Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy											Date: May 2021	
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 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	75.701	5.499	6.318	8.774	-	8.774	-	-	-	-	-	-
0099: *Deep Submergence Bio Med Dev*	43.310	4.289	4.421	4.463	-	4.463	-	-	-	-	-	-
0394: *Shallow Depth Diving EQ*	32.391	1.210	1.897	4.311	-	4.311	-	-	-	-	-	-

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.

FY2022 funding in this PE increased by $2.456M. The majority of this increase is $1.793M for Submarine Rescue to develop, design and implement submarine rescue improvements to current critical requirement gaps.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	5.619	6.346	6.874	-	6.874
Current President's Budget	5.499	6.318	8.774	-	8.774
Total Adjustments	-0.120	-0.028	1.900	-	1.900
• Congressional General Reductions	-	-0.028			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.120	0.000			
• Program Adjustments	0.000	0.000	2.008	-	2.008
• Rate/Misc Adjustments	0.000	0.000	-0.108	-	-0.108

Change Summary Explanation

FY2022 ($1.900M): $0.107M of the FY22 increase funds Contaminated Environment Sensor Development Testing. The remaining $1.793M funds the design and development of the U.S. Navy's only submarine rescue system, the Submarine Rescue Diving and Recompression System (SRDRS), and its equipment to improve pressurized submarine rescue capabilities. To include; shallow water capability, mobilization improvements, reduce Total Ownership Costs, oxygen decompression monitoring capability, and material evaluation for service life extension.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
0099: *Deep Submergence Bio Med Dev*	43.310	4.289	4.421	4.463	-	4.463	-	-	-	-	-	-
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. This project also validates and improves 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 3900.10A, Management of the Deep Submergence Biomedical Research and Development Program, 6 Nov 2018
Navy Diving Initial Capabilities Document (ICD)

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Deep Submergence Bio Med Dev - Diver Health and Safety	2.211	2.200	2.242	0.000	2.242
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 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 alternations, hydration, and sustained operations. Develop pulmonary oxygen toxicity exposure limits. Provide pulmonary and Central Nervous System (CNS) 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 2021 Plans:*** * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable. * Diver Hearing Conservation: Continue work to quantify acoustic exposures to divers and thus support hearing loss risk mitigation. * Improve Contaminated Water Diving Risk Assessment: Develop real-time water sampling and analysis methods to determine risk and inform diver protection levels. * Optimize Understanding of Hydration Status Impact on Divers: Develop validated models and guidance related to optimizing hydration and rehydration in divers. * Validate, via manned diving, a new probabilistic surface-supplied helium-oxygen decompression table derived from new modeling techniques that addresses critical gaps in current tables to improve diver safety and operational efficiency. * Develop the first longitudinal, population-based health study of U.S. Navy divers to assess					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
the long-term health impacts of diving compared to the general Navy population to identify mitigation strategies and increase the safety and effectiveness divers to include effects of COVID-19 if any. * Leverage new computer technology and techniques to accelerate, optimize and evaluate DCS models to allow for real-time optimization of dive profiles, including real-time gas switching to improve safety and operational capabilities. * Evaluate a new approach to decompression in an animal model by breathing a different gas (perfluoromethane, CF4) from the one used during the dive to reduce decompression time and enhance safety. ***FY 2022 Base Plans:*** * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable. * Surface-supplied helium-oxygen decompression table modernization: Continue to validate, via manned diving, a new probabilistic surface-supplied helium-oxygen decompression table derived from new modeling techniques that addresses critical gaps in current tables to improve diver safety and operational efficiency. * Diver Hearing Conservation: Continue work to quantify acoustic exposures to divers and thus support hearing loss risk mitigation. * Improve Contaminated Water Diving Risk Assessment: Develop real-time water sampling and analysis methods to determine risk and inform diver protection levels. * Optimize Understanding of Hydration Status Impact on Divers: Develop validated models and guidance related to optimizing hydration and re-hydration in divers. * Longitudinal, population-based health study of U.S. Navy divers: Continue to analyze data to assess the long-term health impacts of diving compared to the general Navy population to identify mitigation strategies and increase the safety and effectiveness divers. * DCS models to allow for real-time optimization of dive profiles: Continue to use new computer technology and techniques to accelerate, optimize and evaluate DCS models to support this effort.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
* Continue evaluation of a new approach to decompression in an animal model by breathing a different gas (perfluoromethane, CF4) from the one used during the dive to reduce decompression time and enhance safety. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase of $0.042M in FY22 is due to the total labor costs associated with a number of new labor intensive human and animal subject projects across these two fiscal years. This allocation reflects continued strong interest in addressing challenging, real-time physiologic problems related to enhancing diver performance and range of operations.					
Title: Deep Submergence Bio Med Dev - Submarine Escape & Rescue	2.078	2.221	2.221	0.000	2.221
Articles:	-	-	-	-	-
Description: Submarine Rescue/Escape Research: Provide decompression procedures for pressurized Submarine Rescue Diving and Recompression System (SRDRS) operators. Investigate adjunctive therapies for treating Disabled Submarine (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 hyperbaric oxygen 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 rescues. 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 Surface Survival Personnel Equipment (SESSPE) training. ***FY 2021 Plans:*** * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable. * Explore Utility of Ketone Esters in DISSUB Scenario: Sponsor research looking at the effectiveness of ketone esters and/or salts to induce ketosis and mitigate risk of O2 Toxicity when oxygen prebreathe is indicated to improve survival during pressurized DISSUB rescue.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
* Assess Impact of CO2 on Pressurized DISSUB survival: We will sponsor animal research to answer the question regarding whether elevated CO2 levels will accelerate onset of Pulmonary O2 Toxicity and increase mortality during high internal pressure DISSUB scenarios. * Manned Testing of Specialized Surface Decompression procedures for DISSUB: New surface decompression procedures have been developed if transfer under pressure (TUP) capability is not available in order to minimize the risk of decompression sickness (DCS) in personnel brought directly to the surface from a pressurized DISSUB. Manned testing is needed to validate these procedures. * Develop a computerized decision support tool based on the U.S. Navy Submarine Rescue System Decompression Plan (SRS DP). The SRS DP is a comprehensive and lengthy guide that describes various strategies and procedures to rescue DISSUB personnel under numerous scenarios. This tool will allow submarine rescue personnel to rapidly and confidently move from data-to-options-to-informed decisions regarding decompression methods and procedures during a DISSUB rescue scenario. * Evaluate Mk10/11 MK10/11 SEIE Ascent Rates in response to a recent increase in incidents of air gas embolism in students undergoing pressurized submarine escape training at the Pressurized Escape Trainer at NSB New London that have coincided with the introduction of the newest version of the Submarine Escape Immersion Equipment suit. * Develop a device to detect Submarine Escape Action Limits (SEAL) levels for the seven contaminants of interest in real time and down to pressures as high as 5 ATA. Such a device could replace the maligned, difficult to operate frequently inaccurate Draeger tubes currently onboard USN submarines. * Complete medical modeling project to support medical supply load out and manning complement for DISSUB entry team and Undersea Rescue Command. ***FY 2022 Base Plans:*** * Multi-Year Project Support: Completion of projects initiated in prior fiscal years will be supported where progress is deemed acceptable and project goals remain valid and attainable.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
* Assess Impact of CO2 on Pressurized DISSUB survival: Continue animal research to answer the question regarding whether elevated CO2 levels will accelerate onset of Pulmonary O2 Toxicity and increase mortality during high internal pressure DISSUB scenarios. * Manned Testing of Specialized Surface Decompression procedures for DISSUB rescue without transfer under pressure: Continue manned testing to validate these procedures. * Down selection and transition of a device to detect Submarine Escape Action Limits (SEAL) levels for the seven contaminants of interest in real time and down to pressures as high as 5 ATA to replace the maligned, difficult to operate frequently inaccurate Draeger tubes currently onboard USN submarines. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A					
Accomplishments/Planned Programs Subtotals	4.289	4.421	4.463	0.000	4.463

