support (00C)	C/CPFF	Unknown : Not Specified	0.017	0.000		0.027	Mar 2018	0.028	Mar 2019	-		0.028	Continuing	Continuing	Continuing
		Subtotal	0.600	0.000		0.121		0.112		-		0.112	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Navy			Date: February 2018
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603713N / *Ocean Engineering Tech Dev*	Project (Number/Name) 0394 / *Shallow Depth Diving EQ*	

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	28.310	1.084		3.521		1.428		-		1.428	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

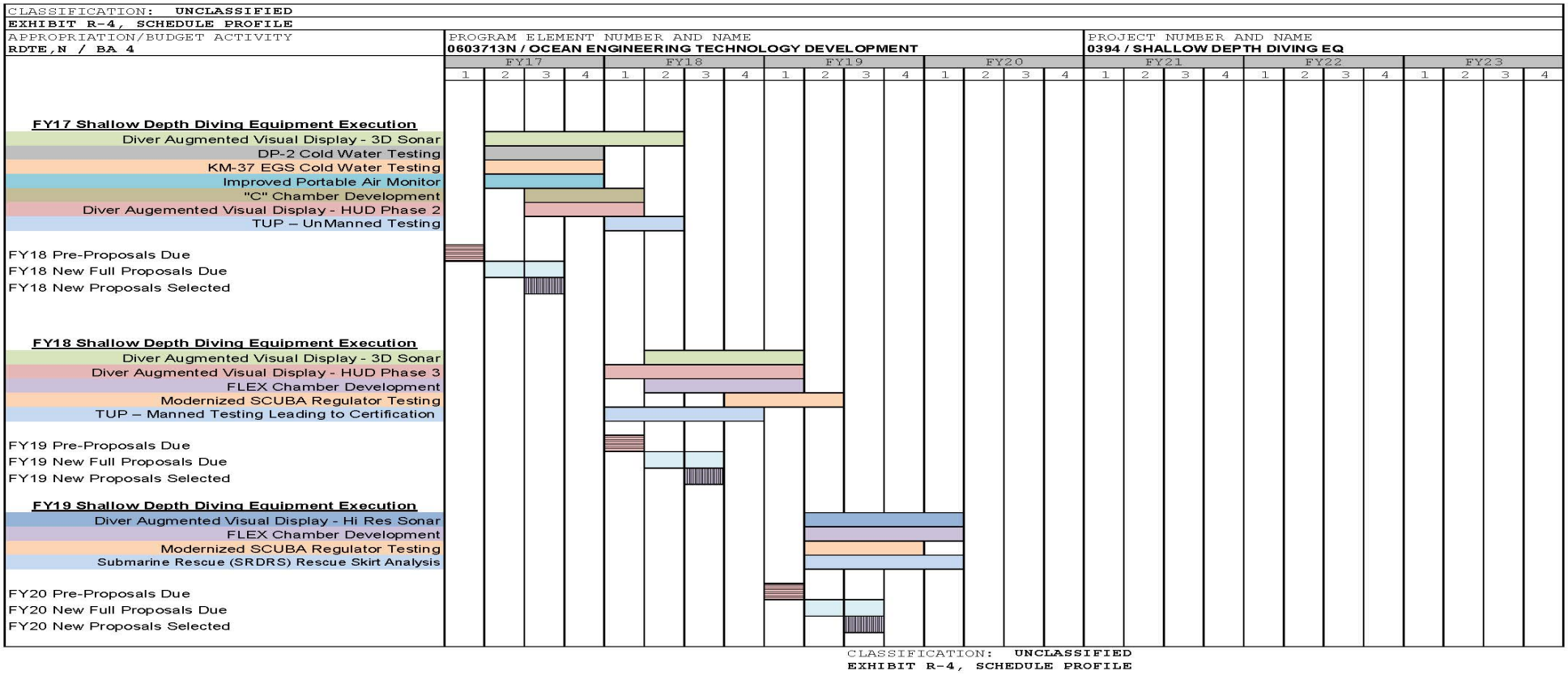

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0394				
FY17 Diving Equipment Execution: Diver Augmented Visual Display - 3D Sonar	2	2017	2	2018
FY17 Diving Equipment Execution: DP-2 Cold Water Testing	2	2017	4	2017
FY17 Diving Equipment Execution: KM-37 EGS Cold Water Testing	2	2017	4	2017
FY17 Diving Equipment Execution: Improved Portable Air Monitor	2	2017	4	2017
FY17 Diving Equipment Execution: "C" Chamber Development	3	2017	1	2018
FY17 Diving Equipment Execution: Diver Augemented Visual Display - HUD Phase 2	3	2017	1	2018
FY17 Diving Equipment Execution: TUP - UnManned Testing	1	2018	2	2018
FY18 Pre-Proposals Due	1	2017	1	2017
FY18 New Full Proposals Due	2	2017	3	2017
FY18 New Proposals Selected	3	2017	3	2017
FY18 Diving Equipment Execution: Diver Augmented Visual Display - 3D Sonar	2	2018	1	2019
FY18 Diving Equipment Execution: Diver Augmented Visual Display - HUD Phase 3	1	2018	1	2019
FY18 Diving Equipment Execution: FLEX Chamber Development	2	2018	1	2019
FY18 Diving Equipment Execution: Modernized SCUBA Regulator Testing	4	2018	2	2019
FY18 Diving Equipment Execution: TUP Manned Testing Leading to Certification	1	2018	4	2018
FY19 Pre-Proposals Due	1	2018	1	2018
FY19 New Full Proposals Due	2	2018	3	2018
FY19 New Proposals Selected	3	2018	3	2018
FY19 Diving Equipment Execution: FY19 Diver Augmented Visual Display - Hi Res Sonar	2	2019	1	2020
FY19 Diving Equipment Execution: FLEX Chamber Development	2	2019	1	2020

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Navy		Date: February 2018
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
FY19 Diving Equipment Execution: Modernized SCUBA Regulator Testing	2	2019	4	2019
FY19 Diving Equipment Execution: Submarine Rescue (SRDRS) Rescue Skirt Analysis	2	2019	1	2020
FY20 Pre-Proposals Due	1	2019	1	2019
FY20 New Full Proposals Due	2	2019	3	2019
FY20 New Proposals Selected	3	2019	3	2019