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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 Research and Development (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 Business Area Analysis (BAA) and leveraging Office of Naval Research (ONR) capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy		Date: May 2021
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*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NEDU : Panama City, FL	24.715	0.592	Jan 2020	0.844	Nov 2020	0.801	Nov 2021	-		0.801	-	-	-
Development Test & Evaluation	WR	NMRC : Silver Spring, MD	10.836	0.954	Feb 2020	1.067	Nov 2020	0.986	Nov 2021	-		0.986	-	-	-
Development Test & Evaluation	Various	DUKE UNIV : Durham, NC	3.432	0.802	Nov 2019	0.676	Mar 2021	0.639	Nov 2021	-		0.639	-	-	-
Development Test & Evaluation	C/FFP	WISCONSIN : Madison, WI	1.671	0.390	Feb 2020	0.401	Feb 2021	0.000		-		0.000	-	-	-
Development Test & Evaluation	C/FFP	SUNY : Buffalo, NY	1.881	0.600	Nov 2019	0.314	Apr 2021	0.325	Nov 2021	-		0.325	-	-	-
Development Test & Evaluation	C/CPFF	JHU APL : Laurel, MD	0.179	0.489	Jan 2020	0.296	Mar 2021	0.296	Nov 2021	-		0.296	-	-	-
Development Test & Evaluation	WR	NAVWAR : San Diego, CA	0.000	0.403	Jan 2020	0.255	Nov 2020	0.205	Nov 2021	-		0.205	-	-	-
Development Test & Evaluation	Various	Various : Various	0.000	0.000		0.000		0.982	Oct 2021	-		0.982	-	-	-
Development Test & Evaluation	C/FFP	ASHWIN-USHAS CORP: : Marlboro, NJ	0.000	0.000		0.350	Jan 2021	0.000		-		0.000	-	-	-
		Subtotal	42.714	4.230		4.203		4.234		-		4.234	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel	Various	Various : Various	0.596	0.059	Nov 2019	0.040	Nov 2020	0.050	Nov 2021	-		0.050	-	-	-
SBIR Assessment	Various	Various : Various	0.000	0.000		0.178	Oct 2020	0.179	Oct 2021	-		0.179	-	-	-
		Subtotal	0.596	0.059		0.218		0.229		-		0.229	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	43.310	4.289		4.421		4.463		-		4.463	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
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*

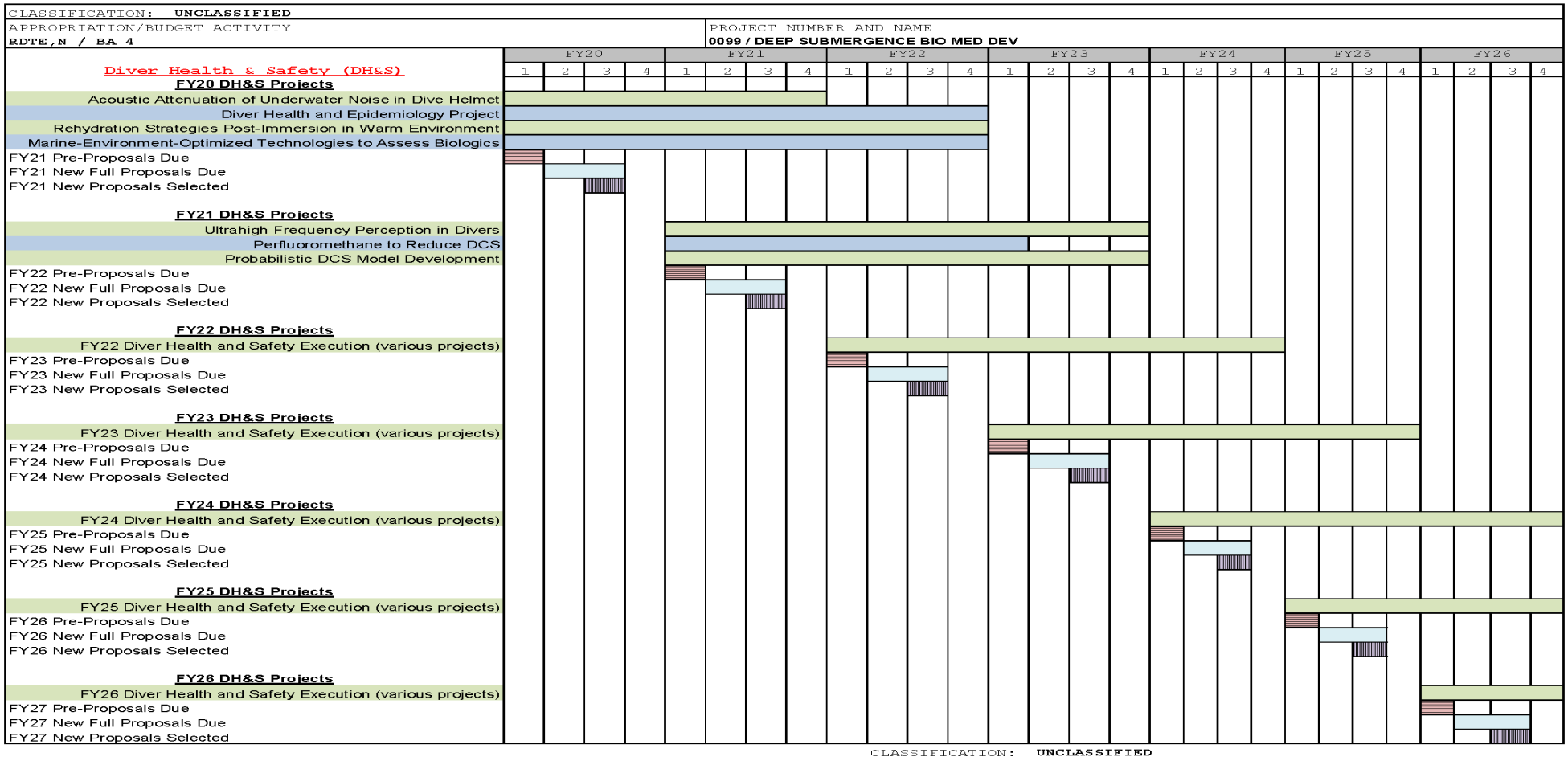

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

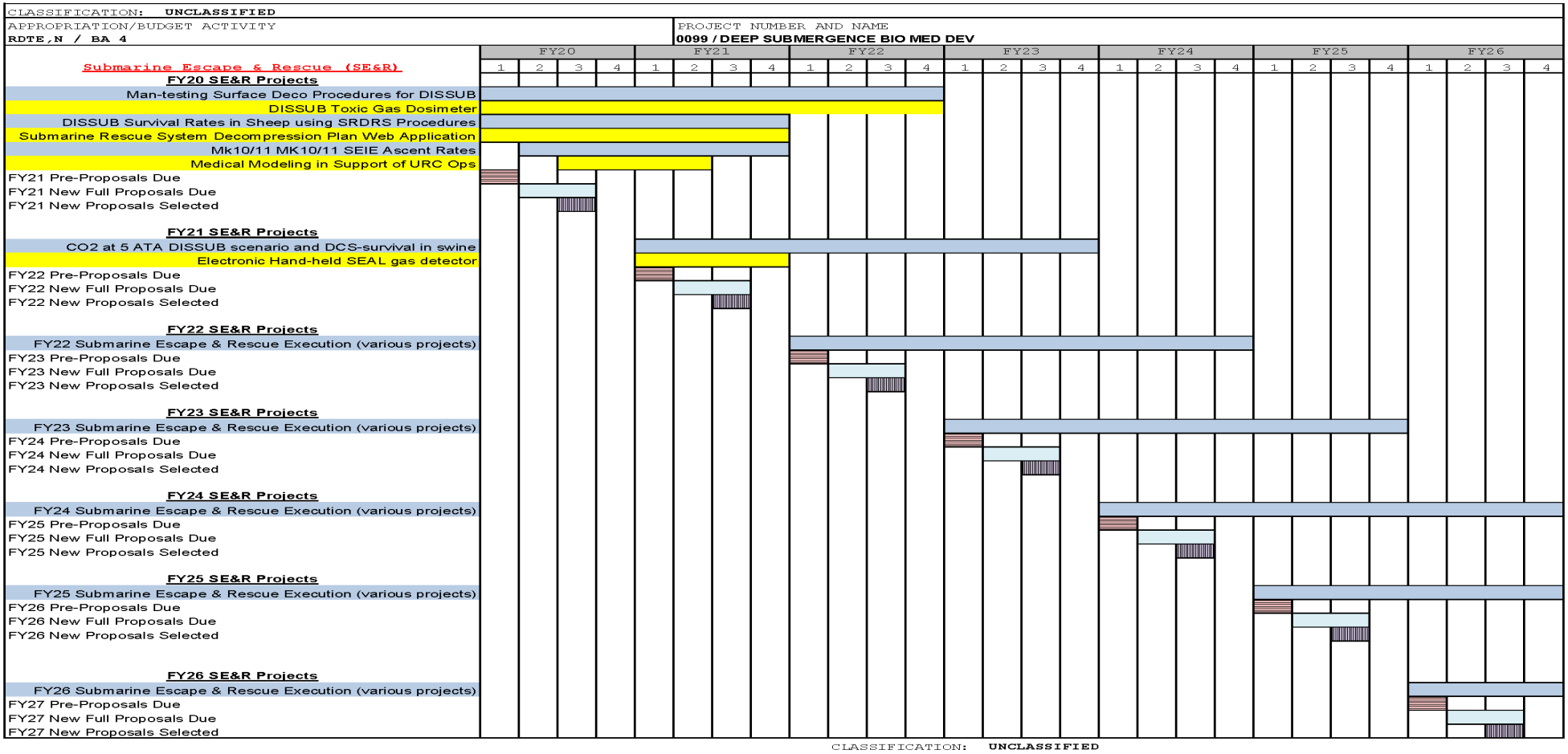

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0099 / *Deep Submergence Bio Med Dev*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0099				
Diver Health & Safety (DH&S): FY20 DH&S Projects: Acoustic Attenuation of Underwater Noise in Dive Helmet	1	2020	4	2021
Diver Health & Safety (DH&S): FY20 DH&S Projects: Diver Health and Epidemiology Project	1	2020	4	2022
Diver Health & Safety (DH&S): FY20 DH&S Projects: Rehydration Strategies Post-Immersion in Warm Environment	1	2020	4	2022
Diver Health & Safety (DH&S): FY20 DH&S Projects: Marine-Environment-Optimized Technologies to Assess Biologics	1	2020	4	2022
Diver Health & Safety (DH&S): FY21 Pre-Proposals Due	1	2020	1	2020
Diver Health & Safety (DH&S): FY21 New Full Proposals Due	2	2020	3	2020
Diver Health & Safety (DH&S): FY21 New Proposals Selected	3	2020	3	2020
Diver Health & Safety (DH&S): 'FY21 DH&S Projects: Ultrahigh Frequency Perception in Divers	1	2021	4	2022
Diver Health & Safety (DH&S): 'FY21 DH&S Projects: Perfluoromethane to Reduce DCS	1	2021	4	2022
Diver Health & Safety (DH&S): 'FY21 DH&S Projects: Probabilistic DCS Model Development	1	2021	4	2022
Diver Health & Safety (DH&S): FY22 Pre-Proposals Due	1	2021	1	2021
Diver Health & Safety (DH&S): FY22 New Full Proposals Due	2	2021	3	2021
Diver Health & Safety (DH&S): FY22 New Proposals Selected	3	2021	3	2021
Diver Health & Safety (DH&S): 'FY22 DH&S Projects: 'FY22 Diver Health and Safety Execution (various projects)	1	2022	4	2022
Diver Health & Safety (DH&S): FY23 Pre-Proposals Due	1	2022	1	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
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): FY23 New Full Proposals Due	2	2022	3	2022
Diver Health & Safety (DH&S): FY23 New Proposals Selected	3	2022	3	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Man-testing Surface Deco Procedures for DISSUB	1	2020	4	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: DISSUB Toxic Gas Dosimeter	1	2020	4	2022
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: DISSUB Survival Rates in Sheep using SRDRS Procedures	1	2020	4	2021
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Submarine Rescue System Decompression Plan Web Application	1	2020	4	2021
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Mk10/11 MK10/11 SEIE Ascent Rates	2	2020	4	2021
Submarine Escape & Rescue (SE&R): 'FY20 SE&R Projects: Medical Modeling in Support of URC Ops	3	2020	2	2021
Submarine Escape & Rescue (SE&R): FY21 Pre-Proposals Due	1	2020	1	2020
Submarine Escape & Rescue (SE&R): FY21 New Full Proposals Due	2	2020	3	2020
Submarine Escape & Rescue (SE&R): FY21 New Proposals Selected	3	2020	3	2020
Submarine Escape & Rescue (SE&R): FY21 SE&R Projects: CO2 at 5 ATA DISSUB scenario and DCS-survival in swine	1	2021	4	2022
Submarine Escape & Rescue (SE&R): FY21 SE&R Projects: Electronic Hand-held SEAL gas detector	1	2021	4	2021
Submarine Escape & Rescue (SE&R): FY22 Pre-Proposals Due	1	2021	1	2021
Submarine Escape & Rescue (SE&R): FY22 New Full Proposals Due	2	2021	3	2021
Submarine Escape & Rescue (SE&R): FY22 New Proposals Selected	3	2021	3	2021
Submarine Escape & Rescue (SE&R): FY22 SE&R Projects: FY22 Submarine Escape & Rescue Execution (various projects)	1	2022	4	2022
Submarine Escape & Rescue (SE&R): FY23 Pre-Proposals Due	1	2022	1	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
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): FY23 New Full Proposals Due	2	2022	3	2022
Submarine Escape & Rescue (SE&R): FY23 New Proposals Selected	3	2022	3	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy			Date: May 2021
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
0394: *Shallow Depth Diving EQ*	32.391	1.210	1.897	4.311	-	4.311	-	-	-	-	-	-
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 tools to improve work efficiency, tracking and navigation, visual enhancement, contaminated water diving, diver environmental protection, and recompression chamber technology.

Requirements:
Operational Requirements Document, Revision 2 for Submarine Rescue Diving and Recompression System (SRDRS) Serial 694-87-06 dtd 6 June 2006
COMSUBLANT/COMSUBPAC OPORD 2137 (Submarine Rescue) dtd 5 Aug 2014
Mission Needs Statement, M016402-92
Survivability, OPNAV N87 ltr Serial N87/5U659719 dtd 30 Jan 1995

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Shallow Depth Diving EQ - Diving	1.162	1.049	1.670	0.000	1.670
Articles:	-	-	-	-	-
Description: Continued research into all engineering and equipment design aspects of manned diving, to include: life support, contaminated water, SCUBA, gas analysis, thermal protection, saturation diving, and divers tools.					
FY 2021 Plans: * Diver Augmented Visual Display - Hi Resolution Sonar: Continue design and testing of a high resolution, high frequency, short range visualization system (Close in Visualization System, CIVS) that will integrate with the DAVD. This will allow accurate, real time visualization for use when conducting underwater search, salvage, ship husbandry, or construction in low visibility waters. * DAVD System Improvement: Start work on developing a self contained DAVD that does not rely on surface umbilicals or fixed sonar installations. This will allow HUD systems and onboard spatial awareness without the requirement to be tethered to the surface.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
* Authorized for Navy Use (ANU) Item Testing/Retesting: Testing of life support and other underwater systems for inclusion on the ANU list. This will include both testing of existing ANU items to ensure continued compliance with configuration management and quality or the testing of new items that are desired by fleet divers. ***FY 2022 Base Plans:*** * DAVD System Improvement: Continue work on developing a self contained DAVD that does not rely on surface umbilicals or fixed sonar installations. This will allow HUD systems and onboard spatial awareness without the requirement to be tethered to the surface. * Authorized for Navy Use (ANU) Item Testing/Retesting: Continue testing of life support and other underwater systems for inclusion on the ANU list. This will include both testing of existing ANU items to ensure continued compliance with configuration management and quality or the testing of new items that are desired by fleet divers. * Lightweight 1ATA Dive Suit (LADS) Development and Testing: Continue to build and test the zero thrust joints and prehensor and initiate integration into lightweight version of 1ATA EXOSUIT. This will allow US Navy divers to work at significant depth in a self-propelled, flexible suit without the risk of decompression sickness or performing lengthy decompression. * Contaminated Environment Sensor Development and Testing: Start development of sensors to analyze for oil and particulates in air and pathogens and other contaminants in water. These sensors will allow divers to maintain air purity in breathing gases and assess water constituents to inform pre-dive mission planning. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase of $0.621M in FY22 is required to support two efforts. The first effort is to successfully transition the ONR project to develop and integrate new joints and prehensors into the Lightweight 1 Atmosphere Dive Suit (LADS) to 00C. The second effort is to initiate the development of environmental sensors to meet an NECC need for Mobile Diving & Salvage Divers to dive in contaminated waters. Once developed, these sensors could be used across the Navy diving community on projects including, Salvage, Battle Damage Repair, Underwater Ship Husbandry, Underwater Construction, Explosive Ordinance Disposal and Special Warfare. Failure to					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
dovetail the transition of the LADS will result in reduced diver work efficiency and increased safety risk to the divers. Failure to develop environmental sensors restricts MDSU operations and could deny safe diving access across the Navy diving spectrum.					
Title: Shallow Depth Diving EQ - Submarine Escape and Rescue	0.048	0.848	2.641	0.000	2.641
Articles:	-	-	-	-	-
Description: Research, development, testing, and design of technologies to support improvements, increase resiliency, and increase capabilities of equipment, processes and procedures required to ensure successful escape and rescue of Distressed Submarine (DISSUB) survivors. The ability to ensure successful escape and rescue is a core function of the Undersea Warfare enterprise. ***FY 2021 Plans:*** Design and development of equipment to improve the pressurized shallow water mating capability of the SRDRS. Pressurized shallow water mating is a critical capability gap. Current capability only covers 60 percent of the world's rescuable waters. The US submarine recue system currently mates to US and Foreign submarine through an articulating transfer skirt. Funding provides for testing and engineering needed to develop a new Transfer Skirt mating seal and assistive equipment to allow for shallower submarine mating capability and improve the ability to rescue submariners from a Distressed Submarine (DISSUB). ***FY 2022 Base Plans:*** *Complete the design and development of equipment that improves the pressurized shallow water mating capability of the SRDRS. Pressurized shallow water mating is a critical capability gap. Current capability only covers 60 percent of the world's rescuable waters. The US submarine recue system currently mates to US and Foreign submarine through an articulating transfer skirt. Funding provides for testing and engineering needed to develop a new Transfer Skirt mating seal and assistive equipment to allow for shallower submarine mating capability and improve the ability to rescue submariners from a Distressed Submarine (DISSUB). *Design and implementation of mobilization improvement initiatives to address current inability to meet requirements for mobilization time of 18 hours and improve system capability in meeting Time To First Rescue (TTFR) of 96 hours. This effort optimizes the mobilization of rescue equipment by (1) reducing the amount of time required to weld the Ship Interface Template System (SITS); (2) reducing the time required to assemble the A-frame; and (3) reduce the time required to install the overboarding cylinders.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
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*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
*Provide Independent Verification and Validation (IV&V) software testing, development, integration, and certification of the oxygen decompression monitoring capability for the Submarine Decompression System (SDS) which provides the Transfer Under Pressure (TUP) capability. Delivery of this closes the capability gap for oxygen decompression as required by the ORD to ensure submarine rescue and decompression timelines meet onboard submarine life support onboard stores requirements. *Develop and evaluate material for a service life extension plan of the submarine rescue system. Failure to develop this life extension plan will prevent necessary analysis to be conducted prior to existing SRDRS end of life. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase of $1.793M from FY21 to FY22 is needed to support multiple efforts to improve submarine rescue capability and to close current critical requirement gaps captured in FY 2022 Base Plans.					
Accomplishments/Planned Programs Subtotals	1.210	1.897	4.311	0.000	4.311

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• OPN/0955: *Deep Subm Sys Proj (DSSP) Equip*	2.909	2.918	10.682	-	10.682	-	-	-	-	-	-
• OPN/1130: *Diving and Salvage Equipment*	11.854	11.143	10.772	-	10.772	-	-	-	-	-	-

Remarks

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 - SBIR contract is in place to support development and design.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering - Design, Integration (PMS-390 TUP)	C/CPFF	Oceaneering : Hanover, MD	26.981	0.000		0.000		0.658	Jan 2022	-		0.658	-	-	-
Systems Engineering - Design, Integration (PMS-390)	WR	NUWC : Newport, RI	0.000	0.048	Dec 2019	0.351	Nov 2020	0.052	Nov 2021	-		0.052	-	-	-
Systems Engineering - Design, Integration (PMS-390)	WR	PNSY : Portsmouth, NH	0.000	0.000		0.250	Apr 2021	0.300	Oct 2021	-		0.300	-	-	-
Diving Equipment Product Development (00C)	C/CPFF	Phoenix : Largo, MD	0.430	0.000		0.000		0.000		-		0.000	-	-	-
Diving Equipment Product Development (00C)	C/CPFF	Vanderbilt Unversity : Nashville, TN	0.503	0.050	Oct 2019	0.000		0.000		-		0.000	-	-	-
Diving Equipment Product Development (00C)	C/FFP	Coda Octopus : Orlando, FL	0.000	0.000		0.604	Oct 2020	0.460	Oct 2021	-		0.460	-	-	-
Diving Equipment Product Development (00C)	C/CPFF	PCCI : Alexandria, VA	1.830	0.421	Jan 2020	0.000		0.000		-		0.000	-	-	-
Diving Equipment Product Development (00C)	C/CPFF	Penn state UARC : Not Specified	0.600	0.000		0.000		0.000		-		0.000	-	-	-
Diving Equipment Product Development (00C)	WR	NSWC-PC : Panama City, FL	0.657	0.000		0.000		0.000		-		0.000	-	-	-
Diving Equipment Product Development	C/CPFF	GPC : Irvine, CA	0.000	0.316	Apr 2020	0.110	Oct 2020	0.000		-		0.000	-	-	-
Diving Equipment Product Development	TBD	NAVFAC : Port Hueneme, CA	0.000	0.200	Apr 2020	0.000		0.000		-		0.000	-	-	-
Diving Equipment Product Development	TBD	Mide Technology : Woburn, MA	0.000	0.000		0.000		0.517	Oct 2021	-		0.517	-	-	-
Diving Equipment Product Development	TBD	Polestar : Needham Heights, MA	0.000	0.000		0.000		0.370	Oct 2021	-		0.370	-	-	-
Systems Engineering - Design, Integration (PMS-390)	C/CPFF	Penn state UARC : Penn State, PA	0.000	0.000		0.247	Jul 2021	1.231	Nov 2021	-		1.231	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Navy			Date: May 2021
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*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering - Design, Integration (PMS-390)	C/CPFF	JHU : Baltimore, MD	0.000	0.000		0.000		0.400	Dec 2021	-		0.400	-	-	-
		Subtotal	31.001	1.035		1.562		3.988		-		3.988	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test and Evaluation (00C)	WR	NEDU : Panama City, FL	0.673	0.075	Jan 2020	0.250	Oct 2020	0.204	Oct 2021	-		0.204	-	-	-
Developmental Test and Evaluation (00C)	WR	NSWC : Panama City, FL	0.000	0.100	Mar 2020	0.000		0.000		-		0.000	-	-	-
		Subtotal	0.673	0.175		0.250		0.204		-		0.204	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Travel (00C)	Various	NAVSEA : Washington, DC	0.159	0.000		0.012	Oct 2020	0.017	Oct 2021	-		0.017	-	-	-
SBIR Assessment	Various	Various : Various	0.513	0.000		0.045	Oct 2020	0.072	Oct 2021	-		0.072	-	-	-
Program Management Support (00C)	C/CPFF	Unknown : Not Specified	0.045	0.000		0.028	Mar 2021	0.030	Oct 2021	-		0.030	-	-	-
		Subtotal	0.717	0.000		0.085		0.119		-		0.119	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	32.391	1.210		1.897		4.311		-		4.311	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
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*

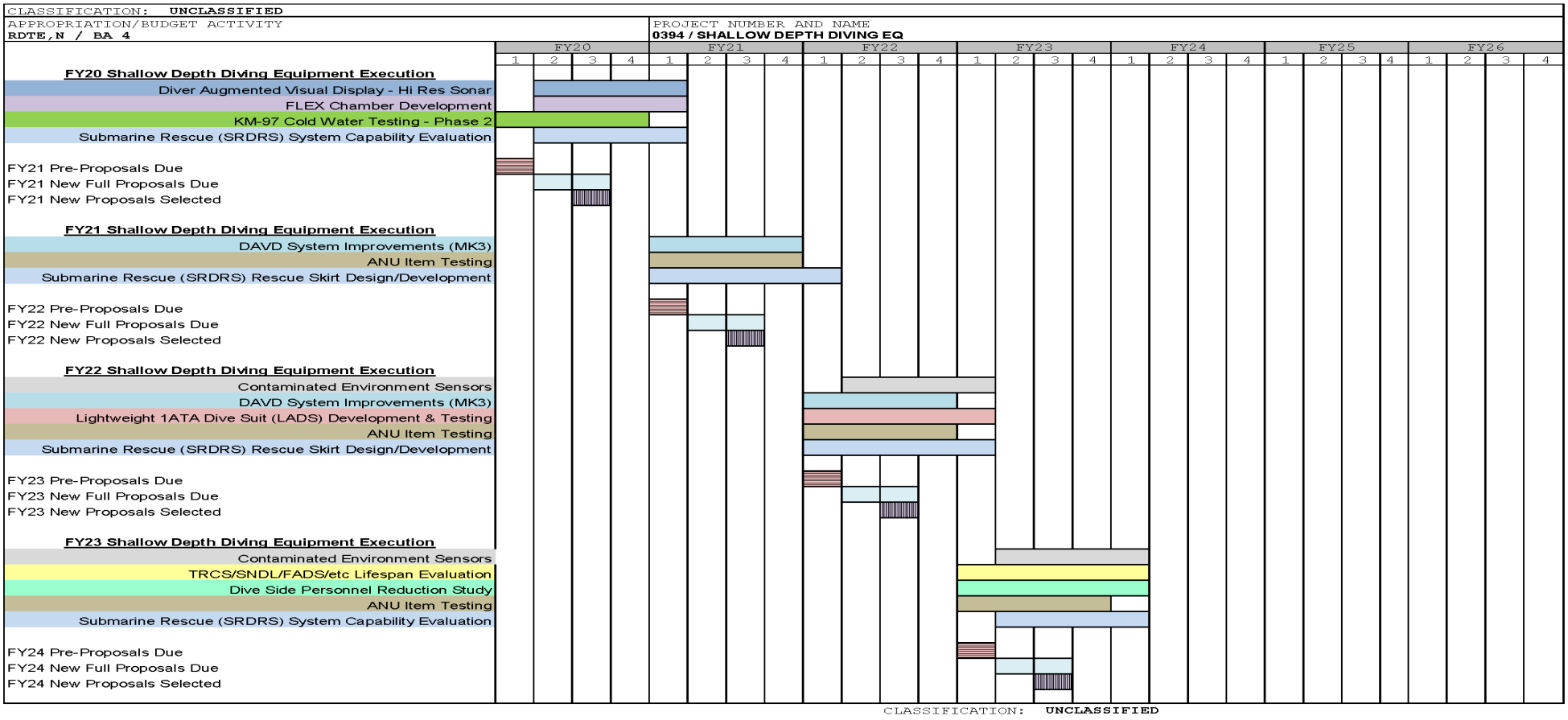

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

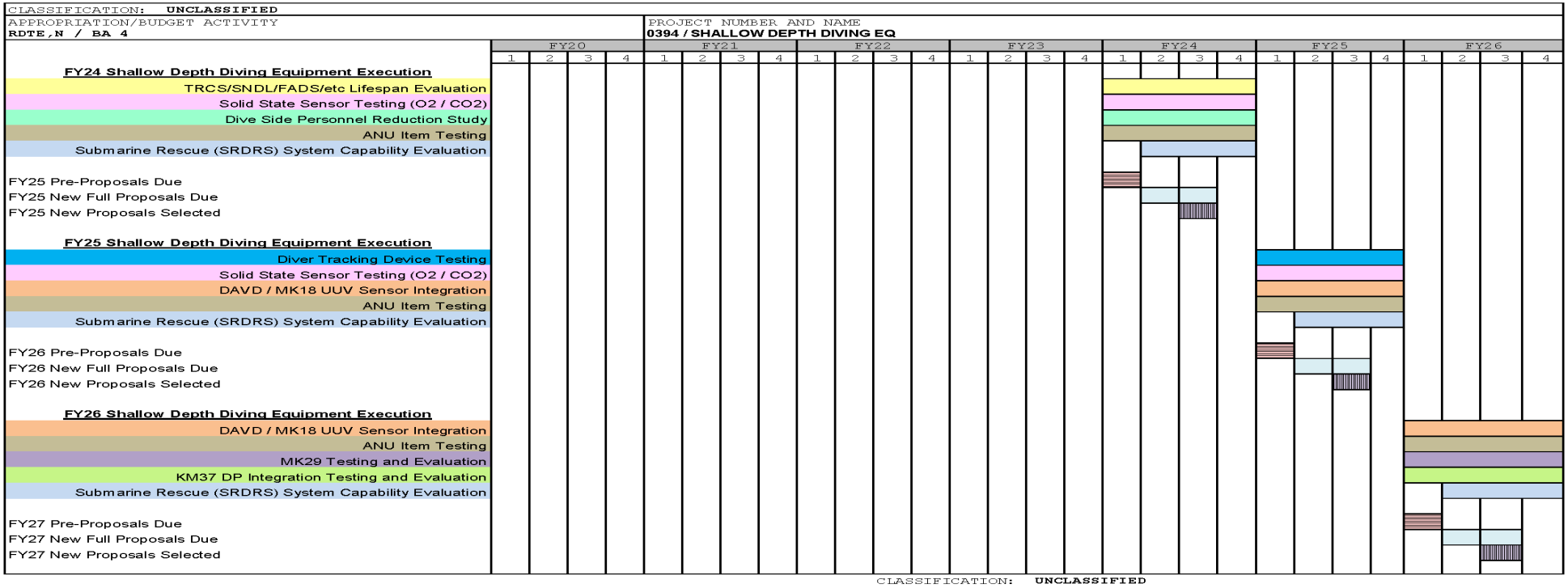

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603713N / *Ocean Engineering Tech Dev*	**Project (Number/Name)** 0394 / *Shallow Depth Diving EQ*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0394				
FY20 Shallow Depth Diving Equipment Execution: Diver Augmented Visual Display - Hi Res Sonar	2	2020	1	2021
FY20 Shallow Depth Diving Equipment Execution: FLEX Chamber Development	2	2020	1	2021
FY20 Shallow Depth Diving Equipment Execution: KM-97 Cold Water Testing - Phase 2	1	2020	4	2020
FY20 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evaluation	2	2020	1	2021
FY20 Shallow Depth Diving Equipment Execution: FY21 Pre-Proposals Due	1	2020	1	2020
FY20 Shallow Depth Diving Equipment Execution: FY21 New Full Proposals Due	2	2020	3	2020
FY20 Shallow Depth Diving Equipment Execution: FY21 New Proposals Selected	3	2020	3	2020
FY21 Shallow Depth Diving Equipment Execution: DAVD System Improvements (MK3)	1	2021	4	2021
FY21 Shallow Depth Diving Equipment Execution: ANU Item Testing	1	2021	4	2021
FY21 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) Rescue Skirt Design/Development	1	2021	1	2022
FY21 Shallow Depth Diving Equipment Execution: FY22 Pre-Proposals Due	1	2021	1	2021
FY21 Shallow Depth Diving Equipment Execution: FY22 New Full Proposals Due	2	2021	3	2021
FY21 Shallow Depth Diving Equipment Execution: FY22 New Proposals Selected	3	2021	3	2021
FY22 Shallow Depth Diving Equipment Execution: Contaminated Environment Sensors	2	2022	4	2022
FY22 Shallow Depth Diving Equipment Execution: DAVD System Improvements (MK3)	1	2022	4	2022
FY22 Shallow Depth Diving Equipment Execution: Lightweight 1ATA Dive Suit (LADS) Development & Testing	1	2022	4	2022
FY22 Shallow Depth Diving Equipment Execution: ANU Item Testing	1	2022	4	2022

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Navy		Date: May 2021
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	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
FY22 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) Rescue Skirt Design/Procurement	1	2022	4	2022
FY23 Pre-Proposals Due	1	2022	1	2022
FY23 New Full Proposals Due	2	2022	3	2022
FY23 New Proposals Selected	3	2022	3	2022
'FY26 Shallow Depth Diving Equipment Execution: Submarine Rescue (SRDRS) System Capability Evauation	2	2020	4	2